CHILMARK RESEARCH

AUGMENTED INTELLIGENCE FOR HEALTHCARE OPERATIONS

ENTERPRISE AI4OPS SOLUTIONS COME TO HEALTHCARE

A *MARKET TRENDS REPORT* EXCERPT PREPARED FOR

LeanTaaS

BETTER HEALTHCARE THROUGH MATH

This document contains an excerpt of our recent syndicated research, *Augmented Intelligence for Healthcare Operations: Enterprise AI4Ops Solutions Come to Healthcare*, released December 2021, specifically prepared for LeanTaaS. It is intended to make the key findings of the report more accessible to a broader strategic audience and highlight the performance of the company relative to other major vendors in this subvertical of the healthcare IT market.

Click below to learn more about the full report:

AUGMENTED INTELLIGENCE FOR HEALTHCARE OPERATIONS: Enterprise AI4Ops Solutions Come to Healthcare

EXECUTIVE SUMMARY

AI/ML applications have been developed in recent years to address the complexities of the administrative costs and operations from revenue cycle management (RCM) to hospital operations and supply chains. While most of the attention in the AI space has focused on clinical applications, AI in operations has received far less attention in the media and analyst reports in 2020-21.

Many health systems and hospitals suffered a severe financial shock with the onset of the COVID-19 pandemic in March 2020. Lockdowns and overburdened health systems treating an influx of COVID-19 patients saw dramatic decreases in elective procedures that impacted their bottom lines. Hospital operating margins are already so slim that a shock that pushes margins into negative territory can impact the survival of smaller hospitals.

The dire financial circumstances created by the pandemic created an environment where CFOs and CIOs had to respond quickly and opened the door to a number of AI and operations vendors that had solutions mature enough to meet their needs across revenue cycle management, hospital operations and supply chains. Some of the vendors we interviewed for our report were already present in health systems and were able to provide better analytics on hospital beds, supply chains, and facilitate revenue cycle management as we moved out of lock downs and more elective procedures began to go online again.

Our report covers a number of operational use cases that the current ecosystem of vendors offers solutions for including the following:

- Discharge Planning: ER management, Discharge barriers, Perioperative
- Hospital Operations: Staffing, Hospital beds, Surgery, Asset optimization
- Revenue Cycle Management (RCM): Intelligent claims management/denial prevention, Prior authorizations/eligibility, Patient ability to pay, Fraud detection
- Supply Chains: Predictive caseloads, Supply chain forecasting, Resource prioritization

AI has the advantage over traditional algorithms used for operational use cases due to the mathematical complexity of some issues such as operational excellence and asset optimization where the combinatorial possibilities exceed the computing power of many non-ML approaches. A major focus of many vendors is automating burdensome tasks for back office staff on tasks associated with claims management or automating calls for eligibility checks.

Investors have obviously caught on to the business that can be garnered from attacking inefficiencies and waste in the administrative aspects of healthcare. Substantial investments in this sector have been happening over the past two years.

LeanTaaS, whose focus is on operational excellence and asset optimization, has a slightly different take where the initial focus has been on moving beyond grid-based block scheduling to smarter capacity management. The initial focus of their iQueue platform was on infusion chairs, inpatient hospital beds, and operating rooms; now, they will begin expanding into other assets such as labs, imaging and clinics. Their experience to date has shown a 7-20x ROI and ability to recover faster from the impact of COVID.

Key Takeaways

- **COVID-19 created an opportunity for AI to demonstrate real value in the operations space**

  Prior to the pandemic, AIML applications were often hammers in search of nails, COVID created an opportunity to demonstrate ROI in the context of tight margins and increasing financial pressures from patient loads and decreases in elective procedures.

  The challenges across supply chains, reducing administrative costs, and automating the back office were critical test cases for the AIML market to pass under the financial pressures induced by COVID

  The operations space is much more mature and reliable than the current clinical decision support applications and have the ROI to demonstrate value.

- **Operations applications are now realizing the value of learning from AIML in industries such as airlines for operational excellence**

  AI applications have been used for quite a while in the airlines industry, for example, and healthcare has lagged behind. Vendors with experience in other sectors are now realizing similar impacts in healthcare through automation of inefficient administrative functions.

  AIML supply chain platforms also enabled superior analytics from aggregating hospital data across an ecosystem rather than single hospitals making more resilient supply chains and forecasting possible.

  Startups and lead innovators in this space are providing tools well beyond the capabilities of EHR tools for the same functions.

- **Digital Transformation is still in the early stages in healthcare, but the AI and operations space is becoming a foundational component. Feedback loops across clinical and operations data can be leveraged effectively with AI4Ops**

  While AI4Ops is still in the early stages, the impact on both business models and customer journeys is already having an impact where organizations have been willing to consider broader platform approaches vs. point solutions.

  A number of vendors are offering solutions with sufficient scope that can be implemented in weeks or a few months. Coupled with risk-based pricing models this may facilitate scaling up across administrative operations in the context of CIOs/CFOs increasingly adopting data-driven management approaches after the 2020-21 pandemic experience.

AI4Ops MARKET FORECAST

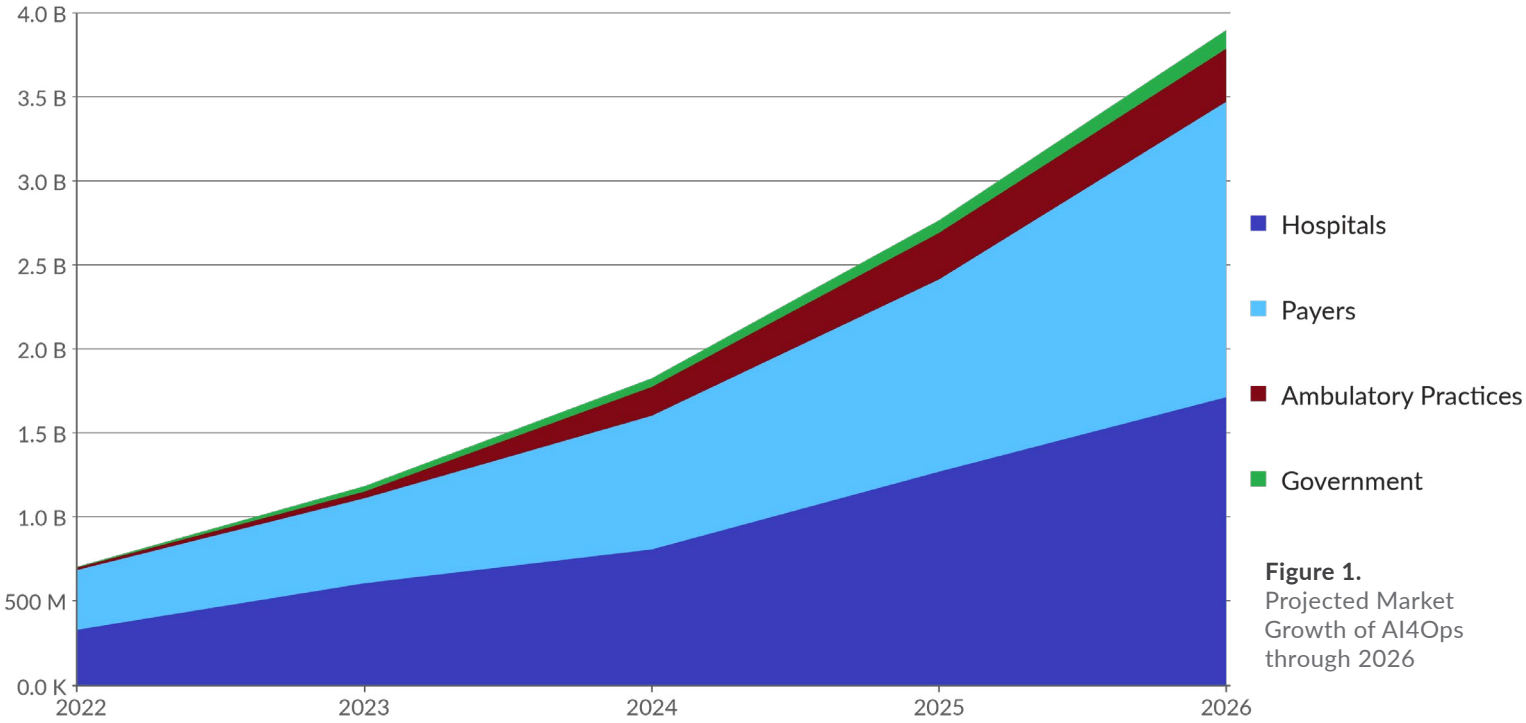


Figure 1. Projected Market Growth of AI4Ops through 2026

Forecast Notes

- Large investments and acquisitions in 2020-21 for bigger players including LeanTaaS: 2022 we expect to see dividends from these investments in terms of scaling up existing services, expansion of scope of platforms and more acquisitions
- ROI-based and money-back guarantees are offered by a number of vendors rather than the traditional licensing or SaaS model alone
