

# Hype Cycle for Real-Time Health System Technologies, 2023

Published 17 July 2023 - ID G00788393 - 96 min read

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Initiatives: [Healthcare and Life Science Digital Optimization and Modernization](#)

This Hype Cycle includes technologies pivotal to the real-time health system vision. It is an essential reference for CIOs when assessing the value and impact of technologies that digitally transform the healthcare organization into a responsive, collaborative, smart, next-generation health system.

## 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

The real-time health system (RTHS) is a conceptual, technical and operational paradigm for the next-generation healthcare delivery organization (HDO). The RTHS transforms the HDO into a situationally aware, collaborative, smart and real-time enterprise. The RTHS acquires, assimilates and activates real-time operational intelligence to achieve its business objectives and provide high-quality patient outcomes and care team experiences. It supports the shift to increasingly complex models of care delivery.

For HDO CIOs, this Hype Cycle profiles a collection of innovative technologies, from embryonic to mainstream, that are key to forming digital transformation strategies and subsequent deployment roadmap for their organizations. It highlights technologies and solutions that enhance situational awareness surrounding the patient and converts them into actionable, operational intelligence. High-quality, timely operational intelligence fuels the digital capabilities to optimize and orchestrate care delivery workflows and processes, a primary goal for today's HDOs.

## The Hype Cycle

This Hype Cycle illustrates the steady, year-over-year evolution and adoption of technologies and IT solutions that characterize, enable and advance the RTHS operational paradigm and vision. It identifies, describes and analyzes the digital technologies and solutions that facilitate the transformation of the HDO into one that is:

- Accessible, inviting and nurturing
- Collaborative and devoid of unnecessary clinical toil
- Safe, secure and compliant
- Responsive to individual preferences and needs
- Operationally efficient and sustainable
- Situationally aware, smart and appropriately autonomous

This Hype Cycle highlights technologies and solutions that leverage real-time patient event data, operational intelligence and predictive analytics to streamline clinical workflows and business processes. Healthcare providers must leverage RTHS technologies to capitalize on new opportunities to create and deliver value to an increasingly demanding consumer and patient, while optimizing resource utilization and reducing waste, latency and costs.

In pursuit of the RTHS vision, HDO CIO IT investments continue to:

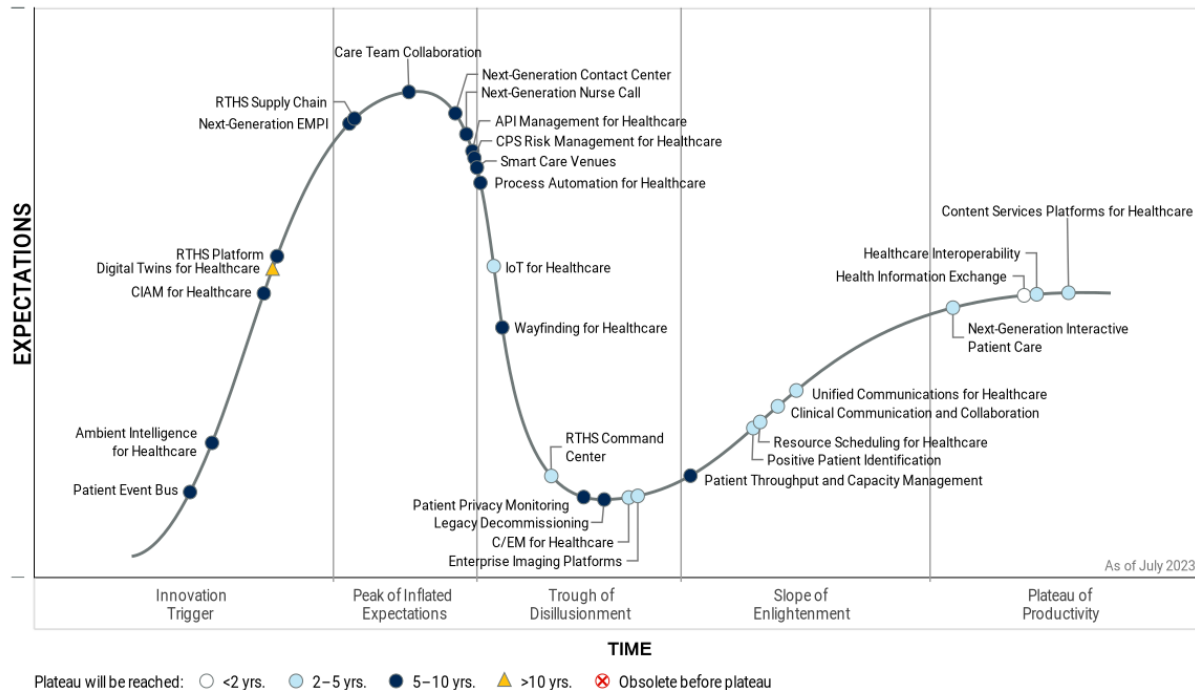
- Enhance real-time situational awareness surrounding the consumer and patient.
- Convert patient encounter and engagement data into actionable operational intelligence.
- Automate and orchestrate essential workflows and processes.
- Measure, monitor and predict enterprise performance and capacity.

This year there have been hype advances in next-generation nurse call, interoperability, IoT and process automation. Some technologies did not advance significantly on the Hype Cycle, including next-generation interactive patient care, enterprise imaging platforms and RTHS supply chain, which indicates a shift in attention to core RTHS capabilities.

As IT solution vendors continue to out-feature and out-message one another, the RTHS Hype Cycle reminds the HDO CIO that every IT investment must exhibit RTHS characteristics and capabilities and advance the vision.

**Figure 1: Hype Cycle for Real-Time Health System Technologies, 2023**

## Hype Cycle for Real-Time Health System Technologies, 2023



Gartner

## The Priority Matrix

There are 30 innovations on the 2023 RTHS Hype Cycle, 12 of which offer transformational value to the HDO over the next 10 years. Transformational technologies and solutions can fundamentally change how the HDO does business and serves its clients. The transformational technologies and solutions in this Hype Cycle catalyze the RTHS vision.

Transformational technologies that deliver value in the near term are uncommon, as it takes time to disrupt and penetrate a complex, regulated industry with an entrenched ecosystem of incumbent vendor solutions. Transformational technologies must also rely on year-over-year advances in foundational technologies — such as cloud computing, mobility, interoperability, machine learning, AI, data science, IoT and analytics. Foundational technologies must possess critical mass before they can effectively facilitate transformation.

While a few transformational innovations provide near-term value, the RTHS paradigm maintains its momentum from the steady advancement and incremental adoption of moderate and high-value solutions and technologies. These innovations implement foundational RTHS capabilities that make HDOs aware (e.g., IoT in healthcare), collaborative (e.g., care team collaboration), smart (e.g., smart care venues), and real-time (e.g., RTHS command center).

**Table 1: Priority Matrix for Real-Time Health System Technologies, 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		Clinical Communication and Collaboration IoT for Healthcare Next-Generation Interactive Patient Care	Ambient Intelligence for Healthcare Care Team Collaboration Next-Generation Nurse Call Patient Event Bus Process Automation for Healthcare RTHS Platform RTHS Supply Chain Smart Care Venues	Digital Twins for Healthcare
High	Health Information Exchange	Content Services Platforms for Healthcare Enterprise Imaging Platforms Healthcare Interoperability Positive Patient Identification Resource Scheduling for Healthcare RTHS Command Center Unified Communications for Healthcare	API Management for Healthcare CIAM for Healthcare CPS Risk Management for Healthcare Next-Generation Contact Center Next-Generation EMPI Patient Throughput and Capacity Management	
Moderate		C/EM for Healthcare	Legacy Decommissioning Patient Privacy Monitoring Wayfinding for Healthcare	
Low				

Source: Gartner (July 2023)

## Off the Hype Cycle

- Autonomous monitoring has been replaced by ambient intelligence for healthcare. This change is due to the rapid development of AI based algorithms that extend the capability and definition for this type of clinical environment monitoring.

- Critical condition surveillance systems has been moved to Hype Cycle for Digital Care Delivery Including Virtual Care as it is a clinical, care delivery solution set that depends on RTHS technologies such as IoT and patient event bus, rather than an RTHS technology in and of itself.
- Process simulation modeling has merged into process automation for healthcare. This change is due to the extension and maturation of simulation capabilities into orchestration and automation of workflow execution in the HDO.
- Vendor-neutral archive has been replaced by enterprise imaging platforms. This change recognizes the growth of the imaging repository solution set beyond the PACS/DICOM traditional requirements of the past and toward enterprise-based image storage/retrieval solutions.

## On the Rise

### Patient Event Bus

Analysis By: Gregg Pessin

**Benefit Rating:** Transformational

**Market Penetration:** Less than 1% of target audience

**Maturity:** Embryonic

#### Definition:

Patient event bus (PEB) platforms are software systems that provide a centralized and standardized digital conduit for capturing and sharing all patient activity and status events across the HDO. PEBs consume event descriptor content from any available patient clinical system and deliver it to any authorized subscribing receiver application. It is fundamental to the real-time healthcare system (RTHS), where complex real-time clinical analysis of clinical events is required.

#### Why This Is Important

PEB platforms provide a centralized, standardized approach to processing event stream data from operational and clinical systems surrounding the patient. Similar technology has proven itself in intensive care units where streaming data monitors and predicts critical health events. PEB platforms bring real-time patient event data that leads to actionable insights on a broader set of patients throughout the enterprise, not just for life-threatening events.

#### Business Impact

The centralized collection of patient events drastically increases situational awareness about patients, which enables healthcare delivery organizations (HDOs) to:

- Remove delays from critical clinical and business workflows and processes.
- Improve operational efficiency and optimize associated costs and overheads.
- Boost performance against key performance indicators critical to reimbursement and revenue.
- Enhance the coordination of care activity from home through postacute care venues.

## Drivers

- HDOs require event-driven architecture (EDA) competency as part of their digital transformation planning. Real-time situational awareness is required for many clinical and business initiatives, yet most deployed applications are poorly designed for event sensing and processing. PEB events represent a wide range of granular, patient-related activities (e.g., encounters, care transitions, location and behavior) and meticulously and immutably chronicle the patient's journey.
- Many modern application designs, including the Internet of Things (IoT), digital twins and B2B ecosystems, are event-driven. The strategic role of event-driven computing in digital business, which strives for continuous awareness, intelligence and agility, creates a demand for technology designed specifically for event-driven use cases, such as those surrounding patients.
- Designing applications around patient events enables closer clinical and IT professionals' collaboration. The event processing language follows business semantics rather than the traditional IT-specific language used by legacy APIs.

## Obstacles

- The PEB technology is nascent with few vendors providing healthcare solutions. Early solutions, such as Medical Informatics' Sickbay, are concentrated on specific clinical use cases.
- Due to the critical clinical nature of the patient data process through a PEB, governmental regulations such as Health Insurance Portability and Accountability Act (HIPAA) and clinical requirements, such as those regulated by the FDA in the U.S., must be met before these systems can be used for medical interventions.
- Existing full-stack medical device integration products will slow adoption as they are readily available in the marketplace and provide a legacy alternative to this disruptive approach.

## User Recommendations

- Adopt event brokers with the understanding that the increasing maturity and standardization of technology over time will lead to strategic changes in data acquisition processes.
- Establish an event-driven mindset to shift IT staff thinking toward business process alignment.

- Identify important patient-related events that fall out of real-patient activity when compared against existing event capture solutions, such as Health Level Seven (HL7) and other admission, discharge and transfer (ADT) sources.
- Build skills and technology for event-driven design to enable application designers to freely draw on traditional request-driven service-oriented architecture (SOA) or event-driven architecture (EDA) capabilities as the business requires.

## Sample Vendors

AlertWatch; Clearsense; Decisio Health; GE HealthCare; InterSystems; IOTICS; Medical Informatics; Philips

## Gartner Recommended Reading

[Innovation Insight for Patient Event Bus](#)

[Real-Time Health System Vision](#)

[Use RTHS Principles to Guide Digital Transformation](#)

## Ambient Intelligence for Healthcare

Analysis By: Barry Runyon

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

### Definition:

Ambient intelligence uses artificial intelligence (AI) and behavioral analytics to analyze and report on real-time intelligence derived from computer vision and sensor technology regarding patient and staff activity. This drives actions and interventions to enhance patient safety, care quality and compliance. Ambient intelligence capture and sensing is unobtrusive and does not require those being observed to wear special tracking or monitoring devices to detect or infer behavior.

### Why This Is Important

Ambient intelligence enables:



- Real-time situational awareness surrounding the patient.
- Patient safety by alerting staff to potential problems or required interventions.
- Improved care outcomes by detecting abnormal behavior or signs of deterioration.
- Compliance by enforcing hygiene rules such as hand hygiene and mask-wearing practices.
- Mitigation of violence against healthcare workers.
- Asset utilization by locating hoarded medical equipment.
- Autonomous monitoring of patients in their rooms.

## **Business Impact**

Ambient intelligence can positively impact the following:

- Key performance measures related to fall rates (e.g., falls per occupied bed days).
- Liability exposure associated with the safety and security of high-risk patients.
- Reducing incidence of self-harm, elopement and staff abuse.
- Reducing incidence of hospital acquired infections by enforcing compliance with hand hygiene.
- Labor costs by eliminating bedside sitters and using nursing resources more efficiently.

## **Drivers**

- The need to reduce labor spend and staffing shortages through automation.
- Persistent healthcare industry focus on patient safety and risk management requirements.
- Advancements in AI, Internet of Things (IoT), gesture analysis, facial recognition, casualty and predictive analytics.
- Increased interest in and acceptance of virtual care delivery options.

## Obstacles

- Patient privacy, security and policy issues related to real-time video surveillance.
- Technical limitations with regard to current generation of image recognition and sensor technologies.
- Integration and retention challenges (e.g., indexing and compliant storage of surveillance data).
- Language interpretation requirements when remotely communicating with at-risk patients.

## User Recommendations

- Draft an ambient intelligence business case and value proposition for leadership acceptance, approval and funding.
- Increase the likelihood of acceptance by aligning the value proposition of ambient intelligence with key performance indicators and quality measures, such as reducing fall risk and length of stay. Leverage experience and results from existing passive monitoring use cases such as telesitting.
- Create a multidisciplinary steering committee for governance and oversight by socializing the value proposition within the enterprise and among peers to identify potential allies and supporters.
- Identify potential care venues and high-level use cases that could benefit from ambient intelligence. Begin by establishing a limited pilot with clear constraints, success criteria and time frames. Modify or expand the pilot based on results measured against key industry measures.

## Sample Vendors

Artisight; care.ai; MySense; Neteera

## Gartner Recommended Reading

[Emerging Technologies: The Future of Sensing](#)

## CIAM for Healthcare

Analysis By: Roger Benn

Benefit Rating: High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Definition:**

Customer identity and access management (CIAM) for healthcare include tools and technologies to identify, authenticate and authorize access to digital assets for consumers not known to the healthcare organization, and with no previous history. CIAM is necessary to secure public-facing applications that require users to enroll or register their identities and create accounts.

**Why This Is Important**

CIAM will continue to gain traction among healthcare providers, along with their increased adoption of systems that offer convenient ways to engage consumers, customers and other constituents (e.g., family members, caregivers, contractors, affiliated clinicians) with whom they have no formal history. These include systems such as patient self-scheduling, virtual care and remote workforce management.

**Business Impact**

The safety and security provided by CIAM for external use cases can positively affect:

- Digital experiences meant to attract and convert consumers into patients.
- Virtual care, wayfinding for healthcare and next-generation contact/call centers.
- Referral management, care coordination and community physician engagement initiatives.
- Remediation of gaps in identity governance and administration (IGA), identity and access management (IAM), and patient privacy monitoring (PPM).

## Drivers

- The increasing need to conveniently and safely engage and service consumers not formally enrolled in the healthcare provider's IAM infrastructure.
- The need to engage consumers on their terms and channels to convert from consumer to customer.
- The need to manage all digital identities (consumers, patients, employees, affiliates) to personalize individual preferences and experiences.
- Increased interest and adoption of self-service technologies, digital front-door solutions that streamline consumer access, next-generation contact and call centers, remote workforce collaboration and management solutions, and virtual care encounters and services.

## Obstacles

- There is a lack of appreciation and understanding of CIAM value proposition by healthcare provider leadership and stakeholders.
- Traditional IGA and IAM software offerings can satisfy most consumer-facing requirements, but in an operationally siloed manner. They lack the social media integration, profile and privacy management, and marketing analytics necessary to efficiently and conveniently engage consumers.
- Traditional IAM providers servicing the healthcare provider space have just begun to extend their platforms to provide better support for the consumer and customer.
- The healthcare industry is heavily regulated, and CIAM providers need to navigate complex compliance requirements, such as the Health Insurance Portability and Accountability Act (HIPAA) and interoperability mandates. The ability to adhere to these regulations, while delivering seamless and secure access to patient data, is maturing within the industry.

## User Recommendations

- Generate CIAM interest by identifying compelling use cases that benefit customer experience.
- Gain the support of your chief information security officer (CISO) and compliance team by mutually exploring how CIAM can become part of the enterprise's identity and access management ecosystem.
- Increase your understanding of the CIAM market by investigating vendors that support the healthcare vertical. Begin with the representative vendor list in this research.
- Test the CIAM value proposition by establishing a limited-scope pilot with clear expectations and success criteria.

## Sample Vendors

ForgeRock; Imprivata; LoginRadius; Okta; Ping Identity

## Gartner Recommended Reading

[Magic Quadrant for Access Management](#)

[Invest Implications: Solution Comparison for Customer Identity and Access Management Capabilities of 7 Vendors](#)

## Digital Twins for Healthcare

Analysis By: Gregg Pessin

**Benefit Rating:** Transformational

**Market Penetration:** Less than 1% of target audience

**Maturity:** Emerging

### Definition:

A digital twin is a technology-enabled proxy that mirrors the state of a thing. A “thing” may be a physical or virtual asset, process, person, organization, or collection. The real-time health system (RTHS) is an example of a digital twin for a health system. The RTHS digital twin models the characteristics and behavior of a healthcare provider enterprise that is situationally aware, collaborative, and smart.

## Why This Is Important

Situational awareness is at the heart of digital twins in healthcare delivery organizations (HDOs). Digital twins manifest information gathered from IoT and other sources to create a digital model of a real-world healthcare organization. They allow healthcare leaders to create an enterprise abstraction that exhibits the RTHS characteristics and behavior, and can be used to monitor, analyze, and predict how the enterprise will respond to changes in conditions and circumstances.

## Business Impact

Digital twins positively impact these organizational areas:

- **Care delivery:** Clinical communication and collaboration, nurse call, alarms and notifications, and crisis/emergency management.
- **Patient engagement:** Experiential wayfinding, integrated patient room, interactive patient care, facilities and operations, patient throughput and capacity management, real-time operational dashboards, and supply chain.
- **Management and administration:** Real-time costing, healthcare information exchange, healthcare interoperability, and revenue cycle management.

## Drivers

- Accelerating problem-solving and decision making, and enabling more efficient and effective care delivery and administration operations.
- Enabling easy testing of various scenarios that can lead to organizational improvement, by studying the effects of changing various inputs and operating conditions used by the digital twin.
- Allowing change impact to be understood, without disrupting services or the risk of impacting patient safety or quality.
- Enabling process simulations that are detailed and dynamic across the enterprise, and supporting many hospital operations and care delivery components.
- Getting the right information to the right people, at the right time and place, to enable highly informed decision making across the healthcare organization.
- Accelerating digital transformation by creating accurate real-time situational awareness for every aspect of the healthcare organization.

## Obstacles

- The primary obstacle is poor data quality or low data point counts used to create the twins. Sound decisions cannot be made based on twins built from unreliable or incomplete data.
- Cultural obstacles exist based on a reluctance to trust a digital twin representation of a real-world healthcare entity. A quality boundary or threshold must be reached before that trust level can be achieved.
- Institutional barriers exist that can slow or prevent investment in these technologies, based on a misunderstanding of the potential value delivery offered by digital twins.

## User Recommendations

- Include a concise digital twin vision within the HDO's digital transformation strategy. The CIO must establish and communicate the direct correlation between expected transformation outcomes, and the purpose and value of digital twins.
- Educate business and clinical units to inform them about the benefits of digital twins, and how they fit in with departmental and organizational goals. Start by identifying the right data to create highly effective digital twins and establish a collaborative environment for the initiative among stakeholders.
- Create a pilot program targeting simple models of patients, a department, or other entity tied to a specific desired business or clinical outcome to understand digital twin challenges. Begin by analyzing the underlying source data required to compose the digital twins, understanding that the twins' usability is directly correlated to their data quality.

## Sample Vendors

GE HealthCare; Philips; PTC; Siemens; ThoughtWire

## Gartner Recommended Reading

[Innovation Insight: Healthcare Provider Digital Twins Transform Decision Making](#)

[Use RTHS Principles to Guide Digital Transformation](#)

## RTHS Platform

Analysis By: Gregg Pessin

**Benefit Rating:** Transformational

**Market Penetration:** Less than 1% of target audience

**Maturity:** Emerging

**Definition:**

The real-time health system (RTHS) platform transforms the healthcare provider enterprise into a situationally aware, collaborative, smart, real-time enterprise. The RTHS platform acquires, assimilates and activates real-time operational intelligence to achieve its business objectives, digitally transform care delivery workflows, and optimize key performance measures.

**Why This Is Important**

The RTHS platform is a response to the current state of the healthcare delivery organization (HDO) and health system, where situational awareness surrounding the patient is limited, patient information is siloed, and clinical workflows are disjointed and lack coordination. The RTHS platform helps healthcare providers leverage real-time operational data to improve patient and provider experiences, and clinical and business operating performance.

**Business Impact**

RTHS platforms:

- Remove delays from the HDO's critical clinical and business workflows and processes.
- Improve operational efficiency and effectiveness and associated cost optimization.
- Enhance coordination of care activity across the entire care continuum — from home through postacute care venues.
- Boost HDO performance on key performance indicators critical to reimbursement and revenue.
- Reduce dependence on megasuite vendor roadmaps and product development and release cycles.



## Drivers

- The need to transition clinical operations to population-health and value-based models, shifting to a model ready for accountability through outcome- and value-based contracting
- Requirements to transform orientation of operations around the patient; crafting the patient journey and designing the delivery and flow of services to create meaningful and continued engagement that is personalized to changing patient needs
- The demand to create an ecosystem of community partnerships and networks to increase operational efficiencies across the network
- The need to improve operational bottlenecks and embrace patient throughput and capacity best practices
- The call to reduce clinical and administrative costs by finding and harvesting economies of scale; creating process standardization and investing in automation
- Fiscal pressure to capture revenue opportunities and create new business, thereby reducing leakage, improving billing, reducing claims denials, optimizing services to the market, and enabling effortless collaboration and coordination to optimize service delivery and eliminate waste and redundancy

## Obstacles

- The concepts of workflow automation, orchestration, and composable architecture are gaining some conceptual acceptance within the healthcare provider industry, but they are challenging to architect and plan.
- Most vendors offer narrow, use-case-specific automation and orchestration capabilities within their particular domains, such as care coordination, patient throughput, pharmacy automation, patient engagement, supply chain, and medical imaging. These narrow capabilities create workflow integration and interoperability issues.

## User Recommendations

- Implement process improvement techniques to analyze business situations and determine what types of real-time intelligence to collect and apply.
- Apply process simulation modeling to reimagine and reengineer critical workflows and processes as part of your RTHS delivery program.
- Incrementally apply situational awareness and operational intelligence to continuously improve the patient experience and outcomes by continually reducing response time and increasing response quality.
- Work with key vendors to expose enterprise access to their processes and data through open APIs.

## Sample Vendors

ABOUT; Artisight; Cliniconex; Exepron; Lumeon; Q-nomy; Qventus; ThoughtWire

## Gartner Recommended Reading

[Real-Time Health System Vision](#)

[Use RTHS Principles to Guide Digital Transformation](#)

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

[The Real-Time Health System Architecture](#)

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

## At the Peak

### Next-Generation EMPI

Analysis By: Roger Benn, Gregg Pessin

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

#### Definition:

An enterprise master patient index (EMPI) maintains cross-referenced patient identifiers so that a patient known by one application can be cross-referenced to their identifier in another application. This is usually done using deterministic and probabilistic matching methods. The next-generation EMPI employs “referential matching” through an identity-proofing service to extend the patient data elements used for matching and merging activity.

#### Why This Is Important

Cross-linking or merging unrelated medical records can lead to adverse medical events and errors that inhibit effective diagnosis, treatment and billing and erode patient confidence in the healthcare system. Additionally, with the growing importance of interoperability between healthcare providers and health information exchanges (HIEs) to offer consumer-mediated exchange — next-generation EMPI is a foundational technology.

#### Business Impact

Next-generation EMPs promise various benefits:

- Reconciles person/patient identity issues. It streamlines interoperability, HIE, reporting, and analytics of any workflow that depends upon identifying a person or patient with a high degree of confidence.
- Reduces duplicate medical record rates, improving patient safety and high costs associated with deduplicating and clean-up services.
- Facilitates merging of patient records as a component of EHR replacement or consolidation initiatives.

#### Drivers

- Gartner client interest in EMPIs grows globally across government agencies and private organizations, as indicated by increased engagements/calls with Gartner clients.
- M&A activity in the healthcare sector and the complexity of the EHR replacement process continue to underscore the importance of an effective EMPI.
- Conventional deterministic and probabilistic approaches to patient matching are not as accurate as they need to be to keep up with healthcare provider organization consolidations. Next-generation EMPIs' ability to use nationwide identity-proofing databases or similar services, increases the patient attributes used for matching, improving the matching accuracy.
- Cloud-based, next-generation EMPIs offer subscription-based payment models that can be more affordable and easier to fund than legacy EMPIs.
- Patient expectations of total experience improvement drive a more seamless experience while ensuring timely access to care and throughput.

## Obstacles

- Limited use for healthcare providers serving pediatric patients, as the availability of identity-proofing information on children continues to provide barriers to full execution.
- In the U.S., healthcare providers perceive that approval of a National Patient Identifier (NPID) may eliminate the role of an EMPI. In reality, EMPIs will be critical to propagate a NPID, if and when it is adopted.
- There is a lack of transparency from vendors offering next-generation EMPIs about data sources used to create a nationwide identity-proofing service.

## User Recommendations

- Increase the accuracy and efficiency of medical records match and merge activity by augmenting or replacing your existing EMPI solution with a next-generation EMPI that leverages high-quality, up-to-date identity-proofing data.
- Improve the accuracy of aggregating patient information across all information systems by utilizing EMPIs — especially for healthcare providers who do not have a monolithic computing environment (one vendor platform that issues the majority of unique person identifiers).

- Select a vendor with next-generation-EMPI-enabling technologies and proven experience reconciling person and patient identities in the healthcare sector. Check if this experience extends to populations comparable to your region and can meet the patient match and merge interoperability and health information exchange requirements. A vendor's experience in the industry is likely to impact the implementation timelines.

## Sample Vendors

NextGate; QuadraMed; Rhapsody; Verato

## Gartner Recommended Reading

[Innovation Insight for Next-Generation Enterprise Master Patient Index](#)

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

[Prepare Now for the U.S. National Patient Identifier](#)

## RTHS Supply Chain

Analysis By: Barry Runyon

**Benefit Rating:** Transformational

**Market Penetration:** 1% to 5% of target audience

**Maturity:** Emerging

### Definition:

Supply chain planning and operations will continue to align with real-time health system (RTHS) principles and enabling technologies. The RTHS supply chain uses up-to-date operational intelligence derived from contemporary clinical and patient activity to implement a dynamic and responsive health system supply chain. It changes the health supply chain from a siloed, cost-focused, historical process to a more end-to-end, optimized, orchestrated, real-time service.

## Why This Is Important

A rapidly evolving reimbursement landscape, increased adoption of alternative delivery models (such as virtual care), and a looming economic downturn all impact supply chain planning and operations. The healthcare provider supply chain must be responsive to these changes and evolve accordingly. The RTHS supply chain model enables healthcare provider supply chain leaders to implement a clinically integrated, automated and predictive supply chain that is closely aligned with patient care activity.

## Business Impact

The relationship between supply chain requirements, care activity and clinical operations is critical to an efficient and cost-effective healthcare provider supply chain. The influence of RTHS principles on legacy supply chain concepts transforms the healthcare supply chain into a clinically integrated one, with transparent and timely data. The RTHS supply chain requires a multidisciplinary team with a deep understanding of supply chain logistics and clinical operations.

## Drivers

- There is an abiding need to establish a closer relationship between clinical activity and supply chain operations (see [Digital Health Transformation](#), Healthcare Information and Management Systems Society). This was made evident by the COVID-19 pandemic, where the supply of personal protective equipment and ventilators was often wildly out of step with demand on the ground.
- Supply chain shortages are actually more widespread now than they were during the height of the pandemic (see [The Next Supply Chain Crisis Is Coming. Here Are 3 Things CEOs Can Do](#), Advisory Board).
- The supply chain has long been viewed as primarily a sourcing function, a silo unto itself, driven by retrospective consumption and inventory data. This traditional orientation has limited supply chains' influence on healthcare providers' strategic planning and decision making.
- The RTHS supply chain model will gain importance as inflation begins to impact the cost and availability of critical supplies and encroach upon profits.
- The RTHS supply chain will increasingly have to consider the supply chain requirements of virtual care, home health and hospital-at-home venues.
- Inflationary pressures and a looming economic downturn will bring supply chain innovation to the fore.

## Obstacles

- The supply chain remains a critical but unheralded function among healthcare providers, and is not often viewed as a source of innovation.
- The end-to-end integration of supply chain logistics and patient care activity will depend on adopting open interoperability standards and the sophisticated automation of clinical and materials management workflows. Legacy supply chain vendor solutions may be challenged to accommodate these evolving, more dynamic requirements.
- RTHS principles and technologies have long been centered on integrating, automating and optimizing patient management, care delivery and care coordination workflows. This is a new space for supply chain vendors, but precisely what the RTHS supply chain requires to advance its vision and value proposition.

## User Recommendations

- Create a business case for establishing and underwriting the RTHS supply chain vision by aligning supply chain and materials management logistics with RTHS characteristics and behaviors (real time, situationally aware, collaborative and smart).
- Use Gartner's RTHS research to educate and inform healthcare provider leadership about the RTHS principles and business value. These overarching concepts are key to understanding RTHS's supply chain challenges and promoting its value propositions.
- Materialize the RTHS supply chain vision by developing a strategic roadmap, identifying current and future supply chain states, the application and technology investments required to bridge the gap, and anticipated implementation timelines.

## Sample Vendors

Cardinal Health; Global Healthcare Exchange (GHX); Infor; Jump Technologies; Olive; Vizient; VUEMED

## Gartner Recommended Reading

[The Healthcare Supply Chain Top 25 for 2022](#)

[Use Gartner's Model to Assess Real-Time Health System Maturity and Plan Investments](#)

## 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](#)

## Next-Generation Contact Center

Analysis By: Barry Runyon

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

**Definition:**

The health system contact center connects the community with patients, providers and hospital resources. Conventional contact centers use purpose-built software and technologies, such as interactive voice response, paging, private branch exchange integration, on-call scheduling and unified communications. The next-generation contact center employs high-quality provider directories, CRM, social media integration, secure messaging, behavioral analytics, AI and total experience capabilities.

**Why This Is Important**

The healthcare provider business has become increasingly competitive as hospitals seek meaningful and impactful ways to engage with patients, consumers, caregivers and community clinicians. The enterprise contact center (or call center) is often their first introduction to the health system. Health systems have begun recognizing the contract center's potential to streamline communications, enhance the consumer experience, increase network utilization and reinforce a positive brand image.

**Business Impact**

The next-generation contact center expands the scope and impact of the conventional healthcare provider contact center. It can enhance a health system's image and brand reputation by improving the convenience and quality of constituent interactions — between consumers, patients, providers, community clinicians and the health system. The next-generation contact center can positively impact patient acquisition and retention, marketing campaign effectiveness, and key performance measures.

## Drivers

- Organizations are investing more in their consumer and patient experience, and retention strategies for growth, while focusing on employee experience strategies to compete for scarce talent.
- Increased industry interest in total experience concepts and technologies pushes healthcare provider leadership to engage consumers in novel ways.
- New channels and touchpoints to communicate and collaborate on care are critical to navigating today's complex and disjointed healthcare delivery system.
- Organizations seek to improve the contact center efficiencies (e.g., decrease costs by consolidating multiple point solutions); address workforce issues (e.g., enabling greater automation to combat labor shortages); and allow work from home by moving away from legacy on-premises solutions.
- The emergence of interoperable application ecosystems (IAEs), such as care team collaboration, patient throughput, and capacity management, has created unprecedented opportunities for the next-generation contact center integration into these IAEs.
- Advances in interoperability, data science, machine learning (ML)/AI, speech analytics, computing at scale and social media integration have accelerated next-generation contact center interest and product development.

## Obstacles

- Conventional call or contact centers are comfortably nestled within the healthcare provider. They are difficult to dislodge and often accompany healthcare provider leadership's "good enough" attitude.
- Point investments in patient engagement, behavioral analytics and CRM have already been made without the benefit of an overall community engagement strategy.
- Legacy integration challenges, interoperability immaturity and lagging adoption of Health Level Seven (HL7) Fast Healthcare Interoperability Resources (FHIR) impede next-generation contact center application and workflow integration.
- Confusing and misleading vendor messaging obfuscates the next-generation contact center value proposition.
- Enterprise resistance to potential workflow and process changes accompanies next-generation contact center adoption.

## User Recommendations

- Revisit the contact center's strategic role within the enterprise, seeking opportunities to engage consumers, patients, caregivers, family members and community clinicians more meaningfully.
- Improve channel-based constituent engagement by investing in total experience, focusing on personalization and experience orchestration that addresses consumer and employee needs.
- Investigate sentiment and customer journey analytics to advance your personalization capabilities and your ability to deliver on the motivations and expectations of your consumers.

## Sample Vendors

Change Healthcare; Healthgrades; PerfectServe; Spok; Syllable; Talkdesk

## Gartner Recommended Reading

[Predicts 2023: Changing How Healthcare Provider Services and Operations Are Delivered](#)

## 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?](#)

## API Management for Healthcare

Analysis By: Roger Benn, Gregg Pessin

**Benefit Rating:** High

**Market Penetration:** 20% to 50% of target audience

**Maturity:** Early mainstream

### Definition:

API management for healthcare includes IT tools and platforms for the creation, provisioning, monitoring and maintenance of APIs. Comprehensive API management includes the entire API life cycle. The increased adoption of Health Level Seven (HL7) Fast Healthcare Interoperability Resources (FHIR) and the emergence of interoperable application ecosystems have made API management an increasingly important IT capability indicator of real-time health system maturity.



## Why This Is Important

Globally, mobile apps, modern web architectures, digital strategies, Internet of Things (IoT) and web APIs have made APIs an essential interoperability component of any digital transformation strategy. APIs are on the leading edge of healthcare's digital transformation and centerpiece of the healthcare industry's recently finalized interoperability rules. Successful APIs will have many active consumers and must be secured, monitored, maintained and managed throughout their life cycle.

## Business Impact

API management is vital to healthcare governance, integrity and performance. APIs extend the reach and capabilities of legacy healthcare provider clinical and business systems beyond original product roadmaps. Healthcare delivery organizations (HDOs) are required to manage APIs throughout their life cycle to ensure application solution sets deliver value continuously. API management is vital for HDO participation in interoperable application ecosystems and digital transformation initiatives.

## Drivers

- While APIs and service-oriented principles have been around for some time, they continue to gain acceptance and traction by vendors in the healthcare provider market. HDOs require more timely responses to their business and digital transformation requirements than the healthcare software vendor community can accommodate through release cycles and product roadmaps.
- Before FHIR, healthcare APIs were often proprietary, and data sharing between different healthcare systems was challenging due to the lack of a standard format for exchanging healthcare data. FHIR introduced a universal standard for healthcare data exchange, enabling healthcare systems to communicate and share data more efficiently and effectively.
- The adoption of API management continues to increase, as the pace of healthcare provider business and clinical information-sharing requirements increases, along with strategic digital transformation initiatives facilitated by interoperability advances. The introduction of composable application architecture is accelerating interest in API management.
- In the U.S., patient access and interoperability requirements codified by Office of the National Coordinator (ONC) and the Centers for Medicare & Medicaid (CMS) interoperability rules drive API management adoption. These rules require open APIs for healthcare data access and exchange.
- HDOs have begun to expect proprietary and open APIs from their vendor community that can be safely consumed and orchestrated to support new data requirements, workflows and business capabilities. They want to exchange data, share work, and move beyond conventional messaging interfaces and siloed workflows.

## Obstacles

- Vendors are marketing API management solutions to the healthcare industry. This may result in solutions that will not easily accommodate traditional healthcare workflows, use cases and information exchange patterns due to a lack of coordination and transparency between vendors.
- Some solutions are only available as cloud-only, which may be a limiting factor for healthcare because most of the industry still deploys most of its IT solutions on-premises.
- The pricing and subscription models of the various API management platform vendors may also be at odds with the high data transaction volumes of typical healthcare provider integration and data exchange workflows.

## User Recommendations

- Implement an API management program to streamline the delivery of new business capabilities, extend existing applications and systems such as the electronic health record, and enable mobile and other multichannel clients.
- Employ opportunities within interoperable application ecosystems such as clinical communication and collaboration platforms to expose data and functionality through API management.
- Leverage API management technologies to help build, consume, operate, secure and manage self-developed APIs and FHIR resources. Use API management platforms to centralize authentication and authorization for the APIs.
- Source your API management capabilities from purpose-built API management, clinical data interchange platforms and the existing interfacing/integration platform.
- Employ APIs when conventional industry interoperability messaging standards fall short of the health information and workflow needs.

## Sample Vendors

Apigee (Google); Axway; Boomi; IBM; Kong; Microsoft; MuleSoft (Salesforce); TIBCO Software

## Gartner Recommended Reading

[Magic Quadrant for Full Life Cycle API Management](#)

## [How to Evaluate API Management Solutions](#)

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

### **CPS Risk Management for Healthcare**

Analysis By: Gregg Pessin

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Emerging

#### **Definition:**

Cyber-physical systems (CPS) risk management ensures that the unique security and safety risks of CPS are effectively managed. Due to their very nature of connecting the cyber and physical worlds, CPS greatly enlarges the threat landscape and consequences for healthcare delivery organizations (HDOs).

#### **Why This Is Important**

High-profile cyberattacks on HDOs can create compromises that impact the back office and the point of care. As HDOs refresh legacy medical devices and other CPSs with new network-connected and programmable smart replacements, the risk of damage, including patient harm, from cyberattacks increases. The variety and scale of security risks in an IoMT-rich healthcare environment are great, owing to a large and complex threat surface.

#### **Business Impact**

CPS risk management is essential for HDOs:

- Brings awareness and measurement of risk level to the organization, allowing for a more accurate cost assessment of risk mitigations.
- Provides accurate input about the relationship between risk level and clinical or operational value of impacted functions, guiding mitigation strategic approach and planning.
- Exposes asset utilization patterns, which can be used to rightsize device population and identify underutilized assets.

## Drivers

- Defending underlying systems from interference from outside entities that want to do harm or take advantage of private information. With increased remote patient monitoring and other virtual care technologies, the HDO threat surface extends into the patient's home.
- Responding to constant cyberthreats with better, faster responses, aiming to keep their protections in equilibrium with the threats. The increase in IoMT acquisitions across clinical and facility use cases complicates this balancing act, as more devices need more security.
- Including CPS risk management as part of a robust cybersecurity program, which is now an ongoing cost of doing business and delivering care.
- Patient safety impacts are inherent with CPS in healthcare, focused mainly on medical devices, which drives the need to minimize risk.
- Lack of CPS risk management threatens stakeholder trust of HDOs that are expected to provide safe, reliable, compliant and private systems for care delivery.

## Obstacles

- Most sensor-based things have minimal computing resources, and the opportunities for antivirus, encryption and other embedded protection are restricted.
- HDOs have difficulty creating an accurate inventory for all IoT/CPS devices and hence lack a true picture of the threat surface they impose.
- The diversity of IoT/CPS devices and vendors creates challenges in assessing and managing these devices for cyber risks.
- Creating unified clinical/security response plans and having them in place for IoT-based cyber events is new and somewhat difficult for most HDOs.

## User Recommendations

- Record all CPS assets, such as minor sensors, facilities controls, and medical devices, and create visibility into IoT networks and topologies.
- Assess integration points in the HDO networks for CPS implementations and determine design gaps in capability, skills and infrastructure. This includes vendor-provided wireless network infrastructure, common with imaging equipment.
- Invest in digital risk management to properly plan for IoT security in digital transformation projects.
- Assign enterprise ownership for CPS technologies, including those claimed by a business or clinical unit, such as clinical or biomedical engineering.
- Change governance and oversight of IT and operational technology (OT) projects to accommodate cyber risk concerns. Stay abreast of changing cybersecurity compliance requirements for medical devices.

## Sample Vendors

Armis; Asimily; Claroty; Cynerio; Forescout; Ord; Palo Alto Networks; Sepio

## Gartner Recommended Reading

[Market Guide for Medical Device Security Solutions](#)

[How to Develop a Security Vision and Strategy for Cyber-Physical Systems](#)

[Facing New Vulnerabilities — Cyber-Physical Systems Mandate Changes to Traditional IT Governance](#)

## Smart Care Venues

Analysis By: Gregg Pessin

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

**Definition:**

Smart care venues improve patient safety, clinical outcomes, operational efficiency, and patient and visitor experience by increasing situational awareness using the Internet of Things (IoT) and care team collaboration technologies. Example technologies include real-time location systems, autonomous monitoring and smart beds. Smart care venues can be as specific as a patient room or encompass an integrated hospital campus.

**Why This Is Important**

A smart care venue is a holistic, consumer and patient-centered environment enabled by technologies such as wayfinding, ambient intelligence, care team collaboration and interactive patient care. Smart care venues are market differentiators as they create a hospital experience that is nurturing, safe, compliant, efficient, and responsive to consumer preferences and needs.

**Business Impact**

The focus of healthcare delivery organizations (HDOs) has shifted from physician-centric IT to investments that more directly support patients and care teams. Smart care venues positively impact patient engagement, resulting in improved patient experiences and reduced costs. Smart care venues increase operational efficiencies by giving patients direct communication or control of their care environment.

## Drivers

- Significant advances in interoperability protocols, standards and frameworks; the industry's commitment to open APIs; more demanding interoperability certification requirements; and health information exchange enable the shift to patient centricity.
- Consumers' expectations of healthcare are expanding in the era of digital business. Consumers increasingly know what is possible owing to their interactions with retail, media and personal technologies. As patients, they bring those expectations to healthcare.
- Market-based policies give healthcare and life science consumers the "power of the purse." In countries such as Germany, Switzerland, the U.K. and the U.S., policymakers are taking incremental steps to create improved marketplaces for healthcare products and services. These approaches progressively put consumers in the same position they have long occupied in consumer-centric industries such as retail.
- The COVID-19 pandemic provided an opportunity to prove how technology could help decrease workforce exposure, create more situational awareness for activities surrounding quarantine wards, and provide remote access for family and friends to those in isolation.

## Obstacles

- Developing smart care venues requires CIOs to get deeper into areas peripheral to their mission — facilities planning and clinical engineering. It is formidable to carry the smart care venue vision through planning and construction and realizing it in day-to-day operations.
- A balance must be struck when creating smart care venues. They must be adaptable to changing requirements and use patterns while improving patient safety, operational efficiency and care quality.
- The cost of smart care venues may be out of reach for many hospitals. In addition to potential capital construction costs, it requires a shift of IT spending away from the electronic health record (EHR) toward investments that more directly support patients and care teams.



## User Recommendations

- Collaboratively craft a smart care venue vision by involving administrative, business, clinical, facilities, and biomedical engineering stakeholders in the planning and design process.
- Carry forward a consistent smart care venue vision throughout the planning, design and construction phases of new buildings and renovations, with an eye toward how they will support day-to-day clinical operations.
- Materialize your smart care venue vision by transforming the conventional patient room with technologies that enable patient personalization, digital interactive patient care and IoT connectivity to drive situational awareness and create flexibility in how the venue can evolve as needed.

## Gartner Recommended Reading

[Real-Time Health System Vision](#)

[Quick Answer: Use RTHS Concepts to Vet Vendor Solutions](#)

[Use Gartner's Model to Assess Real-Time Health System Maturity and Plan Investments](#)

## Sliding into the Trough

### Process Automation for Healthcare

Analysis By: Barry Runyon

**Benefit Rating:** Transformational

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

#### Definition:

Healthcare workflows encompass the tasks that implement healthcare providers' clinical and business functions required to arrange, deliver, manage and coordinate care. Processes contain the workflows to support higher-level clinical and business objectives. Process automation for healthcare is achieved using technologies (e.g., robotic process automation [RPA]), interoperability standards (e.g., open APIs), and platforms (e.g., rule engines).

#### Why This Is Important

- Process automation is critical to advancing digital transformation in healthcare.
- It is in part due to the current state of the healthcare provider where workflows, and clinical and business processes are often siloed, inefficient and uncoordinated.
- Proactive providers focus their process automation efforts on augmenting or eliminating manual, tedious and error-prone workflows, increasing staff productivity, coordinating care, clinical data interchange, and engaging the consumer and patient.

#### Business Impact

Impacts include:

- Process automation removes errors and delays from the health system's critical clinical and business workflows and processes.
- Automation fueled by situational awareness and high-quality operational intelligence reduces care team toil, mitigates staffing shortages and burnout, and removes operational bottlenecks.

- While back-office process automation has been standard among healthcare providers, the automation of clinical and patient-related workflows has gained traction.

## Drivers

- Labor costs, staffing shortages and lower margins drive healthcare providers to investigate and adopt compensating technologies and initiatives that have the potential to reduce uncertainty, contain costs, increase staff retention and enhance morale.
- Process automation is about standardizing the handling of business, clinical and patient events, and well-understood and predictable tasks, workflows and processes to improve process quality and timeliness, reducing manual burden.
- Increased interest and adoption of process automation is a byproduct of the increased availability of higher-quality operational intelligence and actionable insight (e.g., command centers) and rapidly advancing enabling technologies.
- There have been significant advancements in RPA technologies, workflow and inference engines, low-code application platforms, orchestration frameworks, integration platforms, intelligent business process management (BPM) suites, scripting languages, AI, and API management.

## Obstacles

- Many process optimization initiatives fail to deliver the results that business leaders expect because they are poorly scoped and misaligned with the automation technologies intended to enable them.
- Deeply entrenched business and IT cultural barriers inhibit the operating model evolution necessary to foster automation, and impede adoption and scaling.
- Without effective governance, automation digitization efforts increase process and technology environment fragmentation and complexity, which increases long-term technical debt.
- Most IT solution vendors have limited automation functionality that rarely extends beyond their system or platform, making interprocess automation challenging.

## User Recommendations

- Identify workflows that are candidates for process automation. Include those that are well understood, possess error-prone manual tasks or interventions, are driven by predictable events, have quality-related performance requirements, routinely experience processing bottlenecks, and have regulatory, reimbursement or revenue implications.
- Transition management, patient throughput, pharmacy automation, quality reporting, patient engagement, supply chain and medical imaging processes are ideal candidates for automation.
- Develop a digital twin of your enterprise, and use process simulation modeling to reimagine and reengineer critical workflows as a part of a process automation readiness program.
- To support automation ambitions, establish an automation center of excellence (ACOE) with the involvement of key business stakeholders — including risk, security and HR.
- Explore technologies that augment business processes to deliver end-to-end automation — otherwise known as hyperautomation.

## Sample Vendors

Cliniconex; Lumeon; Qventus; Systematic; ThoughtWire

## Gartner Recommended Reading

[Use Gartner's Model to Assess Real-Time Health System Maturity and Plan Investments](#)

## IoT for Healthcare

Analysis By: Gregg Pessin

**Benefit Rating:** Transformational

**Market Penetration:** 20% to 50% of target audience

**Maturity:** Early mainstream

**Definition:**

Internet of Things (IoT) for healthcare is a collection of devices, applications, equipment, appliances and building systems that can connect, communicate, and interoperate within an ecosystem of smart things, using industry standards. IoT for healthcare is foundational to the real-time health system.

**Why This Is Important**

IoT for healthcare is foundational to digital business. IoT provides the digital representation of activities and events in the provider environment, enabling situational awareness. IoT facilitates automation and smart care venues, allowing providers to do more with less. IoT will positively impact healthcare providers' ability to deliver care more efficiently and cost-effectively. Connected things will drive revenue, and improve operational efficiency and asset utilization.

**Business Impact**

IoT for healthcare is a core enabler for healthcare provider digital transformation. IoT provides:

- Improved operations, productivity, efficiency, logistics and coordination.
- Optimized asset utilization, reliability, predictive maintenance and performance management.
- Enhanced remote monitoring in virtual care.
- Increased engagement among care providers, patients and caregivers.
- Improved care delivery and self-care for improved patient wellness, longevity, and quality of life.
- Enhanced security for physical assets and patient safety to reduce risk.

**Drivers**

IoT provides the required informational input that enables digitally transformed healthcare delivery organizations (HDOs). This collected data feeds systems that address core needs of the industry:

- The need to transition clinical operations to population health and value-based models.

- Requirements to transform the orientation of operations around the patient.
- The need to improve operational bottlenecks and the patient journey, which are addressable through the implementation of real-time situational awareness technologies.
- The need to reduce clinical and administrative costs.
- Fiscal pressure to capture revenue opportunities and create new business.

## Obstacles

- Lack of security and privacy measures built into IoT devices creates an additional workload for IT departments.
- IoT populations generally cannot be centrally governed through device policies as other IT devices, such as endpoint computers and mobile devices.
- Internet of Medical Things (IoMT)/cyber-physical system (CPS) selection oversight, during the clinical device acquisition process, is not an IT function. This leaves critical decisions that impact IT to functional departments that may be unable to assess security, privacy and IT operational impacts.
- Creating a patient-centric view remains difficult due to the lack of IoT data standards. Combining multisourced data requires custom integration.

## User Recommendations

- Build business cases with ROI extending across core business processes.
- Engage your customers in solution development and use prototypes to help explore opportunities.
- Ensure architecture teams can incorporate IoT across IT and operational technology (OT) technology stacks.
- Find opportunities to apply IT governance principles to IoT, where the daily operation of IoT lies outside of IT.
- Increase your capabilities to leverage big data cost-effectively.
- Plan to invest in skills and technology to support healthcare-specific IoT platforms and IoT software integration, data and analytics, and managed security solutions.
- Select your technology and service provider partners, based on their technology stack and partner network.
- Ensure end-to-end compliance of your IoT solution with local health information protection legislation.

## Gartner Recommended Reading

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

[Healthcare Delivery Organization IoT Scale Demands a Platform Approach](#)

[Use RTHS Principles to Guide Digital Transformation](#)

## Wayfinding for Healthcare

Analysis By: Gregg Pessin

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

**Definition:**

In their most basic form, wayfinding systems indicate where a user is currently located, provide a way to identify a destination, and provide detailed and continuously updated directions on how to get there. Wayfinding for healthcare enhances the value, scope and convenience of conventional wayfinding, with real-time location data, situational awareness and contextual insight to guide users (i.e., patients, family members and visitors) through their healthcare journey.

**Why This Is Important**

Most hospitals have complex floor plans that can create frustration for patients and visitors trying to find their way. Navigating a hospital or medical center campus should be as easy and convenient as finding your way around a shopping mall. Implementing an integrated wayfinding solution in an “experience” economy that includes consumer and patient location context is fundamental to creating engaging and memorable experiences.

**Business Impact**

Wayfinding for healthcare:

- Is critical for attracting, engaging and retaining patients by making their health journey easier. It solves the fundamental problem of navigating the physical care delivery world.
- Helps understand and optimize patient flow, queue management and care delivery processes.
- Supports referral management processes through improvements in patient navigation and retention.
- Engages patients in a way that enhances their healthcare journey and experience.



## Drivers

- Improving patient engagement through reduced patient stress, anxiety and wait times. In addition, streamlined access to everyday destinations (cafeteria, gift shop and pharmacy).
- Improving employee engagement through decreased staff time spent providing patient directions.
- Creating operational efficiencies by optimizing patient and clinical workflows.
- The need to digitally transform the healthcare delivery organization (HDO) by demonstrating capabilities for digitally enabled consumer-centric experiences. In addition, this technology is used as an onramp to the real-time health system (RTHS).

## Obstacles

- The value delivered by an enhanced patient experience may be difficult to quantify when establishing a business case or calculating a hard ROI.
- Facilitieswide infrastructure requirements for a fully successful wayfinding implementation are challenging due to large campus locations with a mix of facilities, such as parking garages, clinics and hospitals.
- Data streaming can be complex due to infrastructure constraints like multigenerational construction with poor wireless transmissibility.
- HDOs conflate wayfinding with other geospatial data technologies, such as real-time location systems (for example, asset and people tracking), which can mask its differentiating value.

## User Recommendations

- Examine ways to use wayfinding technologies to sense, collect, correlate, analyze and act upon event information, to guide patients from their homes to the provider facility — throughout their entire continuum of care.
- Use wayfinding to make it easy, convenient, and less stressful for patients and consumers to access care and common provider locations, particularly in complex and multifacility campuses. This technology is one way providers can bring consumers to their digital front door.
- Watch for and measure the impact wayfinding technologies have on delivering a positive and memorable consumer and patient experience.
- Technologies, such as Bluetooth low energy (BLE), have been applied to wayfinding, improving accuracy and affordability, and simplifying implementations — look for these solution alternatives.

## Sample Vendors

Everbridge; Eyedog Indoor Navigation; Gozio; Inpixon; Pole Star; Purple Health; Wifarer

## Gartner Recommended Reading

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

[Use RTHS Principles to Guide Digital Transformation](#)

[Magic Quadrant for Indoor Location Services](#)

## RTHS Command Center

Analysis By: Sharon Hakkennes, Gregg Pessin

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

**Definition:**

A real-time healthcare system (RTHS) command center is an enterprise-level composition of clinical, operational and administrative data powered by advanced analytics, including AI, ML and predictive models. As the core of the RTHS platform model, the command center uses real-time operational intelligence to anticipate, optimize and orchestrate healthcare provider enterprise and network resources, workflows, and capacity in response to changing internal and external conditions.

**Why This Is Important**

The rise of RTHS command centers satisfies healthcare provider leadership's need for reliable, real-time operational and clinical intelligence to support proactive, precise, and predictive decision making and interventions. RTHS command centers provide visibility to operational and clinical processes and workflows, enabling a current, integrated, holistic view of these previously disparate domains.

**Business Impact**

Integrated real-time and predictive operational and clinical dashboards applied to high-impact use cases is the ultimate manifestation of the RTHS. They:

- Enable real-time adjustment of operations in response to clinical demand, transforming hospital management and improving patient satisfaction and outcomes.
- Eliminate unjustified variance in processes, quality and cost delivering improvements in operational efficiency, patient throughput, bed capacity and quality of care.

## Drivers

- Progressive healthcare providers recognize the increased value of enterprise command centers over departmental and domain-specific dashboards they have relied on for years.
- The importance of monitoring and understanding the current operational and clinical environment in real time is increasing. This occurs as healthcare providers seek to effectively respond to rapidly changing conditions, manage hospital demand, capacity and patient throughput, improve operational process efficiencies and decrease costs.
- The shift to virtual care models necessitates increased visibility of patients receiving care outside of the four walls of the healthcare facility.
- There is increasing availability and access to data through investment into electronic health records (EHRs) and connected devices, and an associated imperative to deliver value from these investments.
- Hospital mergers and acquisitions and organic growth drive the need for clinical and operational insights at the system level to proactively optimize resource use and maximize clinical outcomes across sites.
- Advances in artificial intelligence (AI) and machine learning (ML) are driving improvements in the relevance and accuracy of predictive algorithms to support proactive, data-driven decision making.

## Obstacles

- Successful implementation relies on solutions informing and helping healthcare providers respond, in real time, to current and future predicted hospital conditions and on reengineering clinical and operational processing for continuous improvement. This represents a fundamental shift in approach for many healthcare providers.
- The value of the insights delivered through the RTHS command center depends on data availability and quality. Healthcare providers continue to experience data quality issues and challenges with access to data across multiple disparate sources in real time. These issues impact the accuracy of underlying algorithms and erode stakeholder trust in outputs.

## User Recommendations

- Set your command center initiative up for success by ensuring executive leadership support and sponsorship. Assemble clinical informatics leaders and operational and clinical subject matter experts to form a command center steering committee.
- Determine the technology design and vendor strategy for your command center by evaluating your organization's requirements against the capabilities of the emerging market.
- Build engagement and trust across stakeholders by selecting pilot use cases linked to organizational strategic priorities, ensuring the availability of high-quality, comprehensive datasets.
- Enable and orchestrate the successful use of an RTHS command center by deploying process engineering capabilities, such as lean principles, across medical, nursing and supporting resource teams.
- Ensure the outputs from the command center drive proactive decision making and actions by embedding alerts and escalation processes into clinical and operational workflows.

## Sample Vendors

Alcidion; Care Logistics; Epic Systems; GE HealthCare; Oracle (Cerner); Qventus; TeleTracking Technologies; VitalHub (Transforming Systems)

## Gartner Recommended Reading

[Innovation Insight for Real-Time Health System Command Center](#)

[Real-Time Health System Vision](#)

[Use Gartner's Model to Assess Real-Time Health System Maturity and Plan Investments](#)

## Patient Privacy Monitoring

Analysis By: Gregg Pessin

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

**Definition:**

Patient privacy monitoring (PPM) is software and services for detecting, analyzing, and managing fraud or misuse across information system users and accounts. PPM is the healthcare industry's implementation of user and entity behavior analytics. PPM is used to monitor and analyze user activity and behavior at the user and application level, as opposed to the system, database or network level. It monitors user activity inside and across accounts.

**Why This Is Important**

PPM can improve a healthcare delivery organization's (HDO's) overall IT governance, risk and compliance posture. Specifically, it reduces the risk of fraud and misuse related to unauthorized disclosures and access to protected health information (PHI) and the significant fines, penalties and damage to brand and reputation that can result. Global trends are moving toward increased patient information sharing year over year, driven by growing health data requirements from systems and devices.

**Business Impact**

The number of end users, systems, services, algorithms and devices within the health system that require access to PHI has increased, along with digital transformation. While ransomware and phishing attacks are most often the headline-stealing cybersecurity threats in healthcare, insider threats are more prevalent and often go undetected. This situation is further exacerbated as more employees and third parties with PHI access requirements work remotely.

## Drivers

- In the healthcare industry, insiders and inadvertent errors cause more data breach damage than external bad actors. Insiders, employees and other intended users of digital care delivery systems, most notably the electronic health record, pose a unique cybersecurity risk to the healthcare provider and the patient.
- The increase in digital care activity has challenged HDO privacy and security resources. Healthcare provider and payer organizations use PPM to detect internal fraud and unauthorized data access to assist with this increased workload. Drug diversion identification and prevention is an example of PPM in practice.
- The evolution of the healthcare provider to a real-time healthcare system (RTHS) is underway. A functional RTHS must support many applications, systems, platforms and devices. The RTHS requires a significant amount of patient information to be readily available to be effective. This requirement exacerbates the fraud and misuse problem, underscoring the need for PPM.

## Obstacles

- HDOs lack a comprehensive strategy and the technical controls to mitigate risk in response to increased insider threats. This is due to factors such as a misunderstanding of PPM capability and chief information security officer skepticism of potential value for the technology.
- PPM technologies require significant integration into HDO IT systems, which is a time and cost barrier for HDOs.

## User Recommendations

- Track and monitor access to PHI by routine examination of the application logs generated by core business and clinical systems. Without a PPM tool, this will be challenging, as there is no application log file format or schema.
- Deploy PPM to recognize, report and become alerted to unauthorized access and disclosure of PHI, and to provide visibility to user access patterns and potentially nefarious insider behavior.
- Favor PPM platforms that employ sophisticated data science techniques, AI technology and tools that optimize PPM forensics.
- Deploy identity governance and administration solutions to ensure safe, compliant, policy-based access by all legitimate users (humans and things) of healthcare provider IT resources.
- Augment PPM with strong authentication measures (such as two-factor authentication/multifactor authentication) and privileged access management for vendors, contractors and third parties.

## Sample Vendors

iatricSystems; Imprivata; Intruno; Protenus; Securolytics; Tausight; Veriphyr

## Gartner Recommended Reading

[Proactively Protect Patient Information With IGA and PPM](#)

[Healthcare Provider Digital Transformation Requires Sophisticated Identity Governance and Administration](#)

## Legacy Decommissioning

Analysis By: Barry Runyon

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream



**Definition:**

Decommissioning a legacy system is often the last step in an application rationalization program. In its most basic incarnation, a legacy decommissioning solution includes a migration or extraction technology, an archive or repository, and a way to access, interoperate, view, and report on the decommissioned data. Some legacy decommissioning solutions map source systems to a proprietary information model, while others move the data to its native format.

**Why This Is Important**

Legacy decommissioning satisfies the need to reduce IT spending with minimum impact on current operations and frees up the IT budget for innovative and transformational initiatives and acquisitions. It creates a repository of patient-centric data for historical and analytical purposes. It fulfills the mandate to preserve patient information in accordance with state, federal, and industry data retention schedules, and if purged, it reduces e-discovery risk.

**Business Impact**

Impacts include:

- Legacy decommissioning can reduce or eliminate costs associated with outmoded or unsupported IT systems, such as licensing, infrastructure, staffing, and maintenance and support.
- Migrating legacy data to a patient-centric archive or repository makes the data available for new purposes without having to keep the source system in service.

**Drivers**

Apart from the requirement to upgrade or replace IT systems as part of an overall application life cycle, the motivation to decommission or retire an IT system includes the following considerations:

- Outdated system functionality that has not kept pace with business or digital transformation requirements.
- Electronic health record (EHR) suite buying that makes it necessary to replace ancillary solutions such as lab, radiology and pharmacy.
- Merger and acquisition activity that requires the rationalization and standardization of the application portfolio.

- Solutions sunsetted by the vendor along with ongoing maintenance and support.
- The adoption of alternative IT service delivery models such as commercial and community hosting arrangements and cloud computing in general.
- Inability or expense required to retrofit a legacy application or system to comply with new industry interoperability requirements.
- Economic downturn that forces the healthcare provider to stop, suspend or scale back existing initiatives.

## Obstacles

While the ROI of legacy decommissioning is one of the easiest to understand and illustrate, legacy decommissioning projects are often long overdue for various reasons:

- The cost and complexity of decommissioning aging niche or defunct systems increase year over year as the technology ages and those who understand the system become more scarce.
- Decommissioning investments do not compete favorably with investments in innovation and digital transformation.
- Defunct systems can be maintained in a “read only” mode until their final disposition is determined and tends to justify deferring decommissioning.
- Without a formal application retirement or rationalization program, the CIO lacks adequate visibility into the nature and costs of these orphaned systems.
- Industry data retention requirements and reconciling patient identities can complicate legacy decommissioning initiatives and add to total cost of ownership (TCO).
- Aging systems that remain in use for annual regulatory reporting tend to avoid decommissioning.

## User Recommendations

- Establish a business case for decommissioning legacy IT by actively rationalizing your application portfolio, looking for opportunities to cut or contain costs and improve IT service delivery.
- Identify and prioritize decommissioning candidates using criteria considering software, hardware and support costs, contractual terms and conditions, and technical and compliance risks.
- Reinforce your decommissioning business case and achieve an early ROI by focusing decommissioning efforts on systems representing the highest cost and contractual overheads. Identify savings opportunities by matching systems with the highest fixed costs retained only for historical data access.
- Reduce discovery risk and data management costs by archiving (and potentially purging) legacy data based on recognized industry data retention guidelines during decommissioning.

## Sample Vendors

Clearsense; DataNovata; ELLKAY; Galen Healthcare Solutions; Harmony Healthcare IT; Informatica; Legacy Data Access; MediQuant; Olah Healthcare Technology

## Gartner Recommended Reading

[Quick Answer: Healthcare Provider CIOs Should Stop, Suspend and Scale Back Projects to Reduce Costs](#)

[Decommission Legacy IT Now to Make Room for Innovation and Digital Transformation](#)

## C/EM for Healthcare

Analysis By: Barry Runyon

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

**Definition:**

Crisis/Emergency management (C/EM) for healthcare distributes and directs information, communications, tasks and resources during a crisis or emergency. C/EM systems share essential information and help marshal resources to contain and minimize the impact of emergencies such as security breaches, weather events, mass casualties, epidemics, active shooters and infrastructure failures on health systems.

**Why This Is Important**

If a crisis or emergency is not managed promptly and effectively, public safety can be compromised, reputation can be damaged, and operations and revenue can be negatively impacted. To that end, C/EM includes essential capabilities to contain and manage emergencies, such as traceable and multimodal communications, virtual command and control, vulnerability assessment, resource tracking, workforce scheduling, social media analysis, data visualization and government compliance reporting.

**Business Impact**

C/EM for healthcare:

- Rapidly mobilizes appropriate staff and resources to respond to unplanned critical events and ensure the continuity of operations and patient care for the duration.
- Enables healthcare providers to enforce standardized, best-practice C/EM response procedures, processes and communications.
- Increases crisis/incident command and controls efficiency through continual progress assessment, postincident review and regulatory reporting.

## Drivers

- There has been a noticeable increase in local and regional crises and emergencies resulting from climate change, infectious disease, and economic and social upheaval.
- Healthcare providers are essential to the community's response to a crisis, providing care to the influx of sick, displaced and injured people resulting from a crisis or incident.
- Like any other business, healthcare providers must also contain and minimize the impact of a crisis that may impair their ability to deliver care and remain financially viable.
- C/EM extends beyond the coordination activities associated with classic emergency scenarios to address the operational challenges within the hospital that impact the effective delivery of care.
- C/EM systems were proven helpful to healthcare providers in responding to the pandemic by facilitating real-time communication and collaboration between operations, care teams and community resources.

## Obstacles

- Like business continuity and disaster recovery initiatives, C/EM is a hard sell to health system CFOs demanding a documented ROI.
- C/EM is a cost center and competes for a budget with systems that generate revenue.
- C/EM often lacks an influential domain champion within the health system C-suite.
- C/EM is perceived as a systematic response to threats from outside the enterprise versus within, therefore less likely to be required.

## User Recommendations

- Adopt a C/EM solution that is interoperable with regional public service protocols to ensure timely and efficient responses that minimize damage and shorten recovery time.
- Select a platform that adheres to public-sector crisis/incident protocols relevant to the geographic regions in which the solution is deployed (for example, National Incident Management System [NIMS]/Incident Command System [ICS]).
- Match the C/EM platform selection to your most critical industry and regulatory prescribed process and reporting rules to ensure the safety of the citizen, customer, patient and workforce. For example, U.S. healthcare providers should review the Centers for Medicare & Medicaid Services (CMS) guidance on handling and reporting privacy incidents involving personally identifiable information.
- Tie C/EM adoption to a larger business continuity management strategy, risk management initiative or enterprise command center deployment.

## Sample Vendors

Everbridge; Juvare; Noggin; OnPage; Rave Mobile Safety; Veoci

## Enterprise Imaging Platforms

Analysis By: Barry Runyon

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

### Definition:

Enterprise imaging is a strategy that specifies how medical imaging content is governed, captured, stored, viewed, managed, exchanged, and shared across all service lines, facilities, external partners, caregivers, and patients. An enterprise imaging platform implements this strategy, including departmental PACS, VNAs, diagnostic and enterprise viewers, enterprise worklists, image intake and sharing, and advanced visualization tools.

## Why This Is Important

Enterprise imaging (EI) increases the value and use of medical imaging data by making it patient-centric and interoperable. It enables centralized storage and access to medical images for historical comparison, second opinions, and integration with clinical systems, third-party mobile apps, and health information exchange platforms. An EI platform functions as a data management layer to normalize and standardize medical image metadata, making downstream reuse such as machine learning possible.

## Business Impact

Impacts include:

- Stem the proliferation of departmental picture archiving and communication systems (PACS), associated archives and viewing solutions.
- Support remote reading and image sharing with community providers.
- Image-enable the electronic health record (EHR), clinical workflows, and mobile apps.
- Better manage the scope of enterprise medical imaging content (e.g., x-ray, CT, MRI, smartphone, etc.) acquired from digital imaging and communications in medicine (DICOM) and non-DICOM modalities.

## Drivers

- Health system mergers and acquisitions and accompanying medical imaging portfolio consolidation.
- PACS replacement activity creating opportunities to deconstruct PACS with vendor-neutral archive (VNA) components.
- Image-enabling the EHR and third-party apps for care collaboration and patient engagement.
- Increasing image-sharing requirements with community physicians, family and patients.
- Conformance with medical imaging interoperability standards (e.g., DICOM, fast healthcare interoperability resources [FHIR], integrating the healthcare enterprise [IHE]).
- Remote reading requirements independent of their source PACS and proprietary viewers.
- Adherence to local, national and industry data retention requirements.
- Disaster recovery and business continuity management service level requirements.
- Population health and advanced analytics initiatives that require patient-centric access.
- Sharing of patient-centric images and studies with local, regional and state health information exchanges (HIEs) for care coordination.
- The PACS and VNA vendors have embraced the enterprise imaging concept and approach.
- PACS vendors have enhanced their archives with vendor-neutral capabilities.
- VNA vendors have begun to deconstruct PACS for the same reason.
- The need to improve radiology productivity through remote radiology reading and reporting.
- The persistent requirement to improve the enterprise's disaster recovery posture.



## Obstacles

- Confusing and misleading vendor messaging from both PACS and VNA vendors that claim to be EI platforms.
- Lack of understanding of the overall EI value proposition by healthcare provider stakeholders and leadership.
- Significant cost and complexity of EI deployments and associated legacy data migration.
- Resistance to change by departmental PACS administrators and medical imaging specialists.

## User Recommendations

- Deploy an EI platform to increase the governance, control, integration, and sharing of all DICOM and non-DICOM medical imaging data and related unstructured content.
- Identify tangible sources of efficiencies, savings and revenue from deploying an EI platform to bolster the business case.
- Select an EI platform that can: (1) leverage your storage and network infrastructure, (2) supports common industry medical imaging interoperability standards, (3) enable diagnostic and universal zero-footprint viewing, (4) support remote reading and reporting, (5) image-enabled EHR, mobile applications, and clinical workflows, (5) provide advanced visualization tools (e.g., 3D viewing, AI-enhanced interpretation), (6) implement enterprise worklist processing, (7) support various IT service delivery models (on-premises, cloud, hybrid cloud), and (8) possesses robust image intake and sharing capabilities.

## Sample Vendors

Canon Medical; Change Healthcare; Fujifilm; Hyland Software; Intelrad; Merative, Novarad; Philips; Sectra; Visage Imaging

## Gartner Recommended Reading

[Quick Answer: What Is Enterprise Imaging?](#)

[Quick Answer: What Is a Deconstructed Picture Archiving and Communication System?](#)

## Climbing the Slope

### Patient Throughput and Capacity Management

Analysis By: Barry Runyon

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

#### **Definition:**

Patient throughput and capacity management (PTCM) is an interoperable application ecosystem that offers a less-siloed approach to managing patient flow, care transition and capacity challenges. PTCM anticipates demand, monitors throughput, alerts to bottlenecks and issues, and balances hospital resources with needs as circumstances change. PTCM systems include admissions, bed management, patient flow, transfer center, resource scheduling, discharge processing and postacute care coordination.

#### **Why This Is Important**

Monitoring and managing patient flow and capacity are persistent healthcare provider challenges, and optimizing the use of facilities, staff and equipment remains a healthcare provider's operational priority. While many healthcare providers have invested in stand-alone bed management and patient flow solutions, PTCM represents a more integrated, holistic and strategic approach.

#### **Business Impact**

The PTCM value proposition includes:

- Advancing clinical operations performance and key performance measures (e.g., bed occupancy rate, length of stay and time to service).
- Delivering higher patient throughput, enhanced resource utilization and revenue at lower resource costs by eliminating waste and delays.
- Facilitating value-based care payment models favorable to PTCM key performance measures.
- Addressing staffing shortages (doing more with less) and clinical burnout (streamlining workflows).

## Drivers

- Looming economic downturn and inflationary pressures.
- Labor and supply chain shortages that can be ameliorated by automation.
- The need to improve patient-related key performance measures (e.g., patient satisfaction scores and wait times).
- The need to improve enterprise key performance measures (e.g., bed occupancy rate and length of stay).
- The need to increase patient days and recover revenue impacted by the COVID-19 pandemic.
- Increased adoption of command centers and enterprisewide performance dashboards giving rise to potential operational bottlenecks and opportunities for improvement.
- Advances in location services and associated technologies (e.g., Bluetooth low energy) and real-time analytics that position and track patients, care team members and equipment.

## Obstacles

- Lack of pervasive sensor and Internet of Things (IoT) technology necessary to acquire real-time presence and location telemetry data to inform real-time operational intelligence and analytics.
- The requisite reorganization and centralization of PTCM responsibilities (e.g., bed assignments) required to leverage PTCM interoperable application ecosystem (IAE) capabilities.
- Delays in the delivery of vendor R&D in areas, such as predictive analytics, open interoperability standards, acquisition and integration of situational awareness data for real-time decision making, and shortages of proof-of-value pilots and references.
- Overreliance on incumbent electronic health record (EHR) vendors for PTCM capabilities.
- Cost and complexity of PTCM interoperability and automation requirements.

## User Recommendations

- Establish an enterprisewide PTCM strategy and roadmap by engaging key stakeholders in areas like admissions/discharge/transfer, transition management, referral management, transfer center, discharge planning, nursing operations and the emergency department.
- Align health system leadership by activating PTCM champions to socialize the PTCM value proposition.
- Share data and work among the component systems within the PTCM IAE by updating or replacing conventional message brokering technology with open interoperability support, such as Health Level Seven (HL7) Fast Healthcare Interoperability Resources (FHIR) and event-driven automation.
- Select individual PTCM component solutions with the strategic intention and forward-looking product roadmaps and architectures necessary to fulfill your broader PTCM strategic vision.

## Sample Vendors

ABOUT; BedWatch; Care Logistics; DECISIO Health; GE HealthCare; LeanTaaS; Philips; QGenda; TeleTracking Technologies

## Gartner Recommended Reading

[Put Patient Throughput and Capacity Management at the Center of Your Performance Improvement Plan](#)

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

[Innovation Insight for Real-Time Health System Command Center](#)

## Positive Patient Identification

Analysis By: Roger Benn, Gregg Pessin

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

**Definition:**

Positive patient identification (PPID) is the acquisition and application of information that uniquely identifies a patient. This information is acquired through evidence (e.g., government-issued cards) or identity biometrics (e.g., vascular scanning), then associated with a unique patient identifier (e.g., medical record number) and encoded on bracelets and tags attached to the patient. These tokens are used in workflows, such as medication administration and identity proofing.

**Why This Is Important**

PPID is essential to patient safety and quality care outcomes. Once a patient has been positively identified, all subsequent encounters and related workflows become safer and more efficient. PPID's value proposition includes the systematic reduction of medical errors and the mitigation of potential healthcare and liability issues associated with misidentifying a patient under treatment.

**Business Impact**

Healthcare provider organizations benefit from implementing PPID as it:

- Improves data integrity and operational efficiency by reducing errors during administrative and clinical workflows.
- Increases patient satisfaction by reducing obtaining the same information multiple times.
- Reduces the number of duplicate medical records in an electronic health record (EHR).
- Improves adherence to regulatory compliance and industry standards for safety and care.
- Reduces medical fraud, waste, abuse and adverse drug events.

## Drivers

- Use cases for using PPID with touchless patient identification using palm scanners emerged through greater demand for cleanliness and safety.
- With HDOs' growing focus on patient experience and care delivery everywhere, PPID becomes a critical step when providing remote access (such as telehealth to patients on their devices).
- PPID improves patient safety and patient satisfaction.
- Challenges with staff efficiency and morale through systemic workflow.
- Significant number of adverse drug events caused by errors in the administration of medications.
- In terms of solution providers, we see continued merger activities from market players on updating/launching new features, such as Zebra Technologies acquiring SAVI Technology.

## Obstacles

- Legacy technologies such as bar codes and bracelets are still considered "good enough" by healthcare provider clinical and business leadership, which is leading to slower adoption.
- Using RFID for PPID is often associated with higher technology costs and supporting infrastructure complexity. Reusable RFID tags come at higher prices than conventional bar code technology (e.g., tags, readers, middleware) and support network infrastructure.
- Cost and complexity of integration with administrative and clinical workflows and IT systems.
- Challenge in demonstrating a measurable ROI on PPID investments.
- Challenges with developing fully capable "fallback" workflows or "backup" plans causes hesitation in full adoption.

## User Recommendations

- Create a PPID strategy. Decide what components to include in your PPID approaches, such as wristband systems, data encoding and payload, scanning/reading devices, and printers.
- Pursue a vendor-neutral environment in which various PPID systems can interoperate, as an enterprisewide approach to PPID may not be appropriate for all patient venues, encounters and workflows.
- Favor bar codes over RFID to satisfy most of your PPID use cases, but expect to replace bar codes with RFID or use combined bar code/RFID wristbands once the technology becomes more cost-effective.
- Start evaluating and piloting identity biometrics (e.g., iris or palm vein scanning) for HDO use cases (e.g., registration, medication, transfusion and diagnostic testing) that present the most potential risk to the patient and enterprise.

## Sample Vendors

GBS Corporation; General Data; Honeywell; Imprivata; MSoft eSolutions; RightPatient; Zebra Technologies

## Gartner Recommended Reading

[Prepare Now for the U.S. National Patient Identifier](#)

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

## Resource Scheduling for Healthcare

Analysis By: Barry Runyon

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

**Definition:**

Resource scheduling is an umbrella term that refers to information systems and services that plan and track the availability of essential human and material healthcare provider resources, such as staff, nurses, physicians, facilities, beds and equipment. It includes standard scheduling systems such as patient, physician and nursing and specialty systems such as patient self-scheduling, on-call, acuity-based, hospitalist, nocturnist, ED, OR, virtual care and scheduling optimization services.

**Why This Is Important**

Resource scheduling systems are at the core of patient access management and contact center activity and clinical workflow and nursing operations optimization. They are foundational to operational efficiency, staff productivity and morale, care-coordination effectiveness, patient throughput and capacity management, facility and equipment utilization, and consumer and patient satisfaction. Interest in resource scheduling has increased along with increased interest in workflow automation.

**Business Impact**

Effective resource scheduling positively impacts:

- Patient satisfaction and quality measures by moving patients through their care journey with the least friction.
- Operational efficiency and asset utilization by optimizing access to critical staff, facilities and equipment based on clinical necessity, agreed-upon rules and historical usage patterns.
- Staff morale and retention through schedules considering business and clinical demands, skills, certifications and individual preferences.

**Drivers**

Resource scheduling solutions address the abiding need for increased efficiencies and optimization in the following healthcare provider disciplines and domains:

- Bed management: Visibility of the current and anticipated status of bed availability based on factors such as acuity levels, case mix and staff availability;
- Capacity management: The ability to support the resource scheduling requirements of the current and predicted census;
- Operating room (OR) management: Optimize OR access, efficiency and utilization;



- Patient access: Timely access to up-to-date provider schedules and on-call status;
- Patient flow: Efficiently transition patients between all care venues, including virtual care;
- Patient throughput: Optimize patient throughput while satisfying care quality and patient satisfaction requirements;
- Staffing: Addresses the severity and pervasiveness of clinical workforce shortages;
- Waiting times: Reduce ambulatory, urgent care and emergency department (ED) waiting times;
- Acuity: Matching staff competence and credentials with the needs of patients and care venues.

## Obstacles

- Increasingly unpredictable patient scheduling requirements due to evolving consumer and workforce expectations.
- Limitations of the reservation-style approach to resource scheduling that has been traditionally employed in the healthcare provider industry. It has become clear that resource scheduling must take a “total experience” approach that balances consumer and employee needs.
- Local, regional, regulatory, and union-mandated staff scheduling rules and constraints limit healthcare providers’ ability to accommodate consumers and patients.
- Acceptance of “good enough” resource scheduling capabilities embedded in clinical software platforms and suites versus best-of-breed solutions.
- Lack of an enterprisewide approach to resources scheduling, resulting in departmental constraints that conflict with organization throughput and capacity objectives and KPIs.

## User Recommendations

- Take inventory of the various resource scheduling systems within the enterprise, and characterize their features, capabilities, effectiveness, and product roadmap.
- Retain those systems that can adapt to increasingly less predictable staffing and scheduling requirements and accurately forecast future demand based on past activity.
- Retain those systems whose product roadmaps are representative of the digital care delivery paradigm shift and are increasingly enabled by automation and AI.
- Ensure retained systems are interoperable (via industry protocols and standards) with application ecosystems that require real-time scheduling intelligence, such as care team collaboration, patient throughput and capacity management, and patient relationship management.

## Sample Vendors

Kyruus; LeanTaaS; PerfectServe (Lightning Bolt Solutions); QGenda; symplr; TigerConnect; UKG

## Gartner Recommended Reading

[Use Gartner's Model to Assess Real-Time Health System Maturity and Plan Investments](#)

## Clinical Communication and Collaboration

Analysis By: Barry Runyon

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

### Definition:

Clