

THE CLINICAL AI SCORECARD:

How Different Integration Approaches Handle Deployment Challenges

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BROKEN PROMISES:

The Dangers of the AI Hype Cycle

In the 2019 book "Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again," author Eric Topol, MD, was optimistic about the ways artificial intelligence (AI) could transform everything doctors do – from notetaking and image analysis to diagnosis and treatment – while subsequently reducing costs associated with care and allowing for better connections between patient and clinician.¹

Three years later, Ben Leonard and Ruth Reader stated in Politico "Artificial intelligence was supposed to transform health care. It hasn't.," arguing that while investors remain enthusiastic about AI's potential, health system infrastructure cannot support it, the FDA is still figuring out how to regulate it and there are too many technological and bureaucratic hurdles to overcome for it to be widely adopted.²

These publications show both sides of the clinical AI coin. One side is buoyed by hope for a transformed healthcare industry, while the other side is marred by unfulfilled expectations.

This chasm has two things to blame: unrelenting hype and an oversaturated market.

Hope or Hype?

The initial hype surrounding clinical AI stemmed from its seemingly limitless potential. Proponents envisioned all-in-one solutions that integrated into clinical workflows, assisted in triage and diagnosis and facilitated inpatient and outpatient care collaboration. An AI that would automate routine tasks, freeing up valuable time for clinicians to focus on patient interaction and analyze vast amounts of data to reveal insights that could personalize care and improve outcomes.

Yet, the reality for many early adopters painted a more nuanced picture. While some AI solutions have achieved success in the areas noted above, the majority have only demonstrated success in pathology-specific areas or for a single department or facility.

Single problem = single solution.

The challenge here is the broader impact has been considered less impressive due to siloed and unreliable data, complex and time-consuming integrations, challenges with end-user adoption and ongoing governance questions.^{3,4,5,6}

Why? The answer is simple...

Not All Al is Created Equal

The year-over-year increase in FDA-cleared Al/machine learning (ML) enabled devices is projected to grow more than 30 percent,⁷ adding to the nearly 700 currently authorized devices.⁸ The broad categorization and grouping of these devices created the misconception they are all created equal. However, there must be distinction between what each technology does, for example intelligent decision making versus performing a function within a device. Understanding these differences is akin to thinking you purchased a smart phone when you bought an app.

The proof: only 318 of the market-cleared devices offer predictive clinical decision support.⁹ That means one of the greatest clinical AI use cases – distilling data into actionable insights – is only available in about 50 percent of AI solutions.⁹

The Path Forward

While these two factors have, rightfully, led to a sense of skepticism among some healthcare leaders, everything is not doom and gloom. While the potential of clinical AI remains undeniable, its full realization requires the shift towards a more measured and realistic approach to adoption that ensures clinical AI delivers on its promise to improve healthcare for all.

This path forward has already been forged by thousands of medical facilities worldwide, and it marries technological requirements with the people and process considerations necessary for scalable and sustainable AI implementation. In this document, we'll assess currently available AI adoption options and demonstrate why a platform approach is the critical factor to AI's success.

AI INTEGRATION:

The Pros and Cons of a Point Solution, Marketplace and Platform

Like healthcare itself, paths to clinical AI integration haven't been one-size-fits-all. Three approaches have gained traction, each with its own unique advantages and challenges.

Point solutions offer rapid deployment and focus on specific tasks but can create data silos and limit scalability.

Marketplaces offer a hub for discovering and choosing different AI solutions but require expertise to navigate and may involve varying quality and system compatibility.

Platforms provide a centralized infrastructure for scalable AI implementation but require upfront investment.

FEATURE	POINT SOLUTIONS	MARKETPLACES	PLATFORMS
Scope	Narrow and focused on a specific task or use case	Broad and diverse offering of solutions from multiple vendors	Flexible and adaptable infrastructure for managing all Al solutions
Scalability	Limited	Variable	High
Data Management	Siloed	Fragmented	Centralized
Interoperability	Limited without customization	Difficult	Out-of-the-box
Deployment Time	Fast	Varies depending on selected solutions	Less than three months
Cost	Lower initial cost but potentially higher maintenance costs	Varies depending on selected solutions	Higher initial cost but longer-term cost savings
Vendor Lock-In	High	Low	Medium
Workflow Customization	Limited	Limited unless selecting a single vendor's solutions	Highly customizable
Technical Support Needed	Low upfront, higher for maintenance	Varies	High upfront, lower for maintenance
Data Security	Potential risk due to multiple system integrations	Potential risk due to inconsistent standards across vendors	Secured infrastructure for all AI solutions on the platform
Innovation Potential	Limited	Frequently adds new solutions	Flexible infrastructure allows for new AI to be added easily
Suitable for	Organizations with specific needs and limited resources	Organizations who want diverse solutions and rapid innovation	Organizations who want an enterprise-approach to Al

Not sure where to start?

Healthcare leaders that have successfully implemented clinical AI in large health systems share "Lessons from the Inside."

HOW EACH INTEGRATION APPROACH ADDRESSES COMMON AI ADOPTION CHALLENGES

How point solutions, marketplaces and platforms mitigate the risks associated with large-scale technology shifts is ultimately what differentiates the integration approaches from one another. In this section, we'll explore three common challenges to AI adoption and rank the ability of each approach to effectively manage them.

Data Challenges:

Medical data is often unstructured, siloed and inconsistent, making it difficult for AI algorithms to analyze it and make it actionable. Additionally, AI models drift over time, requiring ongoing monitoring and maintenance.

Infrastructure Challenges:

The implementation of multiple algorithms can strain limited IT resources, complicating the management and maintenance of these solutions. Plus, the lack of native integration capabilities diminishes the quality of insights delivered.

Human Challenges:

Without automated AI orchestration, teams need to rely on manual processes or rule-based auto-forwarding. Without governance, individual departments may make decisions that are not in the best interests of the facility or health system.



Keeping score

Each integration approach is scored based on how easily it can address a common adoption challenge.

CHALLENGE ONE:

Data Deluge - Will Al Sink or Swim?

Imagine a vast ocean of healthcare data. It spans as far as the eye can see and promises limitless potential for improved outcomes. But this ocean isn't pristine – it's contaminated by unstructured notes, inconsistent formats and ever-shifting protocols. To some, it may also not be accessible. Navigating this ocean is treacherous, and the reality for Al implementation.

UNRELIABLE AND UNSTANDARDIZED DATA

A significant portion of healthcare data is unstructured, meaning it lacks a predefined format or organization. This includes narrative clinical notes, radiology reports and patient-generated data.

Unstructured data is challenging to process and analyze using traditional methods, making it difficult to extract valuable insights for AI algorithms. For instance, a pulmonary embolism (PE) algorithm needs to analyze all chest CT exams with contrast, but this information is not always consistent in the metadata.

A common solution is to manually define a new series of instructions or guidelines for each scan – commonly

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Point Solution

Manual data maintenance

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Marketplace

Limited data accessibility



Platform

Automatically structures and standardizes data

referred to as protocols – but this approach is not scalable due to the sheer number. Additionally, as protocols change, the rules and formatting of metadata also changes, which creates more and more patient data that must be sorted and analyzed. This highlights the importance of data governance and the need to effectively manage and utilize metadata.

THE PROTOCOL PROBLEM

This chart illustrates the seemingly simple problem of which AI algorithm to run on which series of images. Everything above the gray line is a protocol defined by the hospital as "worthy of PE analysis," while all protocols below the gray line are also eligible studies where PE may be detected but were not reviewed by the algorithm. With a point solution, data and protocols need to be manually updated to ensure they continue to capture appropriate cases, while a platform adjusts to data changes and inconsistencies automatically.

NOV. '22 STUDY DESCRIPTION	DEC. '22 STUDY DESCRIPTION	JAN. '23 Study description
CTA Pulmonary Embolus	CTA Pulmonary Embolus	CTA Pulmonary Embolus
CTA Chest	CTA Chest	CTA Chest
CTA Chest (Entire Aorta)	CTA Chest (Entire Aorta)	CTA Chest (Entire Aorta)
СТА СТЕРН	СТА СТЕРН	СТА СТЕРН
-	-	CTA Chest ABD Pelvis W W/O Contrast
STUDY DESCRIPTION	STUDY DESCRIPTION	STUDY DESCRIPTION
CT Chest With Contrast	CT Chest With Contrast	CT Chest With Contrast
CT Chest ABD Pelvis W W/O Contrast	CT Chest W/O Contrast	CT Chest Outside Image
CT Chest Outside Image	CT Chest Venogram	IR PLCMT Chest Tube
Lung	IR Plcmt Chest Tube	CT Chest Venogram
CT Chest W/O Contrast	CT Chest EP Lead Extraction	CT Chest EP Lead Extraction
CT Chest WO/W Contrast	CT Chest Outside Image	IR CT Biopsy Lung
CT Chest W/ Contrast	4D Lung	CT Chest W/Contrast
CT Chest Ep Lead Extraction	Right Lung 4D	CT Chest W/O Contrast
4D Sbrt Bilat Lung	Chest	CT Chest ABD Pelvis W W/O Cont
4D Lung	H&N/ Lung	Lung
SBRT Lung	Lung SBRT	Lung 4D

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DATA "NOISE"

Correctly matching an algorithm or combination of algorithms to the appropriate study while avoiding

exposure to data not relevant to a given algorithm may seem straightforward, but it is a complex process that is often underestimated.

False positives occur when an AI algorithm incorrectly identifies a potential abnormality in an image. These false alerts can overwhelm clinicians with unnecessary notifications, leading to desensitization and potentially missed cases.

Therefore, it is important to monitor the "yield," defined as the percentage of exams that were correctly analyzed by the appropriate algorithm. Relying on manual methods to match protocols to Al algorithms, means a significant portion of exams that should be analyzed will be missed.



Point Solution

Rely on pre-defined rules limiting ability to filter irrelevant data



Marketplace

Each vendor will have different controls leading to inconsistencies



Platform

Learns from historical data to improve yield

EXAM YIELD FOR A CERVICAL SPINE FRACTURE

In the example below, using manual methods resulted in a 21% loss of exams after six months. This highlights the need for automated AI orchestration to ensure that all relevant exams are analyzed by the appropriate AI algorithms.¹⁰



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DATA DRIFT

Data drift is a significant challenge for AI algorithms. It can happen for several reasons, including the introduction of new protocols, the replacement of old machines or the evolving best practices for image acquisition.

With data drift, users may experience frustration when AI algorithms fail to detect relevant findings due to changes in protocols and metadata. They would see the brain in the images, maybe even the trace of a hemorrhage and wonder: why didn't AI analyze this case?



Point Solution

Requires manual process to monitor and adjust



Marketplace

Each solution will require its own monitoring



Platform

Automatically detects changes

INTRACRANIAL HEMORRHAGE (ICH) PROTOCOLS AT ONE LOCATION OVER 2.5 YEARS

A retrospective analysis comparing an advanced AI orchestration (AIO) method with a traditional rule-based metadata orchestration (MBO) was completed. This graph shows the data drift over time, as more protocols and human elements changed workflows. The orange linear MBO average depicts the decline in weekly ICH patient capture at this location.

AlO identified 66,581 ICH scans, while MBO identified 61,902 ICH scans, resulting in a 7.0% decrease for ICH. The mean weekly decrease was 0.1% with a standard deviation of 4.2% The maximum weekly decrease observed was 17.5% for ICH.¹¹





INCONSISTENT DATA

Data can be unreliable, unstandardized and inconsistent across different clinical workflows. The algorithm doesn't always know what dataset will be available or when all the data will be transferred.

Take for instance an algorithm often used for different pathologies using different data sets. Some of these may have thin slices – a narrow cross-sectional image of an anatomical structure that provide greater detail and resolution, allowing for more precise visualization – and others may only include thick slices that have 10% lower accuracy compared to thinner ones.¹²

While this issue is not limited solely to AI - even

radiologists become less accurate reading too many thick slices – this data inconsistency can hinder effectiveness, leading to inaccurate results and patient care risk.

THE MISSED OPPORTUNITY IN ONLY DELIVERING EXPECTED RESULTS

Many clinically relevant findings are incidental, meaning they are discovered during imaging for unrelated reasons. Studies have shown that the miss rate for pulmonary embolisms (PE) in incidental cases can be as high as 40-50%,¹³ compared to only 5-10% for dedicated exams.¹⁴ An evaluation using the Aidoc algorithm for PE revealed that up to 20% of PE detections were incidental, meaning the radiologist was actively looking for another pathology when it was flagged by Al.¹⁵

This discrepancy highlights the inherent limitations of human perception, which can be influenced by clinical history and reason for examination. Al algorithms can analyze vast amounts of medical data with speed and accuracy, identifying incidental findings that might otherwise be overlooked.