- Recognition of AI role in RCM is changing quickly across C-level suite and accompanies more data-driven management overall. The next 2 years will see rapid adoption of AI4Ops for RCM.
- Disruptors Enter – Operations is an area largely untouched by the big platform players entering health with the exception of Amazon (PBMs) and Microsoft but their footprints are relatively light in the segment covered in this report. Amazon may shift these dynamics in the coming two years. Incumbents such as 3M and IBM are also investing in this market segment.

Market Trends to Watch

- **Hospitals and Health Systems**
  - Market driven by impact of COVID-19 from 2020 through 2022 and need to maintain margins and manage revenues and elective surgeries, beds. Risk management and mitigation.
  - RCM becoming critical across revenue, customer experience, waste reduction and improving outcomes.
  - Forward thinking CIOs, Chief Digital Officers will need to think far more strategically about scalable AI and AI first approaches to digital transformation
- **Ambulatory and Independent Providers**
  - More risk averse than hospital segment but a growing need for tools that attack administrative burden and back office costs.
  - Smaller practices will likely adopt lightweight RPA solutions from startups with robust technology to address prior authorizations and eligibility.
  - Point solutions are common today. Platform solutions will begin gaining traction in this segment by 2023.

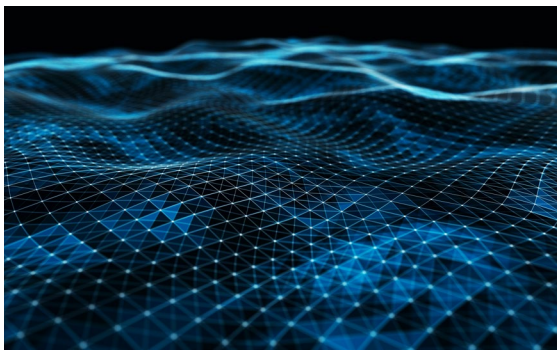
DEFINING AUGMENTED INTELLIGENCE FOR OPERATIONS

Components of AI4Ops

Operations: all administrative, claims, scheduling and general, non-clinical hospital operations functions

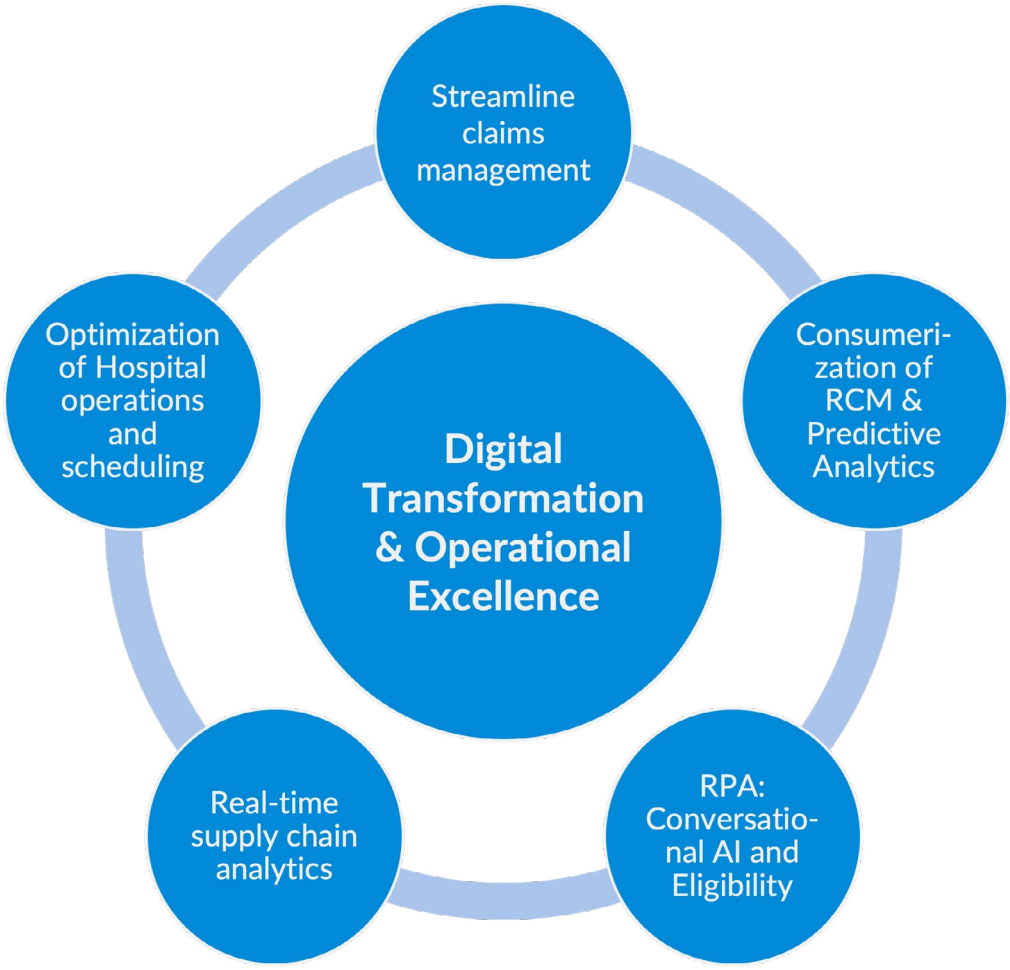
Discharge Planning and Asset Optimization (Scheduling): S/D optimization, bottleneck identification

Revenue Cycle Management: claims processing, payments, prior authorizations, revenue generation including eligibility, managing denials/errors



Supply Chain Optimization: Aggregating supply and demand across hospitals and suppliers, forecasting outbreaks and surge in demand

AI4Ops is Critical to Digital Transformation



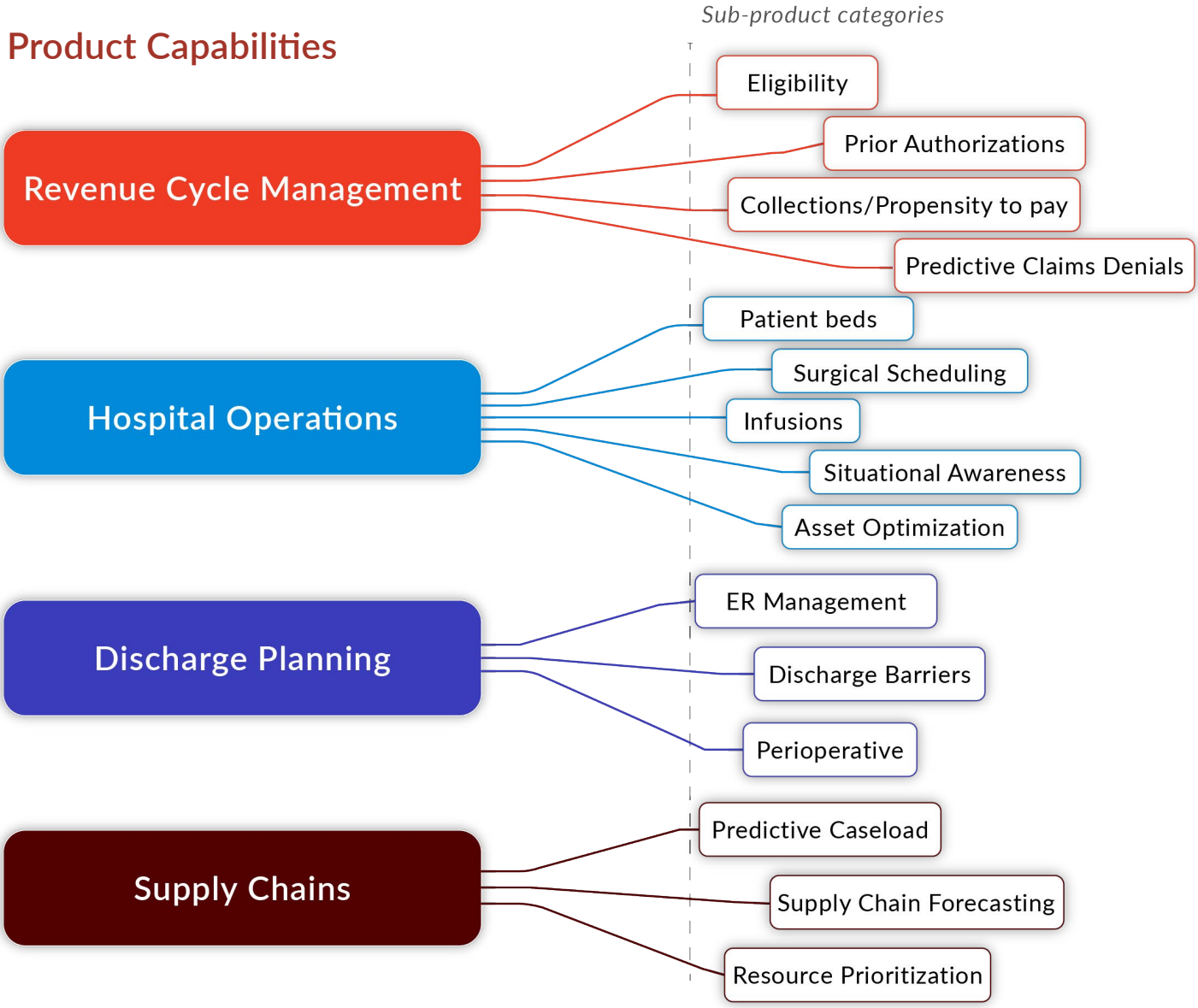
Automate administrative back-end operations

Decrease wait times, improve patient experience while optimizing use of expensive assets e.g., MRI, OR, etc.

Manage complexity in transactions at scale while improving revenues

VENDOR EVALUATIONS

Product Capabilities



REVENUE CYCLE MANAGEMENT (RCM)

Strengths

- Shift from rules-based to more complex billing codes and payer rules is driving faster adoption of automation
- Remote work trend is driving health systems to look at alternatives to the status quo and more innovative approaches including automation
- Nearly 2/3 of providers already use AI in RCM with 100% expected in next 2 years (Change Healthcare Survey)
- RCM and dealing with variability in current COVID-19 context is high on CFO's radars

Challenges

- Successful automation is linked heavily to organization's analytics platform strength and capabilities beyond the control of the vendor
- Trained workforce to manage the analytics for more advanced RCM analytics can be a challenge
- Workers' fear of replacement by RPA can lead to process tampering and impediments

Innovation	Description
Asset Optimization Models/Algorithms	Reframes block scheduling to mathematical solutions for addressing variability in supply and demand	Mathematical approach to scheduling that requires vast number of permutations and calculations to optimize use of assets such as beds, surgical theaters, etc and optimize returns while decreasing wait times and building resilience to changes in patient flows
RPA for Eligibility	Use of conversational AI to automate outgoing calls to verify eligibility and replicate human interaction	Conversational AI can be used to reduce the time spent by human agents contacting payers to verify patient eligibility. A chatbot interacts with a human agent to verify insurance benefits, co-payments, etc. needed to initiate insurance claims and clinical procedures and pharmaceutical benefits.
Predictive Denials Management	From rules-based if-then systems to ML-based predictive analytics for denials based on more complex rules	Models are created to "game-out" the possible scenarios with a wide range of payer rules to facilitate actions that lower denial rates and create efficiencies in claims management.
Prior Authorization Automation	Robotic process automation utilizing voice and ML to reduce human workload in completing prior authorizations	More complex version of automated eligibility calls that requires accessing wider range of data points. As standards for these procedures are developed this area will begin to mature in the coming years.

- Estimated 1/3 of hospitals have no automation strategy or implementation currently
- Privacy and security fears constrain adoption in many HCOs

CLAIMS/ELIGIBILITY

- **Strengths**
  - Tremendous room for automation and technology is fairly mature
  - Administrative burden is a significant pain point for providers who have faced increasing administrative burdens for years
  - RPA for eligibility calls appears to be ready for market and effective at handling complexity of calls
  - Predictive denials management is the next wave of innovation but few health systems have the capability in 2021
- **Challenges**
  - Lack of standards for prior authorization in particular creates challenges for AI implementation
  - HCOs are still at relatively early stage for strategically deploying AI in a platform fashion for these capabilities
  - Independent providers may have the need for the tools but skepticism and sitting on sidelines to understand vendors. Risk aversion with AI.

HOSPITAL OPERATIONS/DISCHARGE PLANNING

- **Strengths**
  - COVID-19 provided solid context for demonstrating test case and the need for solutions for hospitals to manage beds, supplies, etc.

Mature solutions from other industries such as airlines are available and applicable to healthcare and operational excellence

Vendors showing clearly demonstrable ROI within reasonable timeframes

Change management beyond the technology solution is critical for adopting technology and rethinking workflows

- **Challenges**

Entrenched practices around traditional scheduling and hospital operations

Data standards and interoperability can slow progress

EHR vendors develop own tools but they frequently lack the robustness that specialized startups can provide

SUPPLY CHAINS

- **Strengths**

Supply chains acutely impacted by COVID gave vendors that could aggregate across many hospitals a clear advantage in forecasting, responding to disruption

Supply chain insights also carried over into epidemiologically modeling and helped with readiness

Hospitals' awareness of need for improvement in resilience of supply chains is mission critical

Ripe for automation and demonstrating high ROI and improvements for margins

- **Challenges**

Interoperability of diverse supply chain software systems can be a major challenge

Security of supply chain software ecosystem is a major vulnerability for cybersecurity breaches

FDA delaying UDI mandates by two years is an impediment for vendors in this space

Market Execution Metrics

1. **Market Vision:** Acquisitions and roadmap for building platform. How comprehensive the vision and match with market needs.

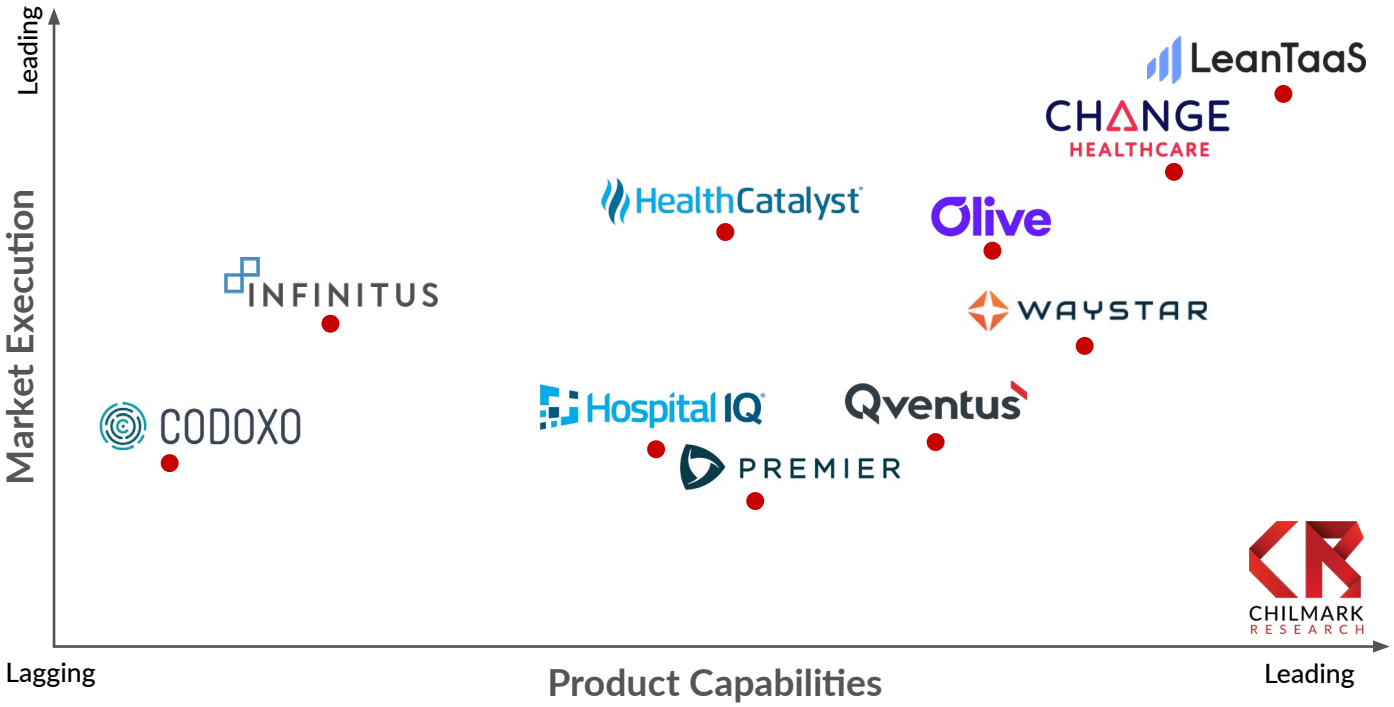
2. **Extensibility/Engagement:** Includes both the ability of clients to customize or increase types of data as well as the strategic partnerships the company has created in recent years.

3. **Complementary Services:** Consulting on change management and human resource issues around AI adoption and digital transformation in respect to AI4Ops.

4. **Momentum:** Acquisition of new clients in the market and overall response and impact to pandemic. Where applicable it also addresses how well they facilitated opening up of elective surgeries and other pre-pandemic operations.

Chilmark Bearing

The Chilmark Bearing is a standard evaluation metric used in all Market Trends Reports. The chart provides a comprehensive, aggregated view of how each vendor profiled in this report performed in the analyst evaluation. Letter grades are assigned based on the averages of Product and Market category ratings.



Harvey Ball Key

1. Every vendor receives a rating in every Product Category
2. Most vendors do not offer functionality in every category
3. Harvey ball rating is relative to all other vendors in report and product requirements defined in the broadest sense

Not applicable | Meets Some Market Requirements | Meets Market Requirements | Exceeds Market Requirements | Market Leading

LeanTaaS

BETTER HEALTHCARE THROUGH MATH

Operational Excellence / Asset Optimization

Products

Products

iQueue

Deployment

SaaS

Pricing

Per asset per month

Top Market Differentiators

1 | Significant demonstrable ROI in 120 health systems across 41 states

2 | Fundamental shift in how scheduling of expensive health assets is transformed into asset optimization and operational excellence. An important stage in digital transformation

3 | Ability to match variable supply and variable demand for assets in a manner that EHRs cannot accomplish

iQueue helps hospitals move from grid-based block scheduling to AIML-based capacity management

- Focus on asset utilization in the following areas: infusion centers, operating rooms and in-patient beds
- Clients, on average, re-coup investment in 3-6 months post-implementation
- Can be deployed remotely and relatively easy to implement without the need for significant hospital IT resources nor vendor consulting staff and fees

Product Execution

Pricing / Business Model	★
Implementation / Maturity	★
Scope of Platform	◔
Change Management	◕

Market Execution

Market Vision	★
Extensibility / Engagement	★
Momentum	★
Complementary Services	◕

Impact of iQueue on hospital operations

- Asset optimization utilizing AI enables dramatically more efficient use of resources, shorter waiting times, faster discharges and higher throughput, and ultimately better care through operational excellence
- Platform is highly scalable and offers impressive ROI in short time duration. Money back guarantee. Invaluable tool during COVID crisis with managing beds, surgical backlogs, and staffing optimization.
- Marks a shift from descriptive statistics to predictive and prescriptive analytics capable of managing supply to demand in context of wide stochasticity.

Solving the problem of non-deterministic, stochastic dynamics for scheduling in healthcare: grid-based scheduling does not work

- Grid-based scheduling lowers patient access, increases wait times and contributes to lost revenue. LeanTaaS demonstrates how AI can address scheduling challenges while improving revenues and the patient experience. Addressing large market of expensive assets across health systems and hospitals
- Clients include 12 of 20 largest health systems, 420+ hospitals
- Demonstrable ROI with clients ranging from 6-20x, generated over $500k/yr/OR, $20k/yr/chair and $9k/yr/bed
- Scalable across multiple additional assets (eg. labs, imaging, pharmacies, etc.)

ABOUT THE AUTHOR

Dr. Jody Ranck has nearly 30 years of experience working in the global health arena and has helped lead a number of major health technology initiatives throughout his career. Author of two books on digital health, he is a globally recognized thought leader on digital health and has been listed in the "Always On" top 100 minds in Global mHealth (2013). His past clients have included Humana, TM Forum, CLSA, T-Systems, Stanford University's School of Medicine, UC Berkeley, the UN, and ARM to name a few. He has been a frequent advisor to large healthcare companies and startups focused on providing more patient-centric care and transitioning to value-based care. In the past he has been appointed as a member of an Institute of Medicine Committee on ICTs in global health/violence prevention and helped launch a major global eHealth initiative with the Rockefeller Foundation. He has been a frequent keynote speaker at health IT conferences and recently organized and chaired the Healthcare Blockchain Summit (2017-18).

Jody has written and worked extensively on mobile innovations, the Internet of Things (IoT), wearables, blockchain and the analytics market in healthcare. He is also working with cutting edge startups on next generation biosensor platforms, patient generated data for clinical research, and emerging blockchain applications in healthcare. His education includes a Doctorate in Public Health (University of California, Berkeley), MA in International Relations and Economics (Johns Hopkins University) and a BA in Biology (Ithaca College).

ABOUT CHILMARK RESEARCH

MISSION

Improve the delivery of care and the patient experience through the effective adoption and use of IT. Leveraging our expert knowledge of healthcare and healthcare IT to guide the industry into the 21st century.

DEEP DOMAIN EXPERTISE

Chilmark Research is a global research and advisory firm whose sole focus is the market for healthcare IT solutions. This focus allows us to provide our clients with the most in-depth, objective research on the critical technology and adoption trends occurring throughout the healthcare sector. Areas of current research focus include among others: Analytics, Artificial/ Augmented Intelligence and Machine Learning, Care Management & Coordination, Clinician Network Management, Cloud-computing Models for Healthcare, Consumerization of Care, Patient Enaggement, Interoperability, Payer-Provider Convergence, Population Health Management, and Value-based Care.

OUR APPROACH

Using a pragmatic, evidence-based research methodology with a strong emphasis on primary research, Chilmark Research structures its reports to serve the needs of technology adopters, consultants, investors and technology vendors. In addition to reports for the general market, CR performs research for clients based on their specific needs. Such research has included competitive analyses, market opportunity assessments, strategic assessment of market and vendors for partnership and/or acquisition.

OUR SERVICES

From its inception in 2007, CR has offered its research reports for individual purchase and aided clients with expert insights through customized consulting projects. In 2012, Chilmark Research launched the Chilmark Advisory Service (CAS) in direct response to clients' request for a continuous feed of research on the most pertinent trends in the adoption and use of healthcare IT. This annual subscription service provides not only access to our research reports throughout the year, but also direct access to Chilmark Research analysts to answer specific client needs. Please contact us directly for further information about CAS.

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