

Hype Cycle for Digital Care Delivery Including Virtual Care, 2023

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This Hype Cycle identifies and tracks digital innovations and market solutions for optimizing and transforming the way in which healthcare providers deliver clinical care. CIOs can use this research to assess the value and impact of new technologies and solutions shaping investment strategies.

More on This Topic

This is part of an in-depth collection of research. See the collection:

- [2023 Hype Cycles: Deglobalization, AI at the Cusp and Operational Sustainability](#)

Analysis

What You Need to Know

Healthcare providers are adjusting strategy and operations in response to business drivers, such as cost optimization, increased consumer expectations, clinical staff shortages and new funding models. For many, the transformation of clinical care is at the heart of a new strategic plan that is enabling a shift from traditional care venues, to digitally enabled clinical services and business models. This shift comes as new market entrants, such as retailers and digital giants, offer a range of digital-first direct-to-consumer health and wellness services.

This Hype Cycle highlights virtual care and other innovations that optimize and transform healthcare provider care delivery capabilities. As CIO, you can use this research as part of a technology and innovation management process to increase awareness and focus investments on the technologies most aligned with your digital care delivery (DCD) vision and roadmap.

The Hype Cycle

Advanced analytics, AI and virtual care are themes underlying many of the innovations featured in this Hype Cycle. These technologies streamline and transform clinical workflows while reducing unwarranted variations in care delivery and decision making.

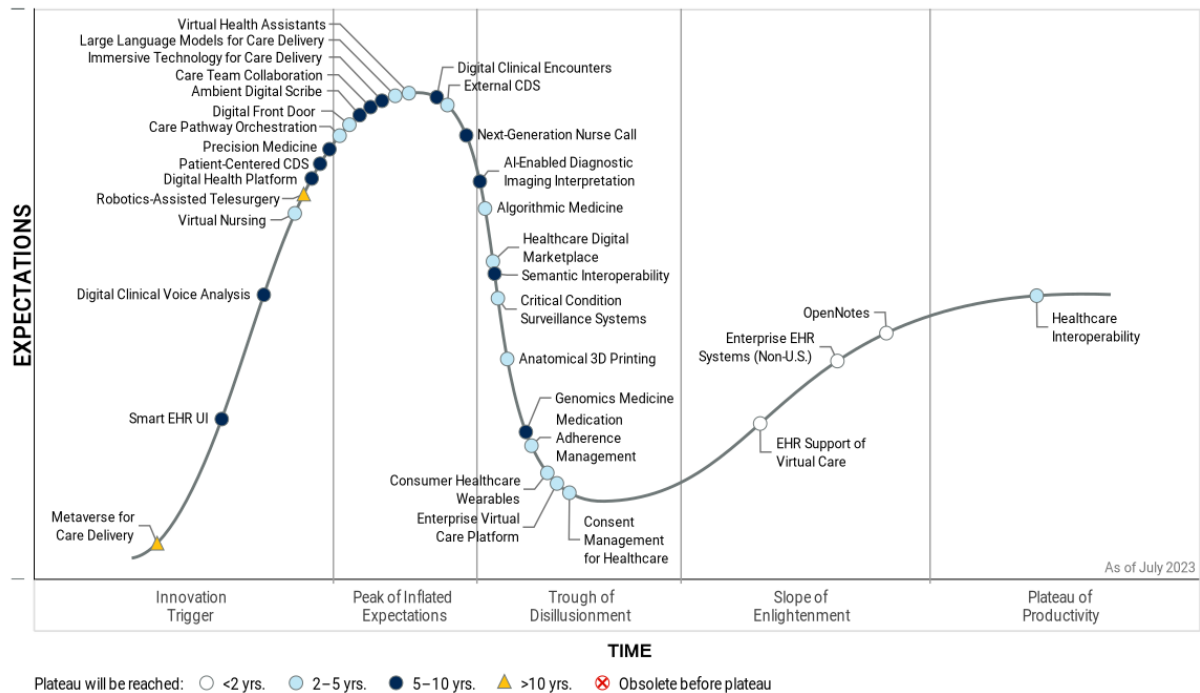
We introduce three innovations this year:

- **Metaverse for care delivery** — A metaverse is a collective virtual 3D shared space created by converging virtually enhanced physical and digital realities. Applied in the healthcare context, providers can leverage a metaverse to deliver new services, enable new channels of patient engagement, personalize patient and clinician experiences and build new ecosystem partnerships.
- **Virtual nursing** — Virtual nursing delivers acute nursing care where the nurse is not in the same physical location as the patient. Virtual nurses complement and augment the bedside care team by performing nursing tasks (such as admission interview and documentation, patient rounding and discharge planning) that do not require a physical presence.
- **Large language models (LLMs) for care delivery** — Large language models are trained on large volumes of unlabeled textual data and are often offered as part of a broader generative AI solution. A broad range of use cases for LLMs is emerging for healthcare providers, including clinical documentation, information summarization, data interpretation, clinical decision support and patient education and engagement.

Our addition of the large language models for care delivery profile warrants special attention — the hype and potential surrounding LLMs for care delivery have seen it rapidly accelerate to the Peak of Inflated Expectations. We expect this rapid movement will continue over the next 12 months as more vendors enter the market and the technology matures on the back of the results of early pilots. This reflects a broader trend of increasing interest in, and maturing of, AI-enabled technologies, such as ambient digital scribes, AI-enabled diagnostic imaging and critical condition surveillance systems. This occurs as healthcare providers look to innovate to address key operational challenges, such as workforce shortages and financial pressures. Meanwhile, the adoption of virtual care remains strong and continues to accelerate the movement of enabling technologies, such as immersive technology for care delivery and consumer healthcare wearables — albeit at a more typical pace than LLMs.

Figure 1: Hype Cycle for Digital Care Delivery Including Virtual Care, 2023

Hype Cycle for Digital Care Delivery Including Virtual Care, 2023



Gartner

The Priority Matrix

The Priority Matrix illustrates the technologies mapped to the time frame by which they are expected to mature into mainstream adoption and deliver benefits and the level and depth of benefits that can be expected from them.

As CIO, you should prepare for high and transformational innovations that will become mainstream in the next two to five years. The impacts of innovations, such as the digital front door (DFD), algorithmic medicine, virtual nursing and LLMs will be numerous and significant. In prioritizing these technologies as part of your DCD roadmap, you will differentiate from the incumbent competition and new market entrants – and position your organization to attract and retain consumers and scarce clinical resources.

At the same time, look for opportunities to pilot and incorporate innovations into your digital strategy that are immature but offer high potential for your organization due to their alignment with strategic and operational priorities. For example, the digital health platform will enable greater organizational agility, and genomics and precision medicine will deliver more personalized care. Innovations such as care pathway orchestration, virtual health assistants and digital clinical voice analysis will enable your virtual care strategy. In addition, deployment of care team collaboration, digital clinical encounters, and ambient digital scribe solutions provide opportunities to improve clinician experience and reduce burnout.

Table 1: Priority Matrix for Digital Care Delivery Including Virtual Care, 2023

(Enlarged table in Appendix)

Benefit ↓	Years to Mainstream Adoption			
	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational		Algorithmic Medicine Digital Front Door Large Language Models for Care Delivery	Care Team Collaboration Digital Clinical Encounters Digital Health Platform Genomics Medicine Next-Generation Nurse Call Precision Medicine	Metaverse for Care Delivery
High	EHR Support of Virtual Care Enterprise EHR Systems (Non-U.S.)	Care Pathway Orchestration Critical Condition Surveillance Systems Healthcare Digital Marketplace Healthcare Interoperability Virtual Health Assistants Virtual Nursing	AI-Enabled Diagnostic Imaging Interpretation Ambient Digital Scribe Digital Clinical Voice Analysis Patient-Centered CDS Semantic Interoperability Smart EHR UI	
Moderate	OpenNotes	Anatomical 3D Printing Consent Management for Healthcare Consumer Healthcare Wearables Enterprise Virtual Care Platform External CDS Medication Adherence Management	Immersive Technology for Care Delivery	Robotics-Assisted Telesurgery
Low				

Source: Gartner (July 2023)

Off the Hype Cycle

The following list indicates which innovations were removed from this year's Hype Cycle and the reason why:

- **3D bioprinted organs.** Removed due to lack of interest among healthcare provider CIOs and market traction.
- **Automated informed consent.** Despite early promise of this innovation, it has become obsolete before plateau.
- **Digital telepathology.** Removed due to lack of interest and market traction.
- **On-demand virtual visits.** Achieved mainstream adoption and matured off the Hype Cycle.
- **Patient portals (untethered).** Obsolete before plateau, replaced by the DFD.

This year, we have renamed automated patient decision aids to patient-centered CDS, and healthcare application marketplace to healthcare digital marketplace to reflect the broader solution space and market opportunity for these innovations.

On the Rise

Metaverse for Care Delivery

Analysis By: Sharon Hakkennes

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

Gartner defines a metaverse as a collective virtual 3D shared space, created by the convergence of virtually enhanced physical and digital reality. A metaverse is persistent, providing enhanced immersive experiences. Gartner expects that a complete metaverse will be device-independent, and will not be owned by a single vendor: It will have a virtual economy of itself, enabled by digital currencies and non-fungible tokens (NFTs).

Why This Is Important

Metaverse has the potential to transform clinical care delivery. Healthcare providers can benefit from the convergence of the physical and digital worlds to deliver new services, enable new channels of patient engagement, personalize patient and clinician experiences, and build new ecosystem partnerships.

Business Impact

Emerging categories of opportunity include:

- Improving access, experience and outcomes of care through the provision of immersive virtual care services
- Expanding wellness by incentivizing positive health behaviors
- Increasing accessibility and effectiveness while reducing the cost of clinical education and training through immersive simulation experiences
- Enabling personalized medicine through the use of digital twins to simulate and test personalized treatments and therapies

Drivers

- Healthcare providers are focused on building digital capabilities that will transform patient, consumer, clinician and employee experiences. Immersive technologies are already reshaping some areas of care delivery (e.g., behavioral health, pain management), patient education (e.g., presurgery) and clinical education and training (e.g., surgical procedure skills acquisition).
- The metaverse provides healthcare leaders the opportunity to reimagine the patient experience without legacy constraints.
- Vendors and healthcare providers are fueling hype and interest through targeted marketing of “metaverse” solutions and services. For example, in the U.S., CVS pharmacy has filed for a trademark that would allow it to sell goods and provide clinical services in the metaverse.
- Healthcare consumers are increasingly demanding more personalized healthcare experiences, and healthcare providers will need to engage the youngest generation of healthcare consumers (i.e., Gen Z) over their preferred channels, for example, gaming and social media.
- Engaging patients longitudinally in their health and wellness journey is becoming increasingly important as healthcare providers shift to value-based care models.
- The metaverse may also facilitate the ecosystem collaboration required to address social determinants of health by connecting healthcare providers with a broad range of supporting service providers.
- There is an increasing demand from healthcare providers and individual consumers for solutions that will enable storage, management, sharing and monetization of electronic health information.

Obstacles

- Current manifestations of metaverses are siloed, app-based, noninteroperable experiences that do not satisfy the decentralized and interoperable vision of the metaverse.
- Prohibitive costs and poor accessibility to the underlying technologies in some geographical regions and for some patient populations may exacerbate inequities in access to healthcare services.
- Clinicians and patients may resist adoption due to personal preferences, privacy and security concerns, a paucity of clinical evidence, and low levels of confidence in using the technology.

- There is an absence of healthcare-specific guidelines and legislation covering different aspects of the metaverse. This must include topics like privacy, data sovereignty, acceptable terms of use, accountability, and identity and legal protections.

User Recommendations

- Task an innovation team to look for opportunities where metaverse technologies could optimize existing clinical care delivery and experiences or enable the provision of new services.
- Explore use cases for metaverse-enabling technologies such as virtual reality, augmented reality, blockchain and digital twins. Establish pilots to gain insights into how these technologies can enhance patient care, improve operational efficiency, and address issues of clinician and patient satisfaction.
- Assess current infrastructure and technology capabilities, and determine what additional resources are required to position the organization to capitalize on the metaverse as this innovation matures.

Sample Vendors

Amedis; Decentraland; DeHealth; Genopets

Gartner Recommended Reading

[Top Strategic Technology Trends for 2023: Metaverse](#)

[Quick Answer: What Is a Metaverse](#)

[Preparing the Enterprise for the Metaverse](#)

[Infographic: Impact Map of the Metaverse](#)

Smart EHR UI

Analysis By: Veronica Walk, Sharon Hakkennes

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Definition:

Smart electronic health record (EHR) user interface (UI) solutions use AI and machine learning (ML) to synthesize, summarize and elevate relevant clinical data from the EHR and other clinical data sources, creating a contextualized view of the patient record. These solutions are separate but integrated within the primary EHR UI, providing a seamless experience to the clinicians and end users.

Why This Is Important

EHRs consistently perform poorly on system usability scales (SUS), with acceptability ranging from low marginal to not acceptable. Poor EHR usability is strongly associated with clinician burnout, which is a prevalent and serious problem for healthcare provider organizations. Smart EHR UI solutions can improve the usability of EHR solutions and mitigate clinician burnout by reducing the time and effort to find relevant clinical information within the EHR.

Business Impact

Healthcare providers can use smart EHR UI solutions to:

- Increase clinician productivity and capacity by reducing time spent on chart review and searching for relevant clinical data.
- Improve the total experience of patients and clinicians by maximizing the patient-clinician interaction, whether conducted virtually or in person.
- Enable clinicians to make more informed decisions and reduce errors of omission by elevating relevant data that might otherwise be overlooked.

Drivers

- Amid ongoing and intensifying clinical workforce shortages, minimizing the burden on the care team and preventing further attrition or outmigration from the industry is a top priority in most healthcare provider organizations. As the primary clinical user interface and a well-documented contributor to burnout, the EHR is one of the focal points for technology improvement.
- Smart EHR UI solutions offer healthcare provider organizations a way to improve EHR usability without significant time or resource requirements from internal IT departments or EHR vendors. These solutions integrate with EHRs primarily through Health Level Seven (HL7) Fast Healthcare Interoperability Resources (FHIR) APIs, resulting in shorter implementation timelines and minimal integration costs.
- Enterprise EHR vendor, MEDITECH, has integrated Google Health's smart EHR UI capabilities into their Expanse EHR solution.
- As global EHR adoption continues to grow and interoperability initiatives accelerate, the volume and complexity of clinical data become increasingly challenging for clinicians to navigate. EHR data is usually organized chronologically in complex and nonstandard hierarchies and is presented without clinical relevance or context. We expect increased adoption of smart EHR UI solutions in tandem with increasing EHR adoption to manage the growing complexity and volume of clinical data.
- Generative AI capabilities are rapidly evolving and, if incorporated into smart EHR UI solutions, can significantly increase the value and adoption of these tools by enabling additional functionality such as automated clinical documentation.

Obstacles

- Integrations with leading U.S.-based EHR vendors are common but may require overcoming EHR vendor resistance to working with third parties and could lead to longer integration timelines.
- Smart EHR UI solutions are primarily designed to support view-only workflows. These solutions can identify and elevate relevant clinical data from a disparate EHR or system without robust write-back capabilities, but that data may not be actionable. This may result in the perpetuation of an incomplete patient record and disjointed clinical workflows.
- Lack of industry standards for developing and validating ML- and AI-enabled solutions and concerns over opacity and legal liability are slowing adoption into clinical practice.

User Recommendations

- Approximate the value of smart EHR UI solutions by measuring baseline clinician satisfaction with the EHR, leveraging EHR usability and productivity metrics, and corroborating data with real-world observations of how the EHR is used in clinical practice.
- Evaluate vendors based on their ability to support your most pressing needs for EHR usability and their ability to scale to other clinical specialties and use cases. For example, some vendors only support the contextualization of clinical data for specific roles or clinical conditions.
- Minimize integration efforts by prioritizing solutions that integrate through FHIR APIs. Check your EHR vendor's app marketplace for solutions that have been validated to integrate with their system.
- Anticipate and mitigate unintended consequences by carefully evaluating vendors' use of AI- and ML-enabled solutions and developing policies and procedures to deal with data discrepancies between the primary EHR and data surfaced through the smart EHR UI.

Sample Vendors

Evidently; Google Health; Navina; Wellsheet

Gartner Recommended Reading

[Healthcare Provider CIOs: Take a Bimodal Approach to Clinician Burnout](#)

[Market Guide for Enterprise Electronic Health Record Solutions](#)

[Quick Answer: What Healthcare Provider CIOs Need to Know About LLM Applications Such as ChatGPT](#)

Digital Clinical Voice Analysis

Analysis By: Sharon Hakkennes

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Definition:

Digital clinical voice analysis evaluates an individual's linguistic variables and vocal cues, such as pitch, tone, pauses, word choices, speech rate and volume. These solutions use artificial intelligence and machine learning to analyze voice patterns and codify voice biomarkers in order to noninvasively detect clinical abnormalities for clinical diagnosis and monitoring.

Why This Is Important

The characteristics of our voice and speech can be evaluated to screen for and monitor a growing list of clinical conditions. This includes behavioral health issues (including depression, psychosis, dementia and post-traumatic stress disorder [PTSD]), Parkinson's disease, cardiovascular disease and lung disease. Startup companies and researchers are leveraging technologies to detect abnormalities sooner and less invasively than traditional clinical assessments.

Business Impact

Applications include predicting the onset, diagnosing and monitoring the progression of disease; measuring the severity of symptoms; and monitoring response to treatment. Outcomes include earlier detection of disease, more frequent monitoring and reduced reliance on care by highly specialized clinicians. These solutions are noninvasive, affordable and portable, and thus highly scalable and well-suited for virtual care.

Drivers

- As a result of advances in technologies such as smartphones and home voice assistants, the enabling technology for accurate recording and real-time interpretation of vocal data is now infinitely more available than ever before.
- While there are no commercially available solutions available on the market with the required, geography-specific, regulatory approval for use as a medical device, several vendors are making progress in this area. For example, Aural Analytics' Speech Vitals – ALS solution (which collects and analyzes speech recordings to assist neurologists in the monitoring of amyotrophic lateral sclerosis) was recently granted designation as a Breakthrough Device by the U.S. Food and Drug Administration.
- Efforts are now underway to build and share large datasets of high-quality voice data for training and validation of algorithms. For example, the [Colive Voice](#) study aims to advance the use of voice for diagnosis, risk prediction and remote monitoring of multiple conditions through the collection and analysis of voice recordings of 50,000 individuals from across the globe.
- New multimodal solutions are entering the market that are combining voice biomarker analysis with additional biomarkers obtained through computer vision and other data sources (such as the electronic health record [EHR]) for clinical diagnosis and monitoring.
- Over time, we predict that technologies to enable digital clinical voice analysis will become embedded as a core capability of healthcare chatbots, virtual health assistants, ambient digital scribes and call center technology. This evolution, combined with the continued extension and scaling of healthcare provider virtual care services, will be the catalyst for accelerated adoption of this technology in the future.

Obstacles

- Despite the obvious potential of these solutions, increasing adoption is being hindered by the paucity of evidence of clinical effectiveness and the limited availability of commercial solutions.
- Training, testing and validating solutions are hampered by the lack of large, high-quality, characterized libraries of voice data from both well and disease-impacted individuals. In particular, algorithms require validation on large diverse population datasets for integration into mainstream clinical practice.
- Uncertainty regarding reimbursement models for services leveraging digital clinical voice analysis solutions limits adoption.
- No solution will be 100% accurate; thus the clinical and legal ramifications of both false positive and false negative results must be accounted for. A false negative may result in a patient not seeking required medical care, and a false positive may result in unnecessary clinical testing and patient anxiety.

User Recommendations

- Identify potential use cases by working with clinical leaders, CDOs, CNIOs and CMIOs to evaluate alignment of the current vendor landscape with clinical strategic priorities.
- Demonstrate both efficacy and practicality of identified use cases through small pilot projects in discrete clinical areas.
- Use your AI governance model to minimize risks associated with deployment of these solutions. Ensure early involvement of key stakeholders to address ethical, medical, legal, privacy and consent issues — even in a pilot phase.

Sample Vendors

Aural Analytics; Canary Speech; Clarigent Health; Cordio Medical; Deliberate Solutions; Kintsugi Mindful Wellness; Sonde Health; Telling.ai; Winterlight Labs

Gartner Recommended Reading

[Applying AI — Governance and Risk Management](#)

Virtual Nursing

Analysis By: Sharon Hakkennes

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Virtual nursing is the delivery of acute nursing care where the nurse is not in the same physical location as the patient. Virtual nurses leverage technology to monitor and communicate with patients, their families, visitors and the bedside care team in real time. They complement and augment the bedside care team by performing nursing tasks (e.g., admission interview and documentation, patient rounding and discharge planning) that do not require a physical presence.

Why This Is Important

Healthcare provider organizations are experiencing nursing workforce shortages, increasing patient acuity and high demand for clinical services. Two models of virtual nursing are emerging to address these challenges:

- **Workflow model:** Virtual nurse focuses on high-volume and high-impact workflows (e.g., admission and discharge) across the organization.
- **Unit-based team model:** Virtual nurse supports a broad range of clinical tasks, sharing patients on a clinical unit as a part of the nursing team.

Business Impact

Virtual nursing helps:

- Mitigate workforce issues including, nurse dissatisfaction, high turnover rates and reliance on contract nurse labor.
- Improve the quality and safety of care including reducing adverse events and patient mortality, decreasing readmission rates, and improving patient satisfaction.
- Deliver operational improvements including reducing length of stay, increasing patient throughput and improving clinical documentation quality and timeliness.

Drivers

- Nursing workforce shortages and burnout rates are forcing healthcare providers to pursue innovative clinical service delivery models to drive nurse attraction and retention.
- Virtual nurses can supervise and mentor ward-based nurses, addressing the challenges associated with an increasingly junior clinical workforce.
- Virtual nursing is emerging as a key patient flow and service design enabler to relieve financial strain and patient throughput and capacity management issues.

Obstacles

- Many healthcare facilities are not equipped with the required audio and video capabilities in each patient room. Thus, advancing this model of care requires either expensive retrofitting of technology or taking a cheaper approach by using mobile devices. The use of mobile devices (e.g., telehealth carts) can add friction to workflows and deliver suboptimal user experiences which increase barriers to adoption.
- Healthcare providers that have not yet implemented an enterprise electronic health record lack the real-time clinical information and documentation capabilities required to fully adopt this model of care.
- Virtual nursing does not reduce the need for bedside nurses, thus is an additional labor cost that may be difficult to justify.
- Implementing virtual nursing models challenges well-established nursing models of care. Significant culture and change management efforts are required to overcome staff resistance and ensure successful collaboration between remote and bedside teams.

User Recommendations

- Work with clinical and operational executive colleagues to define a strategy and goals for virtual nursing. Include opportunities to expand to other clinical disciplines (e.g., pharmacy, social work and physicians) in the future.
- Establish strong clinical leadership to take ownership of the significant change management effort required to successfully adopt virtual nursing. These efforts should focus on defining roles and responsibilities, building trust between virtual and bedside nurses, and training in the clinical model and enabling technology.
- Map clinical and operational workflows aligned to the desired virtual nursing model of care prior to investing in enabling digital technologies. Create a prototype for each type of patient room that includes the required technical specifications and hardware configuration.
- Proactively plan for virtual nursing by ensuring any new build or renovation incorporates investment in the technology and equipment required for this model of care delivery.

Sample Vendors

Artisight; AvaSure; care.ai; Caregility; Solaborate; VirtuSense

Gartner Recommended Reading

[Quick Answer: What Is Virtual Nursing?](#)

[Case Study: Virtual Inpatient Nursing Program Advances Progress Toward the Quadruple Aim](#)

Robotics-Assisted Telesurgery

Analysis By: Sharon Hakkennes

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Definition:

Robotics-assisted telesurgery is a surgical procedure carried out by a surgeon from a distance utilizing robotic surgical technology, high-bandwidth telecommunications and shared interactive visual presence. Robotics and software interpret the surgeon's hand movements and translate them into actions of the remote robot.

Why This Is Important

Robotics-assisted telesurgery seeks to create the virtual presence of a remote surgeon at the patient's operating table, using a robot, with an on-site surgical team available to take over manually in case a problem occurs. Telesurgery can enable access to specialist surgical care in circumstances where it would otherwise be unattainable, such as in remote areas, developing countries, military settings and surgical emergencies.

Business Impact

Despite the many barriers and limitations, robotics-assisted telesurgery holds substantial promise for the long term, including:

- The ability to provide high-quality surgery to underserved medical locations, including remote areas, military operations and developing nations
- Training and support for less-qualified clinicians
- Improved quality of care and patient outcomes
- Increased efficiency through the elimination of long-distance travel for surgery
- Real-time collaboration among surgeons in different locations

Drivers

- Robotics-assisted telesurgery remains a nascent application, limited primarily to research settings.
- Successful pilots and small-scale research studies continue to drive hype. For example, recently, physicians in China demonstrated the safety and feasibility of robotics-assisted laparoscopic telesurgery, across distances of up to 1,775 kilometers, in 29 patients undergoing a radical nephrectomy for renal tumors.
- Consistent advances in robotics-assisted technologies, including developments in haptics, are increasing tactile feedback to the surgeon. Advances in AI, computer vision and machine learning provide surgeons with critical real-time information to prevent complications and enable semiautonomous surgical guidance.
- In the future, ubiquitous adoption of 5G technology with its low latency, high reliability and high bandwidth will address specific issues relating to latency.

Obstacles

- The path to mainstream adoption will be slow — hindered by technical, legislative and logistical challenges that inhibit scaling of services to broad populations.
- Insufficient evidence on safety and clinical outcomes and the lack of fully developed training programs and standard operating protocols inhibit medical advocacy and stakeholder support.
- Negotiating funding and medicolegal liability across jurisdictional boundaries is complex.
- Surgical robots remain expensive, including the initial purchase, consumables and repairs, and maintenance. As a result, proving ROI will be challenging.
- Technical limitations, including latency (the time delay in transferring auditory, visual and even tactile feedback between the two distant locations) and network reliability, negatively impact the safety and efficacy of robotics-assisted telesurgery.
- The care provided through robotics-assisted telesurgery is critical, and cyberattacks will negatively impact patient safety and outcomes. Thus, security measures must be extensive to mitigate threats posed by malicious actors.

User Recommendations

- Track the expanding vendor landscape for minimally invasive robotics-assisted surgery and interventional cardiology, watching for indications that the technology is advancing.
- Explore opportunities to pilot in the context of a research study or in use cases where surgical resources are limited, interventions require extreme urgency, travel is arduous, and the technology can be deployed and supported, such as in military theaters.
- Assess the medicolegal implications and risks that telesurgery poses, including standards for training programs and clinical protocols.
- Evaluate the communications infrastructure that enables telesurgery. This includes 5G communication networks with less latency and jitter; reliable power; and smaller, lighter and efficient telesurgery robots.

Sample Vendors

Asensus Surgical; Intuitive; Johnson & Johnson; Medcaroid; Medtronic; Siemens Healthineers; Stryker; Titan Medical

Gartner Recommended Reading

[Healthcare and Life Science Business Driver: Medical Technology Innovation](#)

[A CTOs Guide to 5G-Advanced and 6G](#)

At the Peak

Digital Health Platform

Analysis By: Andrew Meyer

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

The digital health platform (DHP) is an architectural approach that enables healthcare providers to respond rapidly to strategic imperatives and external uncertainties using modern cloud platforms and services. This approach combines a healthcare data fabric, a library of prebuilt digital business capabilities and composition tools to create the digital experiences.

Why This Is Important

The DHP approach enables CIOs to adjust the application portfolio at the pace of business change. It leads the organization to faster value realization when responding to strategic imperatives and external uncertainties. DHP also addresses a major strategic issue for providers, where existing monolithic EHR-centric application architecture cannot meet changing patient, consumer and clinical workforce demands.

Business Impact

The impact of a DHP includes:

- Addressing business capability gaps, more efficient use of IT and increasing value from current IT investments by repurposing data or application functionality
- A means for rapid innovation and reducing reliance on vendors that lock in buyers by seeking to commercialize access to underlying data
- Better business decisions through powerful data and analytics capabilities at patient, pathway and population health levels
- Improved resilience, adaptability and flexibility for organizational imperatives

Drivers

- Disruptions to the healthcare industry have required rapid innovation using new digital solutions, which are not immediately available from EHR vendors or other systems of record in the IT application estate. These disruptions include the need for on-demand virtual care, Internet of Things for home-based patient monitoring, clinical collaboration tools and multiexperience patient engagement tools.
- CIOs have an increased appetite for modern cloud and platform architectures and require highly compliant application environments.
- The market for healthcare-specific solutions that support the DHP approach is accelerating, and industry clouds are a strategic technology trend. They will drive generative AI building blocks offered to the healthcare industry.
- Organizations need to harness data from many operational systems to support care planning, coordination and data and analytics.
- CIOs need to continuously improve the clinician experience to reduce the burden of IT and data collection.
- Adoption of industry standards, such as FHIR, among healthcare IT vendors is increasing as application reuse, unmetered data access and improvements in interoperability are becoming essential requirements for connected care.
- IT talent shortages and underuse of nontechnical teams slow healthcare innovation.
- The position of this profile has moved close to the Peak of Inflated Expectations; it reflects rapidly advancing maturity and new market penetration by DHP vendors with industry experience and significant investment and market share across regions (see [Market Guide for Digital Health Platforms](#)). These platforms will also be the route by which industry cloud platform vendors bring generative AI to industry markets.
- Due to vendor investment and market interest, we expect the DHP to rise swiftly up and over the peak as drivers combine with the availability of regionally compliant, highly secure and available cloud SaaS and PaaS solutions.

Obstacles

- Regional legislation requires cloud vendors to adapt solution offerings for compliance. This may slow the availability of solutions and require complex precontract evaluation.
- The need to increase IT funding streams to support SaaS and PaaS pricing models in an industry that has historically used the capital for new investment.

- Low API maturity and delays by incumbent vendors to participate in open data ecosystems.
- Limited range of packaged business capabilities offered by DHP providers or third-party vendors.
- Lack of robust healthcare-specific standards and tools to design and operate a real-time data fabric.
- Shortage of IT talent in healthcare teams to apply this approach.
- Mindset among CIOs and executive sponsorship that retains focus on an EHR-first model for new investment.
- Commercial limitations of existing EHR contracts that prevent CIOs from requiring EHR vendors to shift toward a composable approach and improve the availability of open APIs.

User Recommendations

- Build DHP technical foundations by adopting an application strategy that is modular, composable and resilient.
- Change mindsets and adopt composable thinking by socializing the DHP approach with key stakeholders.
- Evaluate where poor digital experience is a priority and needs to change across existing business capabilities.
- Conduct a review of the current application portfolio to determine where gaps in capability exist or if there is a negative burden on clinical workflow.
- Form fusion teams with SMEs from the highest-priority business units, setting common objectives throughout the team.
- Evaluate DHP vendors based on cost, capability and fit with your existing licensing models for integration in terms of open APIs and across core I&O.
- Apply the Gartner Composability Business Index to assess the composability of current applications.

Sample Vendors

Amazon Web Services (AWS); Better; Google; Innovaccer; InterSystems; Microsoft; NTT DATA; Philips; Salesforce

Gartner Recommended Reading

[Tool: Healthcare Provider CIO Executive Presentation for a Composable Digital Health Initiative](#)

[Establish Interoperable Application Ecosystems Early in Your Composable Healthcare Provider Roadmap](#)

[Tool: Healthcare and Life Science CIOs Executive Presentation for Composable Data and Analytics](#)

[Market Guide for Digital Health Platforms](#)

[Case Study: Intermountain Healthcare Creates a Digital Health Platform for Growth and Agility](#)

Patient-Centered CDS

Analysis By: Veronica Walk

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Patient-centered (PC) clinical decision support (CDS) directly engages with the patient or caregiver to deliver evidence-based CDS, focusing on meaningful and achievable personal health goals and outcomes for the individual patient. These solutions empower the patient to actively participate as a member of their care team, enable shared decision making between the patient and provider, and equip the patient to achieve their highest level of health.

Why This Is Important

PC CDS is an important, yet largely missing component of CDS. Most CDS technologies are focused on supporting clinician decision making at the point of care. Clinicians can recommend and prescribe the best evidence-based treatments, but ultimately, the patient must accept and adhere to these recommendations to achieve their highest level of health. PC CDS can advance the goals of value-based care and health equity by engaging patients as active members of their care team.

Business Impact

Healthcare providers and payers can use PC CDS to:

- Increase patient and caregiver knowledge about their conditions and choices, and provide personalized, actionable guidance.
- Increase patient satisfaction and loyalty by incorporating patients' values and preferences in their healthcare decisions.
- Advance value-based care by facilitating shared decision making, increasing the likelihood of adherence to treatment plans and enabling providers to intervene or adjust plans as needed.

Drivers

- As healthcare continues to shift toward value-based care, it is essential to engage the patient in their clinical decision making and care planning tailored to their personal goals, abilities and preferences.
- Advancing health equity will require an increased focus on individual patient's preferences, values and other key considerations, such as social determinants of health (SDOH), when making clinical decisions and recommendations. PC CDS can help ensure these patient-centric factors are considered alongside evidence-based medicine.
- Shared decision making in healthcare has been shown to improve patient satisfaction and outcomes, and remains a key objective of patient-centered care initiatives. PC CDS can facilitate shared decision making by providing patients and caregivers with personalized guidance and recommendations to understand their conditions and choices.
- The proliferation and adoption of consumer health devices and tools, such as smartwatches and self-triage tools, drive increased patient engagement and ownership of their health data and decisions, facilitating progress toward patient-directed care and openness to PC CDS.
- Government-led initiatives and regulations drive patient access and ownership of their health data, which is critical to improve patient-directed and shared decision making.
- This year, we have updated this technology profile to replace and encompass the former profile, automated patient decision aids (APDAs). PC CDS follows a similar trajectory with a higher benefit rating.

Obstacles

- Paternalistic culture in medicine remains a barrier to empowering patients as decision makers in their care.
- Patients and providers are skeptical of PC CDS, especially solutions leveraging advanced capabilities such as artificial intelligence and machine learning.
- As with clinician-facing CDS, PC CDS faces challenges with keeping current with evidence, and perhaps, with less oversight for direct-to-consumer solutions.
- Lack of integration with electronic health records (EHRs), patient engagement, care management and other clinical systems will impede adoption and perpetuate data silos.
- Healthcare providers are in the early stages of integrating patient-generated health data (PGHD) into their EHR and clinical workflows. PGHD will be an important component of PC CDS. Concerns over the quantity and quality of PGHD will slow adoption.
- Lack of data standards for PGHD, or adherence to existing data standards, will perpetuate data quality and interoperability challenges and impede scalability.