CASE STUDY: YALE NEW HAVEN HEALTH

Yale New Haven Health, a 1,541-bed private, nonprofit teaching hospital in southern Connecticut, wanted an AI solution that accelerated routine pulmonary embolism workflows by alerting Pulmonary Embolism Response Teams (PERTs) the moment a PE is suspected.

Leveraging Aidoc's aiOS[™] platform, means the algorithm is always on, running in the background and flagging suspected and unsuspected PEs to the radiologist for prioritization. Notifications are sent to the PERT via Aidoc's mobile app based on workflow requirements, allowing for streamlined communication amongst the clinical team and consultations on next best actions.

The results:

- Over 78% of the intermediate-risk to high-risk patients, who were retrospectively identified by AI, had not been communicated to the PERT team for a transfer evaluation¹⁶
- 40% increase in appropriate interventions after implementing Aidoc's AI solution¹⁶



Point Solution

Inability to analyze data that doesn't conform to expected formats

Marketplace



Each solution will handle inconsistencies differently



Platform

Adapts to inconsistencies in real-time to improve accuracy

CHALLENGE TWO:

Siloed or Seamless – The Integration Imperative

Picture a hospital unit, not filled with patients in beds, but with AI point solutions occupying individual rooms – each functioning as its own silo of data and functionality. Radiologists are forced to go from room to room to piece together insights from each algorithm. Physicians are bombarded with calls from each room, many of them unhelpful. Administrators struggle to keep this patchwork of similar, yet unrelated, rooms staffed and functional. This is healthcare's AI infrastructure gamble: loosely connected chaos.

LIMITED RESOURCES TO MANAGE SOLUTIONS

In the face of limited resources and the ever-growing complexity of AI solutions, health systems need a streamlined approach to manage and deploy these technologies, if not:

- Local hardware requirements for AI solutions will grow with the number of algorithms deployed, straining hospital IT resources and increasing costs.
- Integrating and maintaining multiple AI algorithms will be a time-consuming and inefficient process.
- Legal and information governance teams will be required to review and approve each new Al algorithm added.



Point Solution

Each solution deployed requires manual support



Marketplace

Each solution deployed requires manual support



Platform

Centralizes management and deployment of all Al

INTEGRATION HURDLES WITH DATA AND WORKFLOW

Delivering AI results alone is only the first hurdle. To truly impact clinical workflow, AI needs to seamlessly integrate with existing systems and data streams, including PACS, EHRs, scheduling systems, and other critical sources of information that create a comprehensive patient profile.

Radiologists need information tailored to their preferences and workflow, delivered via interfaces they

already understand. This means deep integration and a nuanced understanding of their data needs and case prioritization. Similarly, AI alerts for subspecialists like vascular surgeons and intensivists must integrate with on-call schedules to avoid fatigue and ensure effective communication. Without these integrations, even the most accurate algorithm would be rendered useless.



Point Solution

Limited integrations and fragmented workflows

Marketplace

Complex and resource intensive

Platform

Infrastructure for seamless integration

EHR INTEGRATION: CONTEXT IS KEY

Al results often need to be accompanied by additional information to provide physicians with the full clinical picture for informed decision-making. Some Al algorithms may require clinical context to reduce alert fatigue and improve performance, including avoiding alerts on post-operative patients, chronic findings or patients with specific conditions such as smoking or cancer.

Unfortunately, many AI point solutions – and even some platforms – lack EHR connectivity or struggle to effectively ingest and process EHR data. This can lead to slow implementation times, errors and frustration, hindering the realization of AI's full value.

CHALLENGE THREE:

The Human Factors – Usability and Governance

While the initial installation of AI solutions can be met with excitement, long-term success hinges on adoption. One of the most critical factors is the day-to-day user experience: Is it reducing steps or adding new ones? Is it accurate or requires more work? Is it easy to use or cumbersome?

Poor integration with existing workflows, lack of transparency into AI decisions and inconsistent user interfaces can all lead to frustration and decreased adoption. It's a pitfall of the point solution or marketplace approach versus a platform's connected system of intelligence.

CHANGE MANAGEMENT

Installing an AI solution, turning it on and hoping users will figure it won't lead to success. Change management is a critical step that requires clinical champions, ongoing training, proactive and regular feedback, monitoring results and celebrating wins. Navigating this effectively is largely driven by your chosen approach to AI adoption, and the vendor(s) you work with.

YOUR SUCCESS IS OUR SUCCESS

A one-size-fits-all approach cannot be used when it comes to Al implementation. That's why **Aidoc's Customer Success** and Onboarding teams act as a partner. Using tailored metrics, studies and surveys to drive change management – this dedicated team is solely focused on ensuring your success and helping you demonstrate Al's value.



Point Solution

Each solution will require its own change management plan

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Marketplace

Limited vendor support means internal teams take heaviest lift



Platform

Unified user experiences facilities smoother adoption

GOVERNANCE

While AI governance will mean different things to each health system, it shouldn't be treated as a footnote to AI adoption. Whether the focus is on how to safeguard patient data, minimize bias in algorithms or create transparency for how and why certain solutions are implemented, governance isn't a set of rules, rather it is the compass that keeps organizations pointed in the same direction.

Beyond choosing the first set of AI solutions, health systems also need to consider the process for evaluating,

measuring and adding – or removing – technologies. A true platform can help address this part of the Al governance puzzle by not only seamlessly onboarding third-party solutions, but also exercising due diligence in selecting which solutions to integrate.



Marketplace

Each solution governed independently



Marketplace

Each solution governed independently



Platform

All-in-one infrastructure for governance

ADDING NEW AI SOLUTIONS: THE PLATFORM APPROACH

Instead of a marketplace with endless options, Aidoc curates a select group of high-quality third-party AI solutions through a rigorous 360° evaluation process. This means every AI algorithm powered by the aiOS[™] meets the same strict standards:

- Solves a real need and captures measurable value
- ✓ Demonstrates accuracy
- ✓ Offers workflow integration and flexibility
- Conforms to quality standards
- Leverages feedback from actual users

SELECTING THE RIGHT AI PLATFORM

As evidenced throughout this document, the unified framework provided by an AI platform is the only adoption and integration option that meets enterprise-wide requirements for data management, scalable integration and seamless usability.

Aidoc originated the healthcare AI platform category and continues to provide the most comprehensive solution to health systems. The platform examples cited within this document are based on Aidoc's aiOS[™] technology, feedback from customers and published evidence using our solution.

As the market of available AI platform options grows, it is important to ensure the platform you select expands AI strategy beyond individual algorithms, enables growth with evolving patient care needs, facilitates change management and establishes a robust governance framework.

We recommend vetting platform options against these criteria:



Automatic Orchestration:

An automated process for reducing the workflow adjustment and administrative burden associated with implementing multiple FDA-cleared AI solutions.



Seamless Integration:

Native integrations into existing systems. This should be out-of-the-box functionality for all current and future AI solutions managed through the platform.



Security Standards:

A consistent security framework to ensure all Al solutions deployed within the platform meet the highest standards of data protection and privacy.



Drift Mitigation:

Built-in methods to observe and measure if an Al algorithm's performance declines over time.



Clear Visualization:

Can synthesize output from multiple AI solutions into a common, standardized format, enabling clinicians to easily review and interpret results.



Flexible Configuration:

Workflow options should be customized for each service line and physician and not one-size-fits-all.

MITIGATE THE RISK ASSOCIATED WITH YOUR AI IMPLEMENTATION

Aidoc is setting the standard for how AI should be scaled in healthcare with the aiOS[™], the only unified platform for enterprise AI adoption. The aiOS[™] helps health systems mitigate the risks associated with large-scale technology shifts by serving as the full stack orchestration, monitoring and action platform for all your health systems' AI solutions.



Learn more at aidoc.com/aios.

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ABOUT AIDOC

Aidoc is a pioneering force in clinical AI. We focus on aiding and empowering healthcare teams to optimize patient outcomes, which results in improved economic value and clinical outcomes. Our clinically proven AI solutions eliminate silos, increase efficiencies, and improve outcomes by delivering critical information when and where care teams need it leading to immediate collective action.

Built on Aidoc's exclusive aiOS[™], we analyze and aggregate medical data to enable care teams to operationalize the unexpected and work seamlessly with a continued focus on the patient. Aidoc AI is always on, running in the background to change the foreground.



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