User Recommendations

- Work with clinical colleagues to identify potential pilot use cases for PC CDS, for example, chronic pain management, maternal medicine or perioperative care. Ensure PC CDS solutions fit into your overall patient engagement strategies and platforms, such as your digital front door.
- Ensure PC CDS meets the intent of patient centricity by involving patients in designing and deploying tools, and measuring success based on improved health outcomes and patient and clinician satisfaction.
- Increase clinician engagement and support for these solutions by integrating them within clinical workflows, such as the EHR.

Sample Vendors

Abridge; EBSCO Information Services; Epic; Medical Brain; Wolters Kluwer

Gartner Recommended Reading

[Market Guide for Clinical Decision Support Solutions](#)

Cleveland Clinic Abu Dhabi Improves Consumer Engagement Through a Digital Front Door

Innovation Insight for Consumer Experiences in Healthcare and Life Sciences

Precision Medicine

Analysis By: Veronica Walk

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Precision medicine improves health outcomes by precisely diagnosing and treating medical conditions. It leverages individual factors of the disease, such as physiology and genomic indicators, and patient factors, such as social determinants of health and lifestyle. Precision medicine technology orients this data in context for clinical diagnosis and treatment protocols — thus integrating electronic health records (EHR), genomics, labs, images, treatment protocols and other digital data sources.

Why This Is Important

Precision medicine has significant potential to transform medicine and improve health outcomes. As the underlying technologies mature, use cases for precision medicine continue to emerge in clinical practice and complex disease treatment (for example, targeted treatment plans for cancer patients). To remain competitive, healthcare providers must adopt these technologies to bring precision insights to clinical diagnosis and treatment and bridge clinical decisions into care delivery.

Business Impact

Precision medicine can transform clinical decision-making and enable mass personalization of healthcare consumer engagement. It will likely drive the majority of healthcare delivery and targeted clinical decision support in the next five-to-10 years. Healthcare providers presently report significant reductions in medical diagnosis errors and improved treatment efficacy and patient outcomes. These results ultimately lead to higher quality and lower total cost of care.

Drivers

- Advancements in genomics plus the inclusion of genomic data with clinical data are helping to curate the expanded knowledge base required for precision medicine. This has led to more commercialization of precision medicine technology in the last two years.
- EHR vendors have begun incorporating discrete genomic data into the patient record, enabling precision medicine via point-of-care pharmacogenomic clinical decision support (CDS).
- New techniques yield insights into disease origins, for example, which therapies are effective given an individual patient's profile, and how various diseases respond to treatments.
- Large federated learning models and cross-industry collaboration are making precision medicine algorithms more precise, flattening out biases, and thus increasing trust in the ability to use the results to augment clinical diagnosis and treatment.
- Life sciences and pharmaceutical companies are advancing precision medicine through new products better tailored toward more specific patient cohorts — even specific genotypes.
- For these reasons, we have advanced precision medicine closer to the peak of the Hype Cycle.

Obstacles

- Precision medicine at scale is accelerating unevenly. Many early use cases are in oncology, but clinical specialists in other areas of medicine are closely following the development of additional approved diagnostic and therapeutic use cases in their respective fields.
- Regulatory requirements and government agency approvals slow adoption in heavily regulated markets.
- Clinicians cannot always act upon precision knowledge since many are not well-trained to incorporate genomic data and other insight from precision medicine within their workflows.
- Additional challenges include the cost and reimbursement of genomic sequencing, EHR integration, and managing the volume of data required to deliver precision medicine fully.

User Recommendations

- Assess the preparedness of your organization's data and analytics strategy and capabilities to support precision medicine. Precision medicine requires robust, efficient and actionable patient data collection and the analysis and assessment of that data to arrive at a precise diagnosis and treatment.
- Evolve toward a data fabric architecture to collect, curate and leverage diverse patient information sourced from genomics, mobile apps and devices, wearables, patient-generated health data, and social determinants of health.
- Organize a fusion team including clinicians, data scientists, clinical informaticists, and other domain experts to explore opportunities to pilot precision medicine use cases. Evaluate potential vendors based on their ability to interoperate within the data fabric architecture and enable point-of-care precision medicine based on real-world evidence.

Sample Vendors

2bPrecise; BC Platforms; Orion Health; Philips; Syapse; Tempus; Verily

Gartner Recommended Reading

[Market Guide for Clinical Decision Support Solutions](#)

[Healthcare and Life Science Business Driver: Medical Technology Innovation](#)

Care Pathway Orchestration

Analysis By: Sharon Hakkennes

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Care pathways provide a standardized, evidence-based clinical plan for the appropriate sequence of care delivery activities, such as investigations, treatment and education, for a defined patient cohort. Care pathway orchestration employs digital technologies to coordinate care delivery, deliver decision support and automate specific processes across a care journey. They enable healthcare providers to deliver personalized, proactive and coordinated care.

Why This Is Important

Patient-centered care actively engages patients, coordinates services across the continuum and is a core objective for healthcare providers. Information silos and service fragmentation prevent many healthcare providers from realizing this goal. Care pathway orchestration solutions address these challenges by delivering digitally enabled, personalized and coordinated care experiences, thus creating efficiencies through automation and supporting clinicians to practice at the top of their license.

Business Impact

Care pathway orchestration impacts the care journey as:

- Automation of administrative and routine clinical tasks lowers costs and improves staff productivity.
- Delivery of care aligned to standardized clinical pathways eliminates unnecessary variation, improving the quality and consistency of care.
- Proactive and personalized outreach to patients increases adherence to clinical pathways, leading to improved health outcomes and patient experience.

Drivers

- The shift to value-based care requires healthcare providers to build new capabilities to engage with patients longitudinally across their care journey.
- Increasing competition and rising patient expectations are driving a strategic focus on improving the patient experience for many healthcare providers. Care pathway orchestration solutions support improved experiences by addressing issues of fragmentation across the care journey.
- In the face of ongoing financial pressures and significant administrative and clinical staff shortages, healthcare providers are adopting digital solutions to deliver efficiencies in care delivery without compromising clinical outcomes.
- Advances in interoperability and rising interest in composable architectural approaches are accelerating adoption of solutions, such as care pathway orchestration, to address issues related to siloed data caused by monolithic applications.

Obstacles

- For organizations operating on fee for service reimbursement arrangements, the inability to adequately charge for services delivered through these solutions and quantify ROI is a significant barrier.
- Interoperability remains a challenge for most healthcare organizations, preventing them from achieving the required integration into core clinical systems.
- Bidirectional exchange of information between care pathway orchestration solutions and core clinical systems is essential to ensure information flows across the care journey and to optimize both the patient and clinician experience.
- Lack of staff and clinician engagement lead to resistance to adopt solutions and change clinical workflows, as does a lack of trust in underlying algorithms including those that inform care pathways and activities.
- The increasing digitization of touchpoints with health services has the potential to exacerbate health inequities for certain populations that are unable to access or use the digital tools.

User Recommendations

- Implement care pathway orchestration technologies as a component of your organizations' broader patient engagement and total experience strategies.
- Include measures of patient and clinician experience and satisfaction, along with quality and efficacy, in evaluation frameworks.
- Start with well-defined clinical pathways, such as elective surgery, to prove outcomes and use take-aways from these early implementations to expand into increasingly complex pathways.
- Evaluate vendors on their preconfigured pathway capabilities and their ability to configure pathways unique to your organization across a broad range of use cases.
- Ensure your chosen solution enables personalization of patient engagement across a variety of channels (e.g., SMS, interactive voice response [IVR], mobile app).
- Develop systems and processes to aggregate data collected through the platform, such as adherence to pathway requirements and patient outcomes, to deliver insights and drive continuous improvements in care pathway design.

Sample Vendors

Amwell (Conversa Health); Health Catalyst (Twistle); Lumeon; Medical Brain; Memora Health; Personify Care; SeamlessMD; UpHill

Gartner Recommended Reading

[Healthcare and Life Science Business Driver: Total Experience Transformation](#)

Digital Front Door

Analysis By: Sharon Hakkennes

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

A digital front door (DFD) acts as the primary point of digital engagement and digital interaction with consumers. It consists of a multiexperience communications platform (including web portals, mobile applications, SMS and voice) used to provide multiple stakeholder groups (including consumers, family members or ecosystem partners) centralized access to healthcare providers' digital and analog products and services.

Why This Is Important

For many healthcare providers, the rush to deploy digital capabilities to meet the increasing demand for digitally enabled healthcare services is resulting in independent digital interactions that do not support a cohesive patient journey. The DFD solves this issue by spanning a wide range of digital touchpoints to link these interactions and orchestrate comprehensive health journeys for patients across diagnosis, treatment and care management services.

Business Impact

Through the deployment of a DFD, healthcare providers can:

- Streamline the end-to-end patient journey, improving patient activation, engagement and satisfaction.
- Personalize patient journeys across touchpoints, providing an avenue to address gaps in healthcare.
- Enhance digital presence and experience to drive increased revenue through new patient acquisition, and increased patient retention and loyalty.

Drivers

- As healthcare providers continue to scale and expand virtual care offerings, capabilities to digitally engage patients must mature to ensure equitable access to services, optimize patient activation and engagement, and maximize clinical outcomes.
- The DFD enables healthcare providers to differentiate from competitors on the basis of consumer experience. This is becoming increasingly important as traditional healthcare providers expand virtual care services and new market entrants (such as big-box retailers, digital giants and startups) continue to advance into healthcare delivery with a diverse range of digital offerings.
- Increasing consumer and patient expectations for highly personalized digital healthcare interactions across multiple touchpoints and channels are driving the ongoing evolution of healthcare providers' patient engagement strategies and DFD adoption.
- Traditional electronic health record (EHR) tethered portals do not provide the flexibility in digital channels and experiences or the breadth of capabilities necessary to support all requirements of a healthcare provider's DFD.
- The DFD is a critical capability for healthcare providers to maximize patient engagement across their health and wellness journey. This is of particular importance in supporting the shift from episodic to longitudinal care delivery associated with increasing uptake of value-based care.

Obstacles

- Integration remains a significant barrier to DFD deployment. The DFD is not delivered through a single solution; data must flow freely across solutions and touchpoints to optimize the patient experience.
- For healthcare providers that have made significant long-term investments into EHR solutions and their associated patient portals, justifying the time and cost required to transition to a DFD can be a barrier to adoption.
- Overinvestment in digital solutions in the absence of addressing nondigital needs that should be orchestrated by the DFD has the potential to exacerbate health inequities for certain populations unable to access or use digital tools.

User Recommendations

- Gain organizational endorsement for your DFD strategy and roadmap by identifying the cost, revenue, clinical and experience gains that will be realized through the enablement of comprehensive, personalized digital patient journeys.
- Identify strategic vendor partners by evaluating not only their capabilities but also their ability to align with your development and implementation roadmaps and timelines.
- Reduce time to deployment and value realization by adopting a composable architectural approach that enables the composition of existing applications (such as EHR) and custom-built capabilities.
- Maximize consumer, patient and employee adoption by taking a total experience approach to address digital and nondigital needs across their respective journeys — especially the components that intersect. Invest in multiexperience technologies to improve user experiences across channels, devices, touchpoints and interaction modalities.

Sample Vendors

Appian; b.well Connected Health; Gozio Health; Kyruus; League; Loyal Health; Pager; Pegasystems; Salesforce

Gartner Recommended Reading

[Cleveland Clinic Abu Dhabi Improves Consumer Engagement Through a Digital Front Door](#)

[Innovation Insight for Digital Health Platform](#)

[Market Guide for Digital Health Platforms](#)

[Healthcare and Life Science Business Driver: Total Experience Transformation](#)

Ambient Digital Scribe

Analysis By: Sharon Hakkennes

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Ambient digital scribes are intelligent documentation support systems that leverage speech recognition, natural language processing (NLP), AI and machine learning (ML) to automate documentation of the spoken aspects of a clinical encounter. These solutions use ambient listening and speech recognition technology to convert captured audio to text. Relevant information from the clinical encounter is extracted and summarized before being uploaded to the electronic health record (EHR).

Why This Is Important

EHRs have increased the burden of documentation and are associated with negative impacts on work-life balance and clinician burnout. These issues are especially acute in the U.S., where physicians routinely spend a significant proportion of their day as well as time outside of office hours completing documentation. Ambient digital scribes address these issues by replacing clinicians with technology to automate the clinical documentation process.

Business Impact

Ambient digital scribes promise a number of benefits including:

- Reducing time spent on clinical documentation and increasing the timeliness, completeness and accuracy of notes
- Addressing issues of clinician burnout associated with documentation and increasing the time available for clinicians to spend with patients, thereby improving engagement
- Supporting the move to value-based care models, which rely heavily on clinical documentation to identify gaps in care and inform shared savings payments

Drivers

- Healthcare providers are in crisis due to workforce burnout and staffing shortages. Ambient digital scribes help alleviate the documentation burden associated with the EHR, and deployment of these solutions is being used as a tool to support attraction and retention of physicians.
- Many healthcare providers have employed human scribes to chart patient encounters in real time, either in person or off-site (i.e., virtual scribes). Scribes require considerable training and are costly — ambient digital scribes are emerging as a viable and scalable alternative.
- Maturation and evolution of the technology, including the use of large language models, are improving the accuracy of solutions and reducing the need for quality checking of notes by a human prior to surfacing to the clinician. This, combined with an increasing number of solutions in the market, will drive down solution licensing costs.
- New market entrants are expanding the availability of solutions beyond the U.S., such as in Canada and France.
- Maturing speech recognition and NLP capabilities of cloud service providers and their healthcare vertical offerings are enabling healthcare providers to develop solutions to address specific problems at their organizations. For example, Houston Methodist Hospital is leveraging Amazon Web Services (AWS) capabilities, including Amazon Lex and Amazon Transcribe Medical, to deliver voice assistant and ambient digital scribe capabilities in operating theaters and ambulatory clinics.

Obstacles

- Underlying models must be trained by specialty, specific to the language spoken and global variations in healthcare delivery models.
- Commercially available solutions are currently limited to ambulatory settings. Solution vendors are just beginning to pilot capabilities in the inpatient setting with a focus on nursing documentation.
- Ambient digital scribes capture the entire clinical encounter, raising privacy, ethical and legal concerns, which must be addressed prior to implementation.

User Recommendations

- Identify potential use cases for ambient digital scribes across your organization by actively engaging with the chief medical informatics officer/chief nursing information officer (CMIO/CNIO) and clinical leaders. Start with targeted specialty areas to run proofs of concept, using lessons from early trials to scale over time.
- Look beyond the hype when evaluating different solutions by carefully evaluating the approaches taken to develop the underlying models to ensure accuracy and minimize bias. Prioritize solutions that demonstrate explainability and traceability of the output.
- Future-proof your vendor selection by evaluating their product development roadmap for their ability to capitalize on rapidly evolving generative AI capabilities and alignment with your organizations' pain points and priorities.
- Address privacy, ethical and legal concerns by enabling robust discussion and debate with legal, clinical and operational leaders. Develop policies and processes that deal with issues of consent, data ownership, retention and secondary use.

Sample Vendors

3M (M*Modal); Abridge; Ambience Healthcare; Augmedix; DeepScribe; Microsoft (Nuance); Suki

Gartner Recommended Reading

[Innovation Insight: Ambient Digital Scribes Reduce Clinical Documentation Burden](#)

[Quick Answer: What Healthcare Provider CIOs Need to Know About LLM Applications Such as ChatGPT](#)

Care Team Collaboration

Analysis By: Barry Runyon

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Care team collaboration (CTC) is an interoperable application ecosystem (IAE) representing the convergence of conventional and evolving patient access, point-of-care, and middleware technologies. The CTC IAE is enabled through mobility, interoperability, Internet of Things (IoT), AI and real-time operational intelligence. Examples of CTC systems include nurse call, interactive patient care, clinical communication and collaboration, resource scheduling systems, and alarms and notifications.

Why This Is Important

CTC is an essential point-of-care IAE that improves situational awareness surrounding the patient, facilitates real-time patient intervention and information sharing, streamlines disconnected care transitions and care delivery workflows, and makes operational intelligence actionable in real time. CTC can overcome persistent care handoff and coordination challenges, and more demanding patient experience quality measures and consumer expectations.

Business Impact

CTC can improve:

- Key performance measures that impact reimbursement revenue.
- Care team member productivity, morale and retention.
- Patient and family engagement.

CTC can reduce:

- Disjointed care handoffs by synchronizing workflows with CTC participant systems.
- Patient/provider miscommunication with message routing, escalation and collaboration tools.
- Preventable medical errors, adverse drug events and informed consent issues.

Drivers

- Inflationary pressures, economic downturn, staffing shortages and the need to do more with less.
- The need to contain costs by leveraging incumbent IT systems and sunk costs.
- Increased provider participation in value-based care arrangements, requiring the tight integration of key point-of-care systems to improve patient satisfaction and key quality-of-care measures.
- Increased adoption of mobile devices and apps to facilitate care delivery.
- Advances in interoperability, workflow automation and AI that enable CTC.
- Increasing interest in composable architecture, total experience, real-time health system (RTHS) and digital health platform (DHP) as alternative IT service delivery models.

Obstacles

- Lack of understanding of the interoperable application ecosystem conceptual framework.
- Few clinical informaticist CTC champions to educate and influence health system leadership.
- Legacy application integration challenges, particularly the lack of open APIs and automation features.
- Inadequate stakeholder involvement leading to resistance to potential workflow changes.
- Enterprise license agreements that discourage or penalize best-of-breed adoption.
- Few formal CTC pilots and reference sites.

User Recommendations

- Facilitate interest and leadership support by formally establishing CTC as a care delivery and technology program within your IT strategy.
- Rationalize your application portfolio using IAEs that directly impact the patient and provider experiences (e.g., CTC, patient throughput and capacity management [PTCM]).
- Work with incumbent CTC solution vendors (contact center, clinical communication and collaboration [CC&C], interactive patient care [IPC], nurse call, and alarms and notifications) to determine if or how much they are aligned with the CTC IAE concept and framework.
- Invest or decommission constituent CTC vendor solutions based on their ability to participate within IAE.
- Create a level playing field by requiring vendors to adhere to industry standard open APIs, RTHS characteristics, and behaviors within set time frames.

Sample Vendors

Connexall; GetWellNetwork; PerfectServe; Stryker (Vocera Communications); TigerConnect (Critical Alert)

Gartner Recommended Reading

[Establish Interoperable Application Ecosystems Early in Your Composable Healthcare Provider Roadmap](#)

Immersive Technology for Care Delivery

Analysis By: Sharon Hakkennes

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Immersive technology for care delivery is the application of virtual reality (VR), augmented reality (AR) and mixed reality (MR) technologies to create immersive clinical environments that convey a sense of real-world presence through the use of visual, auditory and haptic elements. Common applications include clinical diagnosis and treatment, education and training, and clinical event simulation (e.g., presurgical planning).

Why This Is Important

Immersive technologies are offering a new way in which healthcare providers can engage patients and clinicians. Creating immersive and interactive experiences enables the delivery of more personalized and effective care, increases patient understanding of their health and improves patient engagement in their care. These technologies are also transforming clinical education and training — enabling greater collaboration across distances and supporting skill practice in a controlled environment.

Business Impact

Immersive technologies are being applied in the healthcare domain to:

- Improve clinical outcomes as primary or complementary assessment and treatment approaches across a broad range of clinical conditions
- Increase patient engagement and reduce anxiety by preparing and educating patients about their clinical condition and treatment plan
- Increase effectiveness, reduce cost, improve accessibility and mitigate risk of clinical education and training

Drivers

- Ongoing technology advances are driving increased interest and enabling new use cases. For example, addressing issues of latency has enabled the evolution of live stereoscopic VR training in areas such as surgery and emergency medicine.
- The body of evidence supporting the effectiveness across clinical use cases (e.g., acute and chronic pain management, rehabilitation, patient education, and behavioral therapy) and in clinical education and training (e.g., surgical procedure training, empathy training) is expanding.
- Healthcare providers are prioritizing technology investments that align with their focus on designing and delivering optimal patient and clinician experiences. Immersive technologies are a part of this strategy, providing innovative ways to engage patients and clinicians.
- Hype surrounding the metaverse continues to drive industry-specific interest in foundational metaverse technologies, including immersive technologies.
- The number of vendors bringing healthcare-specific immersive technology solutions to the market is proliferating rapidly. These vendors are bringing new solutions to the market and expanding current solutions to support a broader range of use cases.

Obstacles

- High software, hardware, configuration and implementation costs and lack of dedicated reimbursement mechanisms hinder adoption.
- Patient and clinician attitudes, willingness to trial the technology and weariness of potential side effects (e.g., simulation sickness) can be barriers where the implementation is not coupled with strong clinician engagement, change management and training.
- Many solutions on the market are focused on a narrow set of use cases. As a result, healthcare providers are forced to invest in, and support, multiple solutions and enabling hardware to meet the growing number of applications across clinical care delivery, and education and training.
- There are numerous challenges to enable scaling the use of immersive technologies outside of the healthcare facility. This includes logistics to supply and return the required hardware, privacy and information security, and ensuring patients have the training and support to use the technology independently.

User Recommendations

- Engage with a broad range of clinical and business stakeholders across the organization to identify key use cases where immersive technologies can address clinical education and training challenges, and enhance patient experience and outcomes.
- Build trust and accelerate adoption by implementing comprehensive training programs to ensure patients and clinicians are confident in the independent use of the technology.
- Enable scaling of immersive technology initiatives across use cases by developing standards and resources to facilitate technology evaluation, establishment of clinical workflows, provision of logistical support (e.g., hardware cleaning) and measurement of benefits.
- Future-proof technology investments by prioritizing vendors that facilitate multiple use cases, are hardware agnostic and enable the cost-effective development of new content.

Sample Vendors

8chili; Augmedics; Fundamental Surgery; ImmersiveTouch; KindVR; Penumbra; Surgical Theater; Virtually Better; XRHealth

Gartner Recommended Reading

[Healthcare and Life Science Business Driver: Total Experience Transformation](#)

[Video: 2021 Eye on Innovation Awards in Healthcare and Life Sciences – Virtual Reality to Cultivate](#)

[Clinician Empathy \(Nationwide Children’s Hospital\)](#)

[Advancing Digital Innovation in Clinical Education and Training](#)

Large Language Models for Care Delivery

Analysis By: Sharon Hakkennes, Jeff Cribbs

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Large language models (LLMs) are generative AI algorithms trained on large volumes of unlabeled textual data. Applications can use LLMs to accomplish a broad range of tasks, such as content generation, content summarization, search, language translation and augmenting conversational assistants for care delivery.

Why This Is Important

The hype created by the release of ChatGPT, an application that leverages the GPT LLM, saw LLMs rapidly accelerate to the Peak of Inflated Expectations — creating both excitement and apprehension regarding its potential. Clinicians, hospital administrators and technology vendors immediately saw the value proposition of this technology in addressing some of the biggest challenges being faced by healthcare services today, such as clinician burnout and staff shortages.

Business Impact

Early applications have been focused on administrative tasks — such as clinical documentation, information summarization and data interpretation — that help improve operational efficiency, reduce cost and free time for clinicians to spend with patients. The ability of LLMs to generate humanlike interactions has the potential to improve patient education, engagement and adherence to treatment plans. Other evolving use cases include clinical decision support and clinician education and training.

Drivers

- Healthcare systems across the globe are facing numerous challenges, such as staff shortages, clinician burnout, rising costs and unsustainable demand for service, that are threatening their ability to deliver on healthcare's quadruple aim. LLMs have the potential to drive operational efficiencies and augment clinicians in the provision of high-quality clinical care. For example, ambient digital scribe solutions are leveraging LLMs to automate documentation of a clinical encounter.
- The public release of ChatGPT is enabling broad-scale experimentation and research on the potential applications of LLMs for healthcare providers with promising early results. For example, researchers from University of California San Diego used a sample of 195 publicly available patient questions and physician responses, comparing ChatGPT's response to the question with that of the physician. Evaluators preferred the chatbot's response in almost 80% of cases, and the proportion of responses rated as empathetic or very empathetic was significantly higher for the chatbot than for physicians.
- There is a steady cadence of mature and startup healthcare technology vendors leveraging LLMs either through integrations or as a core component of their technology. For example, Epic has partnered with Microsoft to integrate the Microsoft Azure OpenAI Service with Epic's electronic health record (EHR). Early use cases include drafting clinician responses to patient (In Basket) messages and enabling natural language queries and interactive data analysis in Epic's self-service data reporting tool, SlicerDicer. And Abridge's ambient digital scribe solution has been built using the BERT LLM.
- Large technology companies with healthcare industry cloud platforms (such as Microsoft and Google) are making enormous investments in developing new LLMs, demonstrating and broadcasting their achievements in a race to achieve a strong position in the LLM space.

Obstacles

- There is widespread misunderstanding of the technology. This can result in unproductive strategic discussions and reflexive governance decisions to prohibit use of LLM tools.
- Use cases that will transform healthcare delivery require higher degrees of proven accuracy and safety than the 80% to 90% general performance LLMs demonstrate today.
- LLM outputs are not currently explainable — at least not in the sense we are accustomed to in healthcare when we validate rule-based software, clinical protocols or efficacy studies. LLM use-case adoption will be constrained by the need for transparency about decision making.
- There is significant uncertainty about the future regulatory environment for LLMs. Issues include intellectual property in LLM training datasets, privacy and confidentiality of enterprise data, and legal liability for content generated by the LLM.
- Many LLMs are cloud-based, so the data may have to leave the control of the healthcare organization — creating a risk of exposing protected health and other confidential information.

User Recommendations

- Accelerate clear, effective internal communications by ensuring business, clinical and technology leadership teams have a common set of definitions for key terms in generative AI. Build a foundational understanding of how LLMs — such as GPT — work, along with associated risks.
- Develop an understanding of the different types of LLMs and where they are applied. Similarly, become familiar with techniques for working with these models, including prompt engineering, fine-tuning and the role of vector databases.
- Engage your patient populations directly by convening sessions with patient advisory groups to understand current utilization of LLMs and LLM-enabled applications like ChatGPT, ascertain perceptions of the technology, observe first usage where possible and trial messaging for safe patient usage.
- Ensure your vendor partnerships are positioning their products and services to maximize the value and manage the risk presented by LLMs by making generative AI a regular point of discussion.

Sample Vendors

Amazon Web Services; Google; John Snow Labs; Microsoft; OpenAI

Gartner Recommended Reading

[Quick Answer: What Healthcare Provider CIOs Need to Know About LLM Applications Such as ChatGPT](#)

[GPT-4 Impacts and Actions in Healthcare and Life Science](#)

Virtual Health Assistants

Analysis By: Kate McCarthy

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Virtual health assistants (VHAs) are specialized conversational interfaces using artificial intelligence (AI) technologies that assist people or automate tasks. VHAs apply this technology to enable healthcare and life science consumers to digitally engage with their health and wellness. VHAs incorporate a broad range of use cases for digital encounters, including chronic condition management, medication compliance, triage and health and wellness routines.

Why This Is Important

Accelerated use of digital touchpoints continues across industries — particularly, virtual assistants. VHAs, which are specific to the complexities of health and wellness, have better context models and deeper integration with business applications and back-end systems compared with basic chatbots. They can help manage consumer engagement for chronic and acute condition management, wayfinding, clinical trials, medication therapy management, and health and wellness coaching.

Business Impact

VHAs are designed to help healthcare consumers improve health and wellness compliance and outcomes. They often initiate an interaction to remind the consumer to perform an activity — such as taking a glucose or blood pressure reading, recording weight, or taking medication. VHAs are a necessary touchpoint for healthcare and life science organizations seeking to improve digital consumer engagement strategies.

Drivers

- VHAs have become an important mechanism to triage and interact with patients. They collect data and information and remotely monitor patients, often in command or virtual care monitoring centers. And they can trigger alerts and recommend actions and remote encounters with the appropriate clinician, if needed.
- Payers, providers, life science companies and employers purchase VHAs for use cases ranging across care navigation, virtual behavioral health, chronic disease management, wayfinding and clinical trials.
- VHAs are a strong means to improve patient adherence to care plans and outcomes, lower cost, reduce adverse or unplanned events and increase consumer satisfaction. For example, VHAs increase productivity and time to care for clinicians and improve recruitment and retention in clinical trials because of automation.
- VHAs also render real-time insights into consumers' vitals, activities, behaviors and attitudinal preferences for more immediate, personalized interventions. VHAs improve engagement and access to healthcare advice and guidance for condition or treatment management, and provide a more positive, people-literate, tactile consumer experience for many administrative and transactional tasks that are essential for medication and care plan compliance.
- As VHAs mature, they are increasingly able to initiate a conversation and pick up moods using sentiment analysis, which will be critical for consumer engagement.
- Generative AI, such as large language models like OpenAI (ChatGPT), stands to advance the capabilities of VHAs by improving empathy-based, natural language engagement.
- Due to the increased interest and adoption, we continue to advance this technology to the Peak of Inflated Expectations and continue the benefit rating as high. We expect this to be a rapidly maturing technology capability and project VHAs to reach the Plateau of Productivity in the next two to five years.

Obstacles

- Healthcare and life science organizations continue to lag other industries in digital maturity in consumer-facing capabilities. To overcome adoption barriers, leading organizations incorporate VHAs into their larger multiexperience consumer engagement strategies to yield the greatest value to the business and consumer.
- Data orchestration remains challenging across disparate systems. Leading organizations prioritize their data fabric to ensure employees, users and consumers have access to the right information at the right time to execute informed next best actions.

User Recommendations

- Design VHAs to be one touchpoint among many available to engage consumers, employees and users. Create personas and journey maps for key consumers and users to identify moments of friction that represent high-value use cases for VHAs.
- Engage clinicians actively in user testing and experience design to ensure usability and engagement.
- Counter any resistance by having a robust plan (with training and awareness), and assure your workforce that the technology is to augment their jobs, not take their jobs away.
- Monitor the direction of the electronic health record vendors and their intersection with the personal health record.
- Identify regional privacy regulations for countries when piloting on live patients. For example, find out how and where the apps collect, store and reuse data, as many of these will be cloud- and mobile-device-enabled.
- Evaluate VHAs' use and planned use of generative AI and assess related risks around protected health information (PHI) or intellectual property data sharing.

Sample Vendors

Amazon; Avaamo; Babylon; Cognizant; Medocity; Orbita; Pager; Sensely; Verint Systems

Gartner Recommended Reading

[Case Study: Automation With Intelligent Virtual Assistant \(Humana\)](#)

[Tool: Virtual Care Maturity Assessment](#)

Emerging Tech Roundup: ChatGPT Hype Fuels Urgency for Advancing Conversational AI and Generative AI

Emerging Technologies: Tech Innovators in Advanced Virtual Assistants

Digital Clinical Encounters

Analysis By: Sharon Hakkennes

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Digital clinical encounters are semiautomated patient interactions that include the use of clinical protocols, algorithms and artificial intelligence (AI) to facilitate history-taking, triage, diagnosis, prescribing and documentation. The encounter leverages the latest evidence-based clinical knowledge to reduce clinicians' direct involvement prior to their review of the captured and analyzed content for clinical oversight and action.

Why This Is Important

Epidemiological factors (such as an aging population and increasing burden of chronic disease), coupled with clinician shortages and burnout, have made access to primary and specialist care a major challenge currently facing the healthcare industry. Digital clinical encounters help address these issues by improving clinician efficiency through the automation of certain steps in the care delivery process.

Business Impact

Digital clinical encounter solutions are transformational systems that use automation to:

- Dramatically reduce the time taken by clinicians to gather and review patient information, confirm a diagnosis, select treatment options, and document the encounter.
- Direct patients to the right level of care, avoiding unnecessary emergency room visits.
- Increase both patient and clinician satisfaction.

- Improve access for more complex encounters and those that require in-person visits.

Drivers

- AI capabilities are evolving, and solutions are increasingly available. As the industry explores the potential applications of large language models (such as GPT-4) in healthcare, we expect interest in these solutions to rapidly increase over the coming 12 months.
- New vendor partnerships deliver seamless integration of digital clinical encounter solutions into broader virtual healthcare solution offerings.
- Clinician burnout is a global issue. Through automation of administration and documentation processes, digital clinical encounters address one of the leading causes of this burnout.
- Clinical staffing shortages are creating capacity issues across many health systems. By automating components of the clinical encounter, digital clinical encounter solutions increase clinician productivity and enable health systems to scale access to low-acuity care.
- Healthcare providers are facing ever-increasing market competition. Digital clinical encounter solutions can drive patient access, acquisition and retention by improving health system navigation and providing a convenient alternative for receiving care.
- Clinician and patient acceptance and adoption of virtual care are increasing — in particular, the use of online triage tools to direct patients to the right levels of care, diverting appropriate cases away from overwhelmed acute care resources.

Obstacles

- Current systems are designed predominantly for low-acuity primary care visits and patient triage, restricting adoption to these care settings.
- A number of barriers impact clinician acceptance and adoption of digital clinical encounter solutions. These include concerns about safety and efficacy, and the perceived negative impact on the clinician-patient relationship.
- Legal and compliance risks, as well as the lack of a dedicated funding stream for digital clinical encounters, are also hampering adoption.

User Recommendations

- Increase clinician awareness and acceptance by running targeted educational campaigns focusing on how digital clinical encounters can support increased access to care across high-demand clinical areas.
- Scale implementation through pilots and proofs of concept (POCs), starting with low-complexity, high-volume encounter types.
- Measure the success of pilot implementations through a comprehensive benefits management plan that includes patient and clinician satisfaction, in addition to clinical outcome measures.
- Minimize potential legal ramifications by working with risk management, legal and clinical leadership in establishing an enterprise governance framework for digital clinical encounters.

Sample Vendors

98Point6 Technologies; AdviNOW; Babylon; Bright.md; Intellivisit; Visiba Care; Zipnosis

Gartner Recommended Reading

[Use Gartner's Virtual Care Maturity Model to Transform Care Delivery](#)

[Quick Answer: How to Address Digital Health Equity Across Virtual Care Initiatives](#)

External CDS

Analysis By: Veronica Walk

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

External clinical decision support (CDS) solutions integrate into the clinical workflow and provide patient- and provider-contextualized guidance. CDS supports timely, evidence-based clinical decision making and reduces unnecessary variations in care. These solutions augment native electronic health record (EHR) CDS and include clinical alerts, reminders and care pathways aligned to evidence-based guidelines.

Why This Is Important

EHR-native CDS requires significant maintenance, lacks knowledge and content management and, in many cases, has disrupted clinical workflow with low-value alerts. External CDS augments EHR-native CDS by providing specialized content, managing the evidence base and life cycle, and delivering value-added decision support within the clinical workflow. Different types of CDS are required to meet the full spectrum of use cases and end-user needs across the care continuum.

Business Impact

CDS enables standardized, evidence-based care that improves clinical judgment and patient outcomes and reduces the cost of care delivery. With a dedicated focus on CDS tools and evidence, these solutions enhance healthcare providers' ability to positively impact complex or high-priority clinical conditions, practices and outcomes, such as chronic disease management, hospital readmissions, opioid prescribing practices, oncology diagnosis and treatment, and surgical outcomes.

Drivers

- EHR-native CDS requires significant upkeep on behalf of healthcare provider organizations, and at its worst, adds nuisance and noise to clinical workflows. Healthcare provider organizations turn to external CDS for evidence-based, specialized content and life cycle management tools.
- As EHR vendors have incorporated advanced capabilities, such as artificial intelligence (AI) and machine learning (ML) into their native CDS solutions, some have also come under scrutiny for inaccurate or inadequately vetted algorithms.
- As the adoption of these advanced capabilities accelerates and the regulatory landscape continues to evolve, the need for trusted, evidence-based and properly vetted CDS will be increasingly desired and sought, in part, through external CDS solutions.
- Early external CDS solutions had limited utility as they existed outside of the clinical workflow as referential content. Advances in interoperability standards and regulations have reduced barriers to integrating with EHRs. For example, the U.S. ONC's 21st Century Cures Act mandates the adoption and use of FHIR APIs, allowing healthcare IT developers to integrate data, workflows and insights across previously siloed data sources. By adopting these solutions, healthcare provider organizations can leverage a broader set of clinical and nonclinical data sources, specialty knowledge and evidence-based resources.
- As medical knowledge continues to proliferate exponentially, it is impossible for clinicians to keep up with every advancement and update, thus increasing the value proposition of external CDS solutions that maintain and deliver up-to-date evidence-based guidance.

Obstacles

- Healthcare providers can be reluctant to invest in external CDS due to heavy reliance on their EHR vendor for CDS capabilities.
- Lack of evidence of return on investment (ROI) deters healthcare providers facing ongoing economic challenges and prioritizing other technology investments, such as virtual care or patient engagement capabilities, over external CDS.
- External CDS solutions leveraging advanced capabilities such as AI and ML face increased scrutiny and need to overcome additional barriers to adoption, such as patient and provider skepticism and evolving regulatory requirements.

User Recommendations

- Augment the capabilities of your core EHR and other clinical systems by implementing external CDS solutions that provide relevant, evidence-based guidance in tight integration with clinical workflows. Give priority to vendors with proven ROI based on real-world use.
- Reduce the burden on your IT team by adopting external CDS with capabilities such as content management, citizen IT tools and API integration.
- Address the issue of nuisance CDS and alert fatigue by collaborating with your clinical colleagues to establish governance to oversee the judicious use of CDS. Establish quantitative and qualitative metrics to determine if external CDS is effective, including adherence to CDS and its impact on patient outcomes.
- Increase the value proposition of external CDS by identifying and prioritizing solutions that support additional venues of care, such as virtual care, or other strategic priorities, such as health equity, patient engagement or value-based care.

Sample Vendors

AgileMD; Cambio Healthcare Systems; EBSCO Information Services; Elimu Informatics; Elsevier; EvidenceCare; Hearst Health; Isabel Healthcare; Merative; Wolters Kluwer

Gartner Recommended Reading

[Market Guide for Clinical Decision Support Solutions](#)

[Market Guide for Enterprise Electronic Health Record Solutions](#)

Next-Generation Nurse Call

Analysis By: Barry Runyon

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Patients use nurse call systems to communicate with care team members, and nurses use them to monitor patients and collaborate with care team members. Conventional nurse call systems include master consoles, pillow speakers, pull stations, dome and corridor lights, and alarms and notifications middleware. Next-generation nurse call systems use mobility, location services, Internet of Things (IoT), real-time analytics and smart room technologies to extend their reach and effectiveness.

Why This Is Important

- Nurse call systems are governed by the Underwriters Laboratory (UL) 1069, the Standard for Hospital Signaling and Nurse Call Equipment. The U.S. requires hospitals to install UL-1069-listed nurse call systems to license their inpatient beds.
- Conventional nurse call systems focus on patient safety and optimize care team response times to patient needs.
- Next-generation nurse call systems go beyond patient safety to improve the patient experience and facilitate care team collaboration.

Business Impact

The UL 1069 standard is an artifact of an earlier centralized nurse call implementation model when nursing stations were the hub of most nursing operations. Alternative ways to satisfy nurse call requirements have evolved due to advances in wireless and mobile technologies and interoperability standards. There is a significant overlap between nurse call capabilities and point-of-care solutions, such as clinical communications and collaboration (CC&C) and interactive patient care (IPC).

Drivers

- Interest in the “total experience” paradigm wherein clinician usability and workflow needs are considered along with the patients.
- Mobile communication and collaboration platforms not subject to UL 1069 compliance have begun to extend and redefine the nurse call space.
- Recent mobility and workflow automation advances have enabled delivery of nurse call capabilities outside conventional nurse call platforms.
- The need to address clinician burnout and staff shortages with systems intelligently route communications to the right care team members.
- Merger and acquisition activity in the hospital market drives nurse call consolidation, causing healthcare providers to revisit nurse call requirements.
- The “nurse call” moniker no longer represents the nurse’s evolving role within the healthcare organization.

Obstacles

- UL 1069 certification will continue to be a barrier to innovation and will be revisited to reflect patient safety requirements beyond the protection from electronic component failure.
- The hospital facilities and clinical engineering groups often hold the nurse call budget — not the nursing operations staff who most benefit from nurse call innovation.
- University medical centers, integrated delivery networks and larger hospital systems do not often consider smaller innovative nurse call solution vendors.
- A narrow view of nurse call system requirements (e.g., as primarily a patient safety measure) has inhibited innovation and experimentation in this space.
- Changing and upgrading nurse call vendor solutions can be costly and disruptive to nursing and hospital operations.
- Organizational resistance to change and misplaced loyalty to the incumbent vendor.

User Recommendations

- Delay refreshing your nurse call system until you have a firm grasp of patient and care team communication and collaboration requirements in light of more decentralized care delivery models.
- Investigate functional alternatives to nurse call systems. Consider combining CC&C capabilities, IPC, and alarms and notifications platforms through middleware and other real-time health system technologies.
- Work closely with nursing operations to craft a nurse call request for information (RFI) to be sent to notable solutions vendors to determine how they are extending the reach and effectiveness of the conventional nurse call system.
- Consider wireless nurse call systems where regulations permit. Currently, wireless nurse call is more common in post-acute-care venues.

Sample Vendors

AMETEK (Rauland); Ascom; Baxter (Hillrom); TigerConnect (Critical Alert)

Gartner Recommended Reading

[Is Nurse Call Still Necessary?](#)

Sliding into the Trough

AI-Enabled Diagnostic Imaging Interpretation

Analysis By: Jeff Cribbs, Laura Craft

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

AI-enabled diagnostic imaging interpretation uses deep learning techniques, machine learning (ML) and classification technology on large sets of labeled medical images to create algorithms that enable faster and more accurate findings from an imaging study. AI-enabled interpretation can be applied to radiological and pathological images such as X-ray studies, MRI, CT scans and pathology.

Why This Is Important

Radiology and pathology images contain critical insights about patient health. As the number of studies and images increases, there is rising concern about shortages of imaging specialists to meet the demand. AI-enabled solutions can augment imaging specialists for prescreening large numbers of images, helping clinicians prioritize their workloads and focus on the most urgent images. In poorer less developed health systems, it can deliver imaging expertise where it was not previously feasible.

Business Impact

AI-enabled diagnostic imaging interpretation promises a range of benefits:

- Reduce burnout and time spent on prioritizing caseloads while directing imaging specialists to high-risk findings requiring immediate attention.
- Reducing the likelihood of a missed diagnosis, as the AI algorithms flag abnormalities that the reader's eye may miss at times.
- Additionally, the technology can enable increased and timely access to radiological and pathological services for remotely located patients.

Drivers

- Regulatory bodies worldwide are actively working on developing and regulating frameworks for approving AI-powered solutions that can augment clinicians' decision making when reading diagnostic images.
- While X-ray, CT and MRI have been the primary modalities, use cases are emerging in other areas such as mammography (including 3D tomosynthesis), whole slide imaging in pathology, fundus imaging (of the eye), ultrasound and echocardiography.
- Recent foundational research in pathology has illuminated another potential driver of AI diagnostics: The ability to identify novel features for disease prognostication and treatment. In this [learning from deep learning](#) model, elements of the image that were not previously known to clinicians to be significant are identified as such by the AI.
- Globally, we see researchers and government agencies implementing policies to improve technology adoption, by bringing reimbursement aid for hospitals using the solutions. The Centers for Medicare & Medicaid Services (CMS) in the U.S. has granted [New Technology Add-On Payment \(NTAP\)](#) to various vendor solutions offering AI/ML solutions for diagnostic image interpretation. The NHS has announced its intent to fund certain high-value AI-based software medical devices in 2023 (see [MedTech Funding Mandate Policy 2022/23](#)). Health Insurance Review and Assessment Service (HIRA) agency in Korea is working actively to introduce guidelines to enable hospitals to receive extra reimbursement for AI in radiology (see [Radiology Technologies Using AI Can Get Reimbursement](#), Korea Biomedical Review). A [Springer Nature's article](#) suggests a novel payment design intended to be more equitable and sustainable in the long term.
- Major picture archiving and communications system (PACS) vendors continue expanding their capabilities by bringing AI-algorithm marketplaces that offer a range of AI algorithms designed for specific clinical use cases (such as cardiology, bone health and oncology). This approach leads to a simplified integration process with native PACS systems and often helps reduce the total cost of ownership to the healthcare provider.

Obstacles

- Despite the new ideas for reimbursement cited above, for providers planning to invest long-term in implementing technology, there remains uncertainty regarding the financial implications when imaging specialists are aided or even replaced by computer systems.

- Ongoing skepticism among some providers with apprehension regarding the disruption to existing reporting workflows that many radiologists view as already efficient.
- Concerns around health equity in the representation of populations in training datasets, the algorithmic bias introduced or reinforced by current practices, and the potential for algorithmic drift as equipment and medical practice change over time.

User Recommendations

- Prepare for the adoption of AI for diagnostic imaging interpretation by establishing a strong AI governance strategy. The strategy should address the benefits, risks and regional regulatory requirements and establish metrics to measure the value and adoption by the clinical workforce.
- Build the business case for investment into AI-enabled diagnostic imaging interpretation by collaborating with clinical imaging leaders and understanding how the technology offers the potential to improve medical accuracy and departmental efficiency, and reduce clinical burnout.
- Assess the vendor products by establishing a vendor evaluation framework that evaluates the solution's ability to integrate and clinically transform existing medical imaging workflows and performance at scale, and meet compliance and regulatory approval requirements.

Sample Vendors

Aidoc; DiA Imaging Analysis; GE HealthCare; MaxQ AI; NANO-X IMAGING; PathAI; Philips; Proscia; Viz.ai

Gartner Recommended Reading

[Innovation Insight for AI-Enabled Diagnostic Imaging Interpretation](#)

[Case Study: AI-Enabled Diagnostic Imaging Interpretation \(Bolton NHS Foundation Trust\)](#)

Algorithmic Medicine

Analysis By: Veronica Walk

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Algorithmic medicine enables advanced clinical decision support using insights and rules built from clinical guidelines, evidence-based best practices, and other clinical data repositories to accurately draw “expert level” diagnosis and treatment decisions. These solutions rely on artificial intelligence (AI), machine learning (ML), natural language processing and rule-based algorithms to augment clinical judgment by suggesting diagnoses and specific treatment protocols.

Why This Is Important

Algorithmic medicine solutions can augment certain clinical activities, up to and including diagnosis and treatment, enabling increased diagnostic accuracy and earlier interventions, and freeing clinicians to focus on clinical situations that require human interaction. This is supported by increasing real-world evidence of ML models outperforming clinician accuracy.

Business Impact

Algorithmic medicine can augment clinical decision making and speed up time to diagnosis and treatment, improving outcomes and reducing the cost of care. It is increasingly accepted and used to predict high-priority clinical conditions and outcomes, such as hospital readmissions, opioid use disorder and suicide risk. There is growing evidence for use cases such as cancer detection and treatment, diagnostic image interpretation, and speech analysis for disease detection.

Drivers

- Global healthcare workforce shortages are driving increased interest in technology solutions that can supplement or increase clinical workforce capacity. There is also significant potential to address health disparities in low-income and low-resource regions, where algorithmic medicine might be used to increase access to diagnosis and treatment options that might not be available otherwise.
- Much of the algorithmic medicine model development is being carried out by healthcare organizations themselves or in partnership with vendors for specific clinical use cases. This increases the chances of success by addressing the necessary levels of real-world testing, specificity, localization and work to overcome sociotechnical barriers to adoption.
- Regulatory oversight is critical to ensuring the safe, effective and unbiased application of these technologies. International health agencies and regulators, such as the International Medical Device Regulators Forum and World Health Organization, are actively developing and encouraging industry participation in regulatory frameworks for AI- and ML-enabled software as a medical device (SaMD).
- The emergence of synthetic data will help improve testing and overcome challenges related to algorithmic bias.
- Over the past year, we have observed significant advancements in underlying technologies, such as AI and ML, that make the possibilities for algorithmic medicine more exciting and seemingly attainable than ever. Past the Peak of Inflated Expectations, the industry remains cautiously optimistic, but we expect a proliferation of solutions and adoption in the next two to five years.

Obstacles

- Regulatory and medicolegal issues (for example, who will be held responsible when an algorithm is “wrong” or when it will be considered malpractice not to use an algorithm) remain largely unknown and untested.
- Evidence of algorithmic bias has emerged due to incomplete or inherently biased datasets or models. These biases became evident in some deployments of algorithmic medicine during the pandemic and are highly concerning for their potential to exacerbate socioeconomic health disparities.
- Lack of industry standards and oversight for the development and validation of models has contributed to skepticism and mistrust, and in part, has created the environment for biases to emerge and persist.
- The most advanced algorithms are often the least explainable — often referred to as “black-box algorithms” — leading to doubt and distrust among patients and providers.

User Recommendations

- Maximize investments in algorithmic medicine by partnering with clinical and business leaders to identify high-priority use cases and drive adoption. Leverage shared risk agreements with vendors to ensure the solution delivers on the value proposition.
- Establish strong governance to vet and oversee algorithmic medicine by engaging with leaders throughout the organization, including clinical leadership, compliance, data sciences, legal and risk management. Carefully monitor for algorithmic bias and unintended consequences.
- Work with risk management and legal to monitor and understand evolving regulations and eventually mitigate any ramifications of using or failing to use algorithmic medicine.
- Earn clinicians’ and patients’ trust by starting with explainable algorithms. Commit to transparency in reporting outcomes and addressing any signs of bias or unintended consequences.

Sample Vendors

Epic Systems; Google; Lightbeam Health Solutions; MEDITECH; Oracle Cerner; VigiLanz

Gartner Recommended Reading

[Market Guide for Clinical Decision Support Solutions](#)

[Case Study: Make AI Models Credible, Not Explainable \(Unity Health Toronto\)](#)

[Quick Answer: What Healthcare Provider CIOs Need to Know About LLM Applications Such as ChatGPT](#)

Healthcare Digital Marketplace

Analysis By: ck Andrade, Sharon Hakkennes

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

A healthcare digital marketplace is a systematically organized online catalog that enables healthcare organizations to efficiently find, test, procure, share, implement and integrate technology and clinical products and services. Within organizations, digital marketplaces support the internal sharing of technology, such as algorithms and services. Across the ecosystem, they provide distribution channels serving vendors, technical and nontechnical developers, healthcare providers and consumers.

Why This Is Important

Digital marketplaces help CIOs quickly compose, deploy and scale new capabilities to meet business needs, fill gaps in core systems and innovate without developing all capabilities in-house. They democratize technology by providing a trusted place for technical and nontechnical users to find and use easy-to-consume technology with composable architectures compatible with existing infrastructure or systems. And they support the distribution of clinical services to clinicians and consumers.

Business Impact

Digital marketplaces enable scaling care delivery and operational excellence by providing consumers and employees with a range of clinical services and secure, digitally-enabled business and clinical capabilities, such as patient engagement and virtual care apps. In addition, by providing access to a secure and compliant library of validated novel capabilities and algorithms, they extend the value of core system investments, enable digital innovation and improve patient and employee experience.

Drivers

- The rise of healthcare digital marketplaces reflects a change in buying behavior in which technical and nontechnical technology buyers seek a convenient, trusted place to discover, try and buy products related to a particular application, platform or industry. Buyers do this to gain easy access to capabilities that address the gaps in core clinical systems or drive digitalization.
- Digital marketplaces built around specific solutions (e.g., analytics, no-code/low-code platforms, cloud infrastructure, automation and workforce management) offer composability as the technology providers in these marketplaces are prevalidated to ensure easy integration.
- Vendors are pivoting their business model to sell through digital marketplaces leveraging a strong ecosystem of partners, an easier selling process and a cohesive customer segment to grow their customer base, revenue and healthcare-specific capabilities.
- The breadth of digital marketplaces offered by vendors has increased exponentially to include technology and services from cloud hyperscalers, cross-industry vendors, healthcare-focused vendors and systems integrators.
- As healthcare providers increasingly adopt healthcare industry cloud platforms, they leverage their associated marketplaces for prepackaged business capabilities, composition tools and a broad range of clinical and business solutions.
- Healthcare providers who have accelerated innovation of products and services are increasingly offering their own digital marketplaces for peer-to-peer marketing.

Obstacles

- The proliferation of digital marketplaces contributes to buyer confusion.
- Marketplace owners are at different stages of maturity and some with only a grouping of partner or co-developers present themselves as digital marketplaces leading to a mismatch with customers' expectations
- Managing the digital marketplace is usually the domain of the vendor of the core system of record (e.g., an electronic health record (EHR), picture archiving and communication system (PACS) or virtual care vendor). Healthcare providers may be unable to work within the commercial and integration constraints imposed by those vendors.
- Patient privacy and security requirements can be demanding, necessitating third-party application vendors to meet specific standards. These requirements can increase development costs and time to value.
- For some clinical system vendors, digital marketplaces undermine their business model of providing all functionality in the core product.

User Recommendations

- Raise enterprise awareness of the value of using digital marketplaces, and explain the advantages versus in-house development for technical and nontechnical team members.
- Explore marketplace options to avoid being overly influenced by the offerings available in your marketplace of choice.
- Leverage industry cloud platforms and their digital marketplaces and composable architectures to speed and scale your development.
- Determine how your core system vendors (e.g., EHR, PACS and virtual care) currently support the integration of third-party apps or seek to monetize new application integration.
- Extend your application and information governance policies to ensure apps and algorithms acquired through digital marketplaces meet clinical, infrastructure, support, privacy, and security requirements and standards.

Sample Vendors

Amazon Web Services (AWS); athenahealth; Google Cloud; Innovaccer; Microsoft; NTT DATA; Salesforce; SMART Health IT; SNOMED International; The Agile Application Platform (TAAP)

Gartner Recommended Reading

[Tool: IT Sourcing and Procurement Guide to Using Digital Marketplaces](#)

[Predicts 2023: Composable Applications Accelerate Business Innovation](#)

[To Create a Successful API Marketplace or API-Based Ecosystem, Look Before You Leap](#)

[Innovation Insight for Digital Health Platform](#)

Semantic Interoperability

Analysis By: Andrew Meyer, Mike Jones

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Semantic interoperability in healthcare is achieved when two or more information systems can exchange and process business and clinical information with an unambiguous and common understanding. Furthermore, the participating systems need not know how the information will be used before any information exchange. This technology covers the technologies and working groups that support this objective.

Why This Is Important

Semantic interoperability is essential for connecting digital care across clinical settings, care teams and organizations as it enables sending and receiving systems to identify both the data and clinical context for shared information. For care providers, payers, government agencies and regulators, semantic interoperability is becoming a reality. The shared goal of well-defined and enforceable standards and terminologies is increasingly essential across care ecosystems and system vendors.

Business Impact

Semantic interoperability applies to care pathways that span the health ecosystem. Use cases include:

- Regional health information exchanges (HIEs).
- Complex care pathways such as for cancer and behavioral health.
- End-of-life care coordination.
- Urgent care where the first responder needs access to information on current medicines, known allergies or adverse reactions.
- Referral, discharge and care coordination for planned care.
- Packages of health and social care with multiple agencies involved.

Drivers

- Increasing availability of Health Level Seven International (HL7) Fast Healthcare Interoperability Resources (FHIR)-based APIs in electronic health record (EHR) and other clinical systems is frequently mandated or a “must-have” core requirement for healthcare providers procuring EHR and HIE solutions.
- Increased focus on population health and value-based care means greater demand for sharing data to improve the quality of care, contain cost and address the wider determinants of health.
- In the U.S., the evolution of Qualified Health Information Network (QHIN) and Trusted Exchange Framework and Common Agreement (TEFCA) with the first set of networks to be approved to implement TEFCA as prospective QHINs were recognized.
- Increased investment at the national and regional level in HIEs is driving the adoption of HIE platforms.
- The demand from consumers for patient-held records, including the ability to store copies of their medical records on consumer-managed devices is growing.
- Some governments enforce interoperability rules through regulators such as the Centers for Medicare & Medicaid Services (CMS) and the Office of the National Coordinator for Health Information Technology (ONC).
- The increased investment by the tech giants into new architectural approaches for digital health platform construction and operation that focus on creating a common data fabric that exists beyond the proprietary control of individual health IT vendor systems.
- Presence of enforceable procurement frameworks that translate business needs for HIE into more technical functional specifications. (For example, the U.S. requirements set out by the [National Academy of Medicine](#)).
- We expect the time to maturity for semantic interoperability to become mainstream between five and 10 years. This will be achieved earlier in some regions like the U.S. and countries in EMEA where semantic interoperability standards and terminologies are now being enforced at a national level.

Obstacles

- Lack of enforceable national policy and legislation in some regions which dictate the pace of adoption of semantic interoperability standards by healthcare providers and local health IT vendors (e.g., local EHR, PACS and other clinical system vendors).
- Acceptance by providers of basic methods of exchanging information (e.g., where C-CDA or scanned document with fax exchange is culturally accepted) as opposed to open APIs, which expose structured clinical data and conformance with international standards such as FHIR.
- Low incentives and vendor investment to achieve semantic interoperability or where existing means of information exchange (e.g., point-to-point interfaces) are part of a vendor's existing support fees and revenue generation strategy.

User Recommendations

- Use industry best practices to gain agreement for an interoperability strategy and focus on the specific use cases that will yield the greatest business value.
- Develop a deeper understanding of your interoperability needs by taking an outside-in view of how patients, clinicians and your business would benefit from improved access to and shareability of data.
- Create a roadmap for what you want to achieve with semantic interoperability and address data ownership and oversight questions at the outset of your journey.
- Revisit commercial agreements with your EHR vendor and explore their capabilities for improving interoperability versus your needs. Insist on open APIs that are published on publicly available resources, have freely accessible documentation, are available free of charge for testing, and have transparent and scalable commercial arrangements for third-party use.

Sample Vendors

Better; CommonWell Health Alliance; IHE International; openEHR International; The Sequoia Project; TietoEvry

Gartner Recommended Reading

[Innovation Insight for Digital Health Platform](#)

[Quick Answer: What Healthcare Data Models or Ontologies Are Publicly or Commercially Available?](#)

Critical Condition Surveillance Systems

Analysis By: Veronica Walk

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Critical condition surveillance systems monitor clinical data from the electronic health record (EHR) and point-of-care medical devices in real time. Using evidence-based algorithms, these systems detect signs of clinical decompensation that could be life threatening or warrant urgent transfer to a higher level of care and then trigger alerts to appropriate care team members.

Why This Is Important

Historically, healthcare providers in the acute care setting have relied on manually calculated or partially automated early warning scores to monitor for signs of clinical deterioration. Critical condition surveillance systems drastically improve on these methods by using real-time clinical data to continuously monitor and predict deterioration across a broader patient population. Unprecedented clinical workforce shortages have increased these solutions' value proposition and interest.

Business Impact

Healthcare provider organizations can use these solutions to:

- Enable earlier intervention for deteriorating patients — improving their chance of survival and reducing the need for emergency treatments and higher-cost care.
- Automatically notify caregivers of potential clinical decompensation, reducing the burden on resource-constrained care teams.
- Provide the research and evidence base for predictive algorithms and associated interventions.

Drivers

- While EHR vendors offer capabilities for monitoring and alerting to signs of clinical decompensation, solutions have come under scrutiny for lack of high sensitivity and specificity and the potential for bias. This has driven interest in critical condition surveillance solutions, offering evidence-based, proprietary algorithms that integrate with the EHR. These solutions also include capabilities to improve the coordination of the care team response and related clinical documentation.
- Patient monitoring platform vendors offer the most robust set of critical condition surveillance capabilities by ingesting data directly from various medical devices and clinical systems to provide the most comprehensive view of patient conditions. These solutions can also be used for additional use cases beyond critical condition surveillance, such as e-ICU and remote patient monitoring.
- Unprecedented clinical workforce shortages, especially among highly skilled nurses, will likely drive continued adoption of these solutions.

Obstacles

- Leveraging real-time data requires robust and potentially costly medical device integration to continuously monitor patients using a comprehensive set of clinical data points beyond what is readily available in the EHR.
- Some healthcare providers will default to their EHR vendor's native capabilities to avoid perceived integration issues, although possibly at the cost of a more precise solution.
- Regulatory oversight for solutions that incorporate advanced capabilities, such as AI or ML, is still evolving. For example, the U.S. Food and Drug Administration (FDA) recently issued final guidance on clinical decision support software, indicating that certain solutions may classify as medical devices, thus falling under the purview of FDA regulation.
- Patients and providers are still skeptical about the use of AI in healthcare. Solutions that rely on unexplainable "black box" algorithms will likely face provider and patient resistance.

User Recommendations

- Establish the need for critical condition surveillance solutions by evaluating sepsis, mortality and patient safety data, as these will provide the most compelling rationale for adopting these solutions. Compare what can be accomplished within the EHR and identify gaps that might be addressed by a best-of-breed vendor or patient monitoring platform.
- Judiciously vet any potential solution by examining the evidence base and frequency of review and update of the underlying clinical algorithms. Look for real-world evidence of outcomes improvement, such as reduced mortality.
- Address clinician and patient mistrust by prioritizing vendors using explainable algorithms backed by real-world evidence. Do not overlook the need to localize solutions to your patient population.
- Minimize alert fatigue by tracking false-positive alert rates and evaluating a vendor's ability and willingness to improve their solution accordingly.

Sample Vendors

AgileMD; DECISIO Health; Epic Systems; Lightbeam Health Solutions (Jvion); Medical Informatics; MEDITECH; Oracle Cerner; Philips; Spacelabs Healthcare (PeraHealth); Wolters Kluwer

Gartner Recommended Reading

[Market Guide for Clinical Decision Support Solutions](#)

[Innovation Insight for Patient Event Bus](#)

[2021 Strategic Roadmap for the Real-Time Health System](#)

[Case Study: Critical Care Beyond Hospital Walls \(Showa University Hospital\)](#)

[Case Study: Virtual Inpatient Nursing Program Advances Progress Toward the Quadruple Aim](#)

Anatomical 3D Printing

Analysis By: Roger Benn

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Anatomical 3D printing (3DP), or additive manufacturing, involves 3D printing to create anatomically accurate physical models for planning surgery, medical education and training, and for use as surgical implants. The technology uses patients' CT scans, MRIs and proprietary algorithms to print personalized anatomical models.

Why This Is Important

Anatomical 3DP enables the creation of patient-specific presurgical models and implants, which can help improve treatment accuracy, clinical outcomes and overall patient experience. It further enables surgical teams to efficiently and safely plan surgical procedures (including sizing and fitting). Providing 3DP surgical implants speeds up the availability of surgical implants by reducing turnaround time compared to sourcing conventionally manufactured implants.

Business Impact

3DP:

- Provides biomechanically realistic anatomical models that are an accessible alternative to traditional models (e.g., cadavers) for clinical training.
- Enables customization of surgical implants for specific patients and pathologies.
- Enables patient education on their condition and treatment.
- Increases surgical efficacy through application in surgical planning and practice.
- Improves surgical outcomes by producing personalized implants that accurately copy the shape and function of natural bone.

Drivers

- Healthcare providers' growing focus on personalization for patient treatment is a key driver. 3DP enables patients to quickly receive implants best suited for their case, resulting in greater success than traditional methods.
- The growing prevalence of chronic disorders among global populations is increasing surgical demand.
- Materials drive this innovation: the availability of different material types to create implants; the use of additive manufacturing processes that support mass customizations; and the creation of porous surfaces with 3DP that reduce the rejection rate of implants.
- Increased collaboration opportunities between healthcare providers, medical device manufacturers and researchers are leading to new partnerships and innovations provided by 3DP.
- Reimbursement models for using 3DP presurgery anatomical models are evolving and enabling adoption. In the U.S., the American Medical Association (AMA) has approved reimbursement under Current Procedural Terminology (CPT) Category III reimbursement codes.

Obstacles

- Many healthcare providers may perceive 3DP technology as “nice to have” as opposed to essential. Making a business case and asking for investments can be difficult for many healthcare provider CIOs health systems. Most adoption comes from large academic medical centers and integrated delivery systems that can create their capability. Smaller healthcare providers' hospitals cannot sustain this yet and will need a service bureau or partnership.
- Although regulatory approval has been waived in emergencies, it remains a hurdle. Physicians report that insurance covers hips and knees at the same rate as traditional implants, with the caveat that the patient may have to pay for scans for the design, rather than for diagnosis.
- Regulation and quality controls for ensuring accuracy and safety are unclear. (see N.C. Paxton, [Navigating the intersection of 3D printing, software regulation and quality control for point-of-care manufacturing of personalized anatomical models](#), BMC).
- High cost associated with maintenance of 3D printing devices.

User Recommendations

- Define your health systems' strategies and roadmaps across physician stakeholders, use cases, technologies and vendors for anatomical 3DP capabilities.
- Consult the legal department during planning and procurements to address risks and medical liabilities.
- Review regulatory guidance across your jurisdiction and others, as the vendor community operates across geographical boundaries. To grow the adoption of global standards for 3DP of medical devices, guidelines written by national regulators have been accompanied by ISO and ASTM guidelines.
- Set up a center of excellence or 3DP innovation lab where pilots can acquire technologies across multiple use cases.

Sample Vendors

3D Systems; Axial3D; Conformis; Embodi3D; Formlabs; HP Inc.; Materialise; MEDICAL IP; Stratasys; Stryker

Gartner Recommended Reading

[Predicts 2023: Digital Transformation of Healthcare Beckons New Era for Life Sciences](#)

Genomics Medicine

Analysis By: Reuben Harwood

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Genomics medicine enables the use of genetic information for medical research and treatment (for example, diagnosis, therapy, risk management). It is a component of precision medicine and focuses on leveraging a patient's genomic data and clinical insights derived from it. Technologies include gene sequencing, variance calling, high-performance computing, AI-informed risk assessment and clinical decision support.

Why This Is Important

Genomics medicine is already saving lives, and its promise to improve health outcomes is driving adoption in healthcare. Upstream technologies supporting research and gene sequencing data collection are well-developed and yield increasing amounts of efficiency in genomics. Technologies that use genetic information in clinical care delivery are progressing toward delivering quick, reliable and actionable patient-specific insights.

Business Impact

Genomics medicine's business and population health impact is substantial and an essential component of precision medicine. The value of genomics medicine is demonstrated across multiple areas, including:

- Targeted therapies for cancer and rare diseases
- Accurate and patient-specific clinical diagnosis and treatment decisions
- Patient-genetics-based diagnostic tests to eliminate or reduce extra costs during treatment
- Precision care for prenatal and genetics-directed therapies

Drivers

- Next-generation sequencing (NGS) and third-generation sequencing (such as nanopore sequencing, single-molecule real-time [SMRT] sequencing) have enabled vendors to bring new capabilities at the end-user level, broadening the utilization of genetic information across multiple clinical specialties (such as chronic disease management) and beyond oncology.
- Achievement of key milestones has brought additional momentum to genomics medicine, such as the Broad Institute's launch of a \$1,000 sample-to-report clinical whole-genome sequencing service and the new Guinness World Record awarded to a team at Stanford University in California, U.S. for the fastest DNA sequencing at five hours and two minutes.
- Technology and services related to genomics are progressing as the cost of genomic sequencing decreases. Research has identified more practical uses in diagnosing and treating patients, for example, companion diagnostics that indicate an individual's likely receptivity to a specific medicine by measuring a specific genetic biomarker. Other uses of genomics range from genetic testing for rare and undiagnosed diseases, next-generation therapeutics including gene therapy and RNA therapy, testing for treatment receptivity, to precision cancer treatment.
- Adoption will continue to grow as researchers identify more correlations between genetic biomarkers and health, disease prevention and treatments. The adoption of electronic health records (EHRs) globally creates rich sources of health data ripe for epigenomic exploration.
- EHR vendors have begun incorporating discrete genomic data into the patient record, enabling genomics medicine via point-of-care pharmacogenomic clinical decision support (CDS).
- Data analytics, including AI and machine learning, now have great potential to aid in discoveries leveraging that data. For these reasons, we move this innovation further along on the Hype Cycle with five to 10 years to the mainstream.

Obstacles

- Translating genomic data into actionable clinical insights has required decades of research. However, the maturation of AI and machine learning approaches will accelerate the pace of scientific discovery and translation into clinical action.
- It is equally challenging to make this knowledge actionable by physicians. Many are not well-trained to incorporate actionable insight from genomics within their workflows.
- Although new genetic markers are constantly being discovered, they require frequent reanalysis of patients' sequencing data. This comes with high costs that hinder the development of new tests, drugs and therapies.
- Researchers, life science and healthcare providers demand more genomics information integrated into the EHR, including raw sequencing data, analysis and clinical recommendations. Interoperability remains a barrier to information exchange among scientists, providers, patients and families for collaboration and counseling.

User Recommendations

- Establish a surveillance process to stay updated with the practical use of genomics in diagnosis and treatment and the implications for IT. Initiate discussions with peers as to whether it is worth pursuing an in-house genomics center of excellence or outsourcing this function.
- Outline business process, compliance, laboratory, regulatory and IT implications when including genomics medicine disciplines for decisions about research, therapies and business opportunities, while ensuring patient privacy.
- Architect an IT infrastructure, inclusive of outside services, that supports the acquisition, storage, collaboration and analytics requirements demanded by genomic datasets and therapy delivery.
- Evaluate your EHR vendor for their plans to support genomics medicine needs. Determine if the EHR can record, store, secure and access genetic marker data from patients, and their ancestors and family members at the point of care.

Sample Vendors

DNAexus; Genedata; Helix; Igenbio; Illumina; L7 Informatics; NantHealth; Velsera

Gartner Recommended Reading

[Healthcare and Life Science Business Driver: Medical Technology Innovation](#)

[Healthcare and Life Science CIO's Genomics Series: Part 1 — Understanding the Business Value of Omics Data](#)

[Healthcare and Life Science CIO's Genomics Series: Part 2 — Formulating an Omics Vision](#)

[Healthcare and Life Science CIO's Genomics Series: Part 3 — Prioritizing Omics Investments](#)

Medication Adherence Management

Analysis By: Veronica Walk

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Definition:

Medication adherence management systems are designed to monitor and support conformance with a prescribed medication regimen. These systems leverage various technologies, from patient portals and mobile apps to emerging technology, such as programmable pillboxes and RFID-tagged smart pills. These solutions monitor adherence, provide reminders and notify the patient, family members or caregivers if a patient has missed a dose.

Why This Is Important

Medication adherence can improve therapeutic efficacy, prevent or control disease progression, improve patient outcomes, and reduce care costs. These solutions are especially valuable to pharmaceutical companies with significant investments in drug development that hinge on participant adherence in clinical trials. Healthcare providers and payers seeking to advance population health and value-based care can also benefit from these solutions.

Business Impact

Healthcare and life sciences organizations can improve clinical trial and health outcomes for a variety of use cases, such as:

- Chronic condition management, where nonadherence can lead to disease progression or clinical deterioration requiring higher acuity, more costly care.
- Complex medication management, such as transplant patients where nonadherence can result in organ rejection.
- Nonadherence in clinical trials, which can lead to patient dropout or inaccuracies in trial data.

Drivers

- Adoption of medication adherence management systems is expected to increase in alignment with the shift to value-based care, as medication nonadherence can negatively impact quality measures and outcomes, such as hospital readmissions.
- Medication adherence management vendors are expanding their solution offerings to identify and address other contributors to nonadherence, such as the inability to fill a prescription (for example, due to cost or transportation limitations) or undesirable side effects.
- Vendors are also expanding integrations with other clinical and business systems, such as electronic health records, customer relationship management, care management, and patient engagement solutions to enable continuity of care and seamless patient and provider experiences.
- As healthcare providers seek to expand their virtual care services and use cases, we expect organizations to adopt medication adherence management capabilities as part of their connected care pathways, especially for chronic and complex disease management.

Obstacles

- Medication adherence management also requires an engaged care team to address and manage issues of nonadherence, which may warrant additional resources or paying for clinical services to support patients using these tools.
- The benefit-to-cost ratio of more advanced medication adherence technologies, such as ingestible smart pills, has been challenging to overcome, even for pharmaceutical companies. The proliferation of medication adherence apps, many available for free in the Apple App Store and Google Play app marketplaces, will make the value proposition for more complex solutions increasingly difficult.

User Recommendations

- Evaluate medication adherence management solutions by partnering with your clinical colleagues to identify a pilot use case. Use pilot findings to inform lessons learned, technology and workflow improvement opportunities, and best practices for a larger rollout.
- Empower the care team to identify nonadherence and intervene with education or alternative therapy regimens by integrating adherence data into clinical workflows. Consider pursuing partnerships with community organizations with existing medication adherence programs that may address other aspects of medication adherence.
- Ensure medication adherence management is included in the trial process and technology approach for clinical trial scenarios, such as decentralized trials.
- Enhance the effectiveness of your digital-first patient engagement strategies by incorporating medication adherence management capabilities into your connected care pathways.

Sample Vendors

AdhereHealth; AiCure; Cureatr; E PROCESS MED; EveryDose; Medisafe; Philips; Propeller Health; Scene

Gartner Recommended Reading

[The Digital First Engagement Framework for Healthcare Delivery Organizations](#)

[Market Guide for Remote Patient Monitoring Solutions](#)

Life Science CIOs: Map Your Pathway to Digital Trials

Consumer Healthcare Wearables

Analysis By: Kate McCarthy, Mike Jones

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Consumer healthcare wearables are electronic devices that are designed to collect data on users' personal health and exercise activities. They provide consumers, clinicians, caregivers, insurers and researchers access to data and analytics that can facilitate preventive care, contribute to health, aid in managing ongoing illness and recovery, and support research.

Why This Is Important

Consumer healthcare wearables provide the opportunity to use low-cost devices to engage healthcare consumers in a range of use cases, including remote patient monitoring, chronic condition management and research. As more consumers have obtained and regularly use these devices, they now contribute a rich data source to support care quality. These devices have enabled clinical surveillance of conditions, including cardiac disease and diabetes.

Business Impact

Consumer healthcare wearables allow healthcare and life sciences organizations to:

- Deliver personalized consumer experiences by responding to data and device preferences.
- Monitor patient activity and risk factors at a lower cost than medical-grade technologies.
- Stay conveniently connected to their healthcare consumers.
- Improve symptom awareness, treatment adherence and overall health and wellness.

Drivers

- Consumer healthcare wearables offer engaging user interfaces and experiences using behavioral nudges to help drive self-management and adherence to prescribed lifestyle regimens.
- Healthcare and life sciences organizations can leverage wearables to differentiate journeys for personas for healthcare consumer engagement.
- These devices are more affordable than medical-grade equipment and are increasing in sophistication and accuracy range of wearables available in this space. Wristband-style devices (e.g., Apple Watch, Fitbit, Garmin Connect and Samsung Galaxy Watches) for measuring exercise patterns and intensity have also introduced continuous heart rate monitoring.
- Consumer-grade blood pressure (BP) monitoring, pulse oximeters for measuring lung efficiency, sleep and brainwave monitoring, clothing that senses blood flow and respiratory rates and EKG are available on various devices.
- Data from wearables can be leveraged by providers, care managers and researchers to monitor responses to treatment regimens and activity and assist in quality engagement in virtual care.
- Gamification and rewards programs can be deployed to provide patients with an incentive to change behaviors and share their data.
- Wearables can assist in easing caregiver burden and facilitate caregiver engagement in care by sharing data and notifications, such as a high blood sugar alert on an Apple Watch for a parent with a child with Type 1 diabetes.
- Companies are combating long-standing device fragmentation challenges by building algorithms that are device agnostic, such as Philips partnership with the U.S. Department of Defense RATE wellness device.
- As a result of these drivers, we have advanced this technology down the Trough of Disillusionment with adoption maturity in two to five years.

Obstacles

- Unlike medical-grade technologies, consumer healthcare wearables often lack published clinical evidence on efficacy.
- It is difficult to integrate wearables into legacy systems, such as EHRs.
- Clinicians are skeptical of the value of these devices in the clinical environment and the additional time required to review and interpret consumer wearable data.
- The market is very diverse, and many point solutions exist, which can lead to fragmentation of apps and devices.
- Consumers and healthcare and life sciences organizations alike have security and privacy concerns around sharing personal data.

User Recommendations

- Prioritize an integration strategy that improves data capture and delivery of virtual care, care management, clinical trials, chronic disease management and activities of daily living.
- Evaluate device application and efficacy through peer-reviewed research, focusing on lifestyle, rehabilitation, patient engagement and caregiver support.
- Socialize the concept of the use of these devices in clinical practice through the chief medical informatics officer (CMIO) or chief nursing informatics officer (CNIO).
- Invest in a composable, digital architecture that supports experience and data orchestration across diverse touchpoints that includes healthcare CRM and multiexperience development platforms (MXDP).
- Consider a device-agnostic approach to wearables by prioritizing algorithms and platforms that can deploy on and ingest from an array of wearables.
- Assess privacy and security requirements to ensure compliant deployment and address consent, data locality and other requirements.

Sample Vendors

Apple; Fitbit; Garmin; iHealth; Omron Healthcare; Oura; Samsung Electronics

Gartner Recommended Reading

[Emerging Tech: Critical Insights on Smartwatch Evolution](#)

Top Tech Trend: Total Experience for Healthcare Providers

Enterprise Virtual Care Platform

Analysis By: Sharon Hakkennes

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

An enterprise virtual care platform represents a set of integrated digital solutions and related services that enable augmentation and substitution of conventional face-to-face care delivery. This is achieved through delivery of care where the clinician is not in the same physical location as the patient, either synchronously (i.e., in real time) or asynchronously. Capabilities fall under three core categories: virtual visits and consultations, remote monitoring, and digital clinical encounters.

Why This Is Important

Enterprise virtual care platforms enable healthcare providers to deliver a broad range of clinical services to enhance patient experience, expand into new populations and service lines, and transform service delivery efficiency under alternative payment models. These platforms offer functionality that complements or is not available in existing electronic health record (EHR) megasuite offerings.

Business Impact

Healthcare providers are investing in an enterprise virtual care platform strategy to:

- Expand into new markets, improve staff productivity and increase revenue.
- Bring care delivery to where patients are (e.g., home, office, school) — improving consumer engagement, care experience and satisfaction.
- Increase quality of care leading to improved outcomes in care, health and well-being.

Drivers

- The need to contain healthcare costs, offer more convenient care delivery options, improve staff productivity, and remain competitive is driving the rapid adoption of virtual care. In response, healthcare providers must continuously evolve enabling digital capabilities to meet increasingly diverse clinical requirements and use cases. This includes investing in interoperable solutions and platforms that can scale across multiple use cases.
- Healthcare providers are expanding their virtual care strategies to more complex virtual care service models such as hospital at home. This is requiring a broader range of enabling digital capabilities and integration with existing solutions.
- Health equity concerns are driving healthcare providers to invest in a broad range of digital capabilities to increase their geographical reach and meet the unique requirements of different patient populations.
- Market options are expanding as vendors double down on their product development, seeking to continually expand their solution offerings to meet the ever-increasing requirements of healthcare providers. Vendors are developing these capabilities by fast-tracking their internal development roadmap, acquisitions and strategic partnerships.
- Increasing healthcare provider and vendor interest in composable architecture, combined with advances in interoperability, including the adoption of industry standards (e.g., FHIR), is driving the evolution of virtual care solutions. As the modularity and interoperability of solutions continues to develop, so will the healthcare provider's capability to realize its enterprise virtual care platform vision.

Obstacles

- Clinician frustration with the workarounds associated with poorly integrated solutions
- Organizational disillusionment as healthcare providers identify that no single solution will meet all of their required use cases
- Ongoing uncertainty regarding long-term payment models for virtual care services that are currently being funded through waivers introduced during the COVID-19 pandemic
- Cost pressures and financial constraints experienced by healthcare providers that impact appetite and capacity to invest in new enterprise solutions and concomitant pressure to leverage existing investments into the EHR
- Challenges achieving required integration into EHR solutions to support seamless integration of virtual care services into core clinical workflows

User Recommendations

- Justify investment in virtual care platform technologies by developing a strategic vision and roadmap for enterprise virtual care across your organization. Develop a business case for expanding service models to explore new markets such as direct-to-consumer options.
- Ensure technology solutions are fit-for-purpose by reviewing use cases and identifying enabling digital capabilities that can be leveraged across multiple use cases and those with specialist requirements, necessitating a best-of-breed solution.
- Optimize clinician and patient experience by prioritizing modularity of solutions and availability of APIs in your procurement process. Achieving deep integration into core clinical workflows and a seamless patient experience is essential for long-term success.
- Minimize implementation costs and risks by reviewing vendor capabilities and commercial terms to ensure a scalable pricing model and compatibility with existing medical devices and network policies.

Sample Vendors

Amwell; Caregility; Current Health; Datos Health; Teladoc Health; Validic

Gartner Recommended Reading

[Tame Virtual Care Complexity With a Defined Architecture](#)

[Market Guide for Remote Patient Monitoring](#)

[Ace These Proof Points to Create a Sustainable Virtual Care Strategy](#)

[Use Gartner's Virtual Care Maturity Model to Transform Care Delivery](#)

Consent Management for Healthcare

Analysis By: Andrew Meyer, Mike Jones

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Consent management for healthcare is the combined system, process and set of policies for citizens to establish how care providers can access or exchange their health information. Individuals can confirm participation via patient portals and health information exchanges (HIEs) and dynamically update their health data's granular privacy, access and use preferences.

Why This Is Important

Consent management for healthcare provides citizens, care delivery and other organizations confidence that citizens' health sharing preferences are being upheld regardless of where or how data is used. Health organizations must ensure citizens' wishes are upheld, and transparency is built into their electronic record systems and visible to the interoperability solutions that exchange information among care providers, payers and other third parties.

Business Impact

The impacts of consent management for healthcare include:

- Without effective consent management, organizations find it hard to scale the secondary use of health data for population health, clinical trials, precision medicine, and genomics or algorithmic medicine.
- Healthcare providers must ensure citizens' wishes are respected and rights are retained as protected health information moves between entities.
- Effective consent management and robust governance of protected health information will give consumers the confidence they seek before they agree to share their data.

Drivers

- The development of new capabilities for consent management for healthcare has been accelerated by continuing regulatory shifts across the privacy landscape at the regional, state and country level. This is driven by consumer demand for transparency on how health data is processed and shared outside of the immediate care delivery domain (e.g., for research into vaccines or recruitment of patients into clinical trials).
- Improvements and increased adoption of interoperability standards and networks throughout the healthcare provider sector are leading to more systems and workflows that can now share health information. In the U.S. the first set of networks to be approved to implement TEFCA as prospective (QHINs) were recognized.
- Many countries where shared care records are part of national or regional healthcare reforms have increased the funding and formation of national and regional HIEs.
- This innovation has advanced toward the Slope of Enlightenment due to the greater focus on care orchestration and information sharing needs across health and care agencies. This has resulted in the continued global interest in citizen data privacy and protection.

Obstacles

- Providing citizens clarity about control over their data is central to most privacy laws. Translating complex regulations into operational systems and protocols for a variety of regions means that vendor solutions often require considerable configuration before deployment.
- Many organizations have found themselves constrained by their product choices within 12 months of deployment. Demand for additional capabilities develops rapidly due to market shifts and a greater need for granularity and transparency in first-party-consented data.
- Capabilities chosen and deployed in isolation of consultation with patients and providers are rarely representative of consumer needs, resulting in weak adoption and loss of time and investment.
- Consent solutions are easy to acquire but notoriously difficult to implement throughout all affected systems.

User Recommendations

- Review regional legislation and determine what is required from internal systems to remain compliant with health information protection clauses.
- Evaluate existing application portfolios to determine how these systems record consent and authorize users or external systems to access protected health information.
- Carry out a risk assessment to better understand organizational financial exposure on data processed and shared outside of the provider domain.
- Identify the target level of transparency by analyzing customer preferences and documenting consumer expectations.
- Avoid purchasing an overly “fitted” solution by defining a clear list of requirements based on future needs rather than immediate ones.
- Offset the volume of right-to-information requests by individuals commonly associated with modern privacy regulations by advancing the maturity of the organization’s consent management for healthcare offerings from reactive toward a self-service model.

Sample Vendors

Global Public Inclusive Infrastructure (GPII); InterSystems; IQVIA; Medable; OneTrust; ZeOmega (HealthUnity)

Gartner Recommended Reading

[The USCDI Needs a National Patient Identifier Optimized for Accuracy, Privacy and Consent](#)

[Market Guide for Consent and Preference Management](#)

[Quick Answer: What to Look for in an Enterprise Master Patient Index Solution](#)

[Quick Answer: Who Owns Electronic Health Information?](#)

Climbing the Slope

EHR Support of Virtual Care

Analysis By: Veronica Walk, Sharon Hakkennes

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Definition:

Electronic health record (EHR) support for virtual care is the set of capabilities integral to a core EHR product suite that enables remote care delivery when the clinician and patient are not colocated. These interactions include asynchronous and synchronous virtual visits, and remote patient monitoring (RPM).

Why This Is Important

Virtual care is now an established care delivery model that must be tightly integrated with clinician workflows and patient journeys to enable seamless experiences and continuity of care. The EHR is the primary clinical user interface and repository for patient data. Hence, EHR vendors must provide support for virtual care modalities by developing native capabilities and integrating with virtual care systems and platforms to support clients seeking a broad set of capabilities.

Business Impact

Healthcare organizations are reevaluating their virtual care services and enabling technologies portfolio. They aim to provide improved and expanded virtual care services to their patients and pursue more complex virtual care delivery models, such as hospital-at-home and RPM for chronic conditions. Healthcare organizations face strategic decisions on what digital capabilities they need to sustain and expand to scale virtual care services.

Drivers

- Rising consumer expectations for choice and convenience and increasing competition among healthcare providers are driving the rapid adoption of virtual care.

- As the industry moves toward value-based care, more advanced virtual care models, such as RPM or hospital-at-home, offer significant opportunities to reduce the cost of care while improving outcomes and patient experience.
- Healthcare providers are rationalizing their virtual care solution portfolios and prioritizing investment in solutions that will allow them to sustain and scale their virtual care services.
- Improving patient and provider experiences is a key requirement for increasing the adoption of these solutions and services. This requires tight integration with EHRs to streamline clinician workflows, ensure continuity of care, and offer patients a seamless experience across digital and in-person care modalities.
- Having made significant investments into their EHR solutions, healthcare providers continue to look for opportunities to maximize their investments by leveraging native capabilities, including existing and emerging virtual care use cases.
- While EHR vendors are increasing their native virtual care capabilities, they simultaneously support integration with third-party platforms to address gaps or accommodate provider investments in other solutions.

Obstacles

- Temporary measures — implemented during the height of pandemic activity — to remove legal, regulatory and reimbursement-related barriers to virtual care are still in flux.
- Uncertainty in regulatory requirements and reimbursement models is slowing adoption and exacerbating provider's resistance to virtual care.
- EHR-native virtual care solutions lack the full range of capabilities available through stand-alone or best-in-class virtual care products (such as remote device integration and the ability to work outside of an EHR-centric patient portal).
- Some EHR vendors are more resistant to third-party integration, which has slowed progress.
- Clinicians will actively resist a shift to virtual care delivery when the administrative burden of using the EHR and virtual care technology (e.g., disjointed systems and duplicative documentation) outweighs face-to-face care.

User Recommendations

- Solidify governance mechanisms with responsibility for policies and procedures that, in part, establish patient expectations, determine what is appropriate to deliver virtually, and decide how clinicians' time will be scheduled and accounted for. This ensures that the EHR capabilities will enable efficient and effective virtual care delivery.
- Work with EHR vendors to ensure their current offerings and roadmaps address the required capabilities. Also, if an external platform has been selected, ensure that your EHR vendors will support integration through a comprehensive set of EHR APIs and software development kit tools.
- Evaluate how your EHR can also securely capture and integrate data provided by patients using virtual care modalities (such as IM, SMS, and video or photo sharing). Refresh data processing, privacy and consent policies to incorporate these new forms of data.

Sample Vendors

Altera Digital Health; Dedalus; Epic; InterSystems; MEDITECH; Oracle (Cerner)

Gartner Recommended Reading

[Market Guide for Remote Patient Monitoring Solutions](#)

[Ace These Proof Points to Create a Sustainable Virtual Care Strategy](#)

[Tame Virtual Care Technical Complexity With a Defined Architecture](#)

[Case Study: Virtual Inpatient Nursing Program Advances Progress Toward the Quadruple Aim](#)

Enterprise EHR Systems (Non-U.S.)

Analysis By: Veronica Walk, Sharon Hakkennes

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Definition:

Enterprise electronic health records (EHRs) are clinical systems used in acute and ambulatory (outpatient) care settings. They capture, store, maintain, and share patient-centric encounter, treatment, and health status information. The EHR supports tasks directly related to patient care and facilitates clinical documentation, order processing and clinical decision support. This innovation tracks non-U.S. adoption of enterprise EHRs.

Why This Is Important

Enterprise EHRs provide broad capabilities spanning core clinical functions, interoperability with other clinical systems and medical devices, and analytics. These capabilities are critical for healthcare providers who want to optimize care quality and safety through data-driven improvement. The level of EHR adoption needs to increase in non-U.S. regions to achieve the quality, safety and access goals of healthcare providers and government health systems.

Business Impact

An enterprise EHR system can enable various clinical activities affecting caregivers and patients. It can reduce the rate of medical errors, eliminate unwarranted practice variations, improve operational efficiency and compensate for the shortage of skilled healthcare workers. Although the potential benefits are considerable, it takes substantial planning, financial investment and vendor collaboration to realize the full value of an EHR.

Drivers

- Government regulations, policy and funding continue to drive the adoption of EHRs to improve care coordination among health and social care agencies, manage population health, and support a shift to value-based care. For example, the U.K. has allocated funding to help NHS trusts to achieve Stage 5 or above on the Healthcare Information and Management Systems Society (HIMSS) Electronic Medical Record Adoption Model (EMRAM).
- Global EHR procurement activity is on the rise with the heaviest activity in Australia, Canada, France, Germany, the U.K., and parts of the Middle East and Benelux and Nordic regions.
- As the U.S. enterprise EHR market becomes saturated, U.S.-based EHR vendors are seeking growth outside the U.S., competing directly with regional vendors.

Obstacles

- Time to value (or ROI) for an enterprise EHR is typically five years or more from initial strategy formulation.
- The total cost of ownership (TCO) is significant and enterprise EHRs require advanced levels of configuration, maintenance, support and continuous optimization, requiring ongoing investment.
- Many of the global enterprise EHR vendors are U.S.-based and their solutions are designed for the U.S. delivery system, which can create challenges in localizing to regional workflows and requirements.
- Following significant acquisition activity in the global enterprise EHR markets, the product roadmaps of some vendors are uncertain.
- Regional data residency requirements can limit options for cloud-hosted solutions.
- Digital health platforms are garnering interest as an alternative to monolithic EHR architecture.

User Recommendations

- Adopt a life cycle approach from initial strategy through to procurement and optimization once deployed.
- Work with senior business and clinical leaders to promote EHR benefits and ensure all stakeholders fully understand what is involved in implementation and benefits realization.
- Evaluate vendors in terms of benefit, cost, risk and suitability for long-term strategic partnerships noting that each vendor has a different profile regarding TCO, usability and the speed at which benefits are realized.
- Establish clinical informatics roles, such as the chief clinical informatics officer (CCIO), to lead the required changes to clinical workflow and ensure that the EHR is properly designed, implemented and optimized to facilitate safe, efficient and evidence-based care.
- Evaluate whether an alternative architecture and modular approach to acquiring clinical capabilities might better suit your organization and its digital ambitions.

Sample Vendors

Altera Digital Health; ChipSoft; Dedalus; Epic Systems; ezCaretech; Health Insights; InterSystems; MEDITECH; Oracle Cerner; Philips

Gartner Recommended Reading

[Market Guide for Enterprise Electronic Health Record Solutions](#)

[Tool: Best Practices for EHR Success, Stage 3 – Select](#)

[Tool: Best Practices for EHR Success, Stage 4 – Deploy](#)

[Gauge Readiness and Mitigate Risk to Succeed in EHR Implementations](#)

OpenNotes

Analysis By: Sharon Hakkennes

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

OpenNotes is an initiative to give patients convenient access to their clinical notes stored within electronic health records (EHRs). This is accomplished through local healthcare provider initiatives — using a portal tethered to the EHR or a patient’s preferred third-party application — or through regional and national initiatives that enable patient access to shared care records.

Why This Is Important

OpenNotes is an international movement, rather than a product. Clinical notes document the interactions that patients have with doctors, nurses and other clinicians, and make up the “story” of a person’s healthcare. The types of notes made available to patients, the timing of release of notes, which roles are included and which clinical areas participate vary across health services and geographical regions.

Business Impact

OpenNotes supports improvements in healthcare delivery through greater information transparency. Many studies have demonstrated the value of OpenNotes in:

- Empowering individuals to become active participants in their own care
- Enhancing patient understanding of their health and medical conditions
- Increasing collaboration and trust between patients and clinicians
- Improving adherence to treatment and care plans (for example, medication management)
- Increasing the accuracy of clinical documentation

Drivers

- The 21st Century Cures Act's Interoperability, Information Blocking and the ONC Health IT Certification Program Final Rule, in effect, mandates adoption of OpenNotes in the U.S. The rule applies to all healthcare providers across all clinical settings. In October 2022, the restrictions were lifted that limited the required information for sharing to the United States Core Data for Interoperability (USCDI) data classes. As a result, patients now have the right to access, without delay, all of their electronic health information (EHI), including clinical, billing, enrollment, payments, claims adjudication and case management records.
- In other regions across the globe, government-led regulations and initiatives are driving adoption of OpenNotes. For example, in the U.K., general practitioners have until the end of October 2023 to ensure all patients have prospective access to their full health records (including free text). National e-health records have also been established in countries such as Australia, Austria, Denmark and Estonia.
- As adoption of OpenNotes grows, efforts are evolving to further enable communication and shared decision making between patients, their care partners (often, family members or close friends), and clinicians. For example, OurNotes is a shared documentation initiative in which patients compose and submit an interval history, goals and questions prior to their visits. Similarly, OurNotes for Care Partners is a care partner version of OurNotes. The aim is to identify care partners and assess their needs to enable delivery of care partner resources and support.

Obstacles

- Clinician resistance due to the perception that workloads will increase as a result of additional time required to write each note or to respond to increased communication from patients reading the notes.
- Clinician concerns that access to EHI may create undue patient anxiety due to misinterpretation of information or through access to distressing information, such as real-time patient access to laboratory and imaging test results.
- Lack of access to medical record information in an electronic format. This limits the adoption of OpenNotes for healthcare providers outside of the U.S., in geographies where EHRs have not yet achieved universal adoption.
- EHR systems vary in maturity in enabling OpenNotes initiatives, particularly in relation to providing controls required to restrict sharing for legitimate reasons, such as concerns over privacy or potential harm.

User Recommendations

- Position OpenNotes as a strategic priority by ensuring that transparency in data sharing is a core component of your organization's consumer engagement strategy.
- Enable seamless patient access to their EHI by partnering with your EHR and digital front door vendors to map current capabilities against your organization's requirements. Agree on a development roadmap for identified gaps.
- Address clinical concerns and minimize risks of adverse impacts to patients by developing policies and processes that exempt patients from online access to parts of their records where access would be detrimental to the individual.
- Maximize patient value derived through OpenNotes by establishing systems and processes to support patients in their access to and use of their EHI.

Sample Vendors

Altera Digital Health; Apple; CommonHealth; Epic; Evergreen Life; MEDITECH; OneRecord; Oracle Cerner; Patients Know Best (PKB)

Gartner Recommended Reading

[Quick Answer: The Expanding Universe of Patient Safety Risks](#)

[Top Healthcare Provider HIPAA Questions and Answers](#)

Entering the Plateau

Healthcare Interoperability

Analysis By: Barry Runyon

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Healthcare interoperability refers to accessing, sharing, exchanging and using electronic health information (EHI) to deliver, coordinate and manage care. Interoperability encompasses adopting and advancing interoperability rules, standards, frameworks, technologies and platforms. Rather than plotting the adoption and progress of each area individually, the aggregate maturity of healthcare interoperability and its impact on the industry are highlighted further.

Why This Is Important

Healthcare interoperability rules, standards, trust frameworks, technologies, and platforms enable the compliant interchange and sharing of EHI, allowing clinicians and legitimate stakeholders safe access to a patient's medical record data when and where they need to. They establish best practices in their respective domains and collectively facilitate safe and secure sharing of EHI at scale.

Business Impact

Globally, standards-based interoperability and health information exchange have been recognized as chief enablers of digital transformation. In the U.S., the 21st Century Cures Act and accompanying interoperability rules have enabled increased access and sharing of EHI, and the mitigation of information-blocking practices. Open APIs, trust frameworks and the United States Core Data for Interoperability (USCDI) have set the stage for a Nationwide Health Information Network (NHIN).

Drivers

- The increased adoption of electronic health record (EHR) systems globally.
- The need to share EHI to facilitate care coordination across all care venues.

- In the U.S., the 21st Century Cures Act (Cures Act) facilitated the adoption of open APIs, trust frameworks, health information exchanges (HIEs), the creation of an NHIN, and the development of a standardized set of core data classes and elements for interoperability (the USCDI).
- Health Level Seven International's (HL7's) Fast Healthcare Interoperability Resources (FHIR) related interoperability initiatives such as the Da Vinci project (to advance value-based care and payer-provider collaboration) and Gravity Project (social determinants of health data sharing standards) projects.
- Increased interest in using HL7 FHIR to advance public health challenges.
- A global consensus on interoperability by the [Global Digital Health Partnership](#) (GDHP).

Obstacles

- Legacy interfaces: HL7 messaging interfaces still handle the bulk of interoperability use cases within and between health systems. The legacy interfaces will not be decommissioned in favor of modern open APIs any time soon until a new mix of use cases reaches critical mass that favors more granular, direct access to EHI.
- Inherent complexity: The complexity of interoperability is considerable despite easier-to-implement specifications, such as FHIR. Healthcare interoperability includes a daunting array of exchange standards, trust frameworks, information models and domain vocabularies, and apprehension about managing this complexity has slowed adoption.
- Data quality: Semantic interoperability is the exchange of clinical information with enough meaning and granularity to support meaningful decision support, care coordination, quality initiatives and analytics. Meaningful semantics depend on consistent data quality, which remains an industrywide challenge.

User Recommendations

- Participate in local and regional health information exchange networks that employ industry interoperability standards and granular consent management.
- Promote HL7 FHIR and SMART on FHIR support of your EHR system vendor.

- Report suspected information blocking by referring to the guidelines set forth within Office of the National Coordinator for Health Information Technology's (ONC's) Information Blocking Exceptions, keeping in mind that there are circumstances where information blocking is legitimate.
- Strengthen patient engagement by preparing for consumer-mediated health information exchange.
- Investigate notable industry alliances and advocacy groups, such as the [CARIN alliance](#), and government initiatives such as [MyHealthEData](#) and [Australian Digital Health Agency](#).
- Assess your interface/integration platform vendor's support for modern and open APIs and health information exchange (HIE) participation to ensure it will support your digital transformation needs.

Sample Vendors

Carequality; CARIN; CommonWell Health Alliance; Health Level Seven International (HL7); IHE; Surescripts Network Alliance

Gartner Recommended Reading

[The USCDI Needs a National Patient Identifier Optimized for Accuracy, Privacy and Consent](#)

Appendixes

See the previous Hype Cycle: [Hype Cycle for Digital Care Delivery Including Virtual Care, 2022](#)

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 2: Hype Cycle Phases

(Enlarged table in Appendix)

Phase ↓	Definition ↓
<i>Innovation Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
<i>Peak of Inflated Expectations</i>	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
<i>Trough of Disillusionment</i>	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
<i>Slope of Enlightenment</i>	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
<i>Plateau of Productivity</i>	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
<i>Years to Mainstream Adoption</i>	The time required for the innovation to reach the Plateau of Productivity.

Source: Gartner (July 2023)

Table 3: Benefit Ratings

Benefit Rating ↓	Definition ↓
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2023)

Table 4: Maturity Levels

(Enlarged table in Appendix)

<i>Maturity Levels</i> ↓	<i>Status</i> ↓	<i>Products/Vendors</i> ↓
<i>Embryonic</i>	In labs	None
<i>Emerging</i>	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
<i>Adolescent</i>	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
<i>Early mainstream</i>	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
<i>Mature mainstream</i>	Robust technology Not much evolution in vendors or technology	Several dominant vendors
<i>Legacy</i>	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
<i>Obsolete</i>	Rarely used	Used/resale market only

Source: Gartner (July 2023)

Document Revision History

[Hype Cycle for Digital Care Delivery Including Virtual Care, 2022 - 9 July 2022](#)

[Hype Cycle for Digital Care Delivery Including Virtual Care, 2021 - 13 July 2021](#)

Recommended by the Authors

Some documents may not be available as part of your current Gartner subscription.

[Understanding Gartner's Hype Cycles](#)

[Tool: Create Your Own Hype Cycle With Gartner's Hype Cycle Builder](#)

[2023 Healthcare Provider Business Drivers of Technology Decisions](#)

[Healthcare Provider CIOs: Take a Bimodal Approach to Clinician Burnout](#)

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Table 1: Priority Matrix for Digital Care Delivery Including Virtual Care, 2023

Benefit ↓	Years to Mainstream Adoption			
	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational		Algorithmic Medicine Digital Front Door Large Language Models for Care Delivery	Care Team Collaboration Digital Clinical Encounters Digital Health Platform Genomics Medicine Next-Generation Nurse Call Precision Medicine	Metaverse for Care Delivery
High	EHR Support of Virtual Care Enterprise EHR Systems (Non-U.S.)	Care Pathway Orchestration Critical Condition Surveillance Systems Healthcare Digital Marketplace Healthcare Interoperability Virtual Health Assistants Virtual Nursing	AI-Enabled Diagnostic Imaging Interpretation Ambient Digital Scribe Digital Clinical Voice Analysis Patient-Centered CDS Semantic Interoperability Smart EHR UI	

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Moderate	OpenNotes	Anatomical 3D Printing Consent Management for Healthcare Consumer Healthcare Wearables Enterprise Virtual Care Platform External CDS Medication Adherence Management	Immersive Technology for Care Delivery	Robotics-Assisted Telesurgery
Low				

Source: Gartner (July 2023)

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Phase ↓

Definition ↓

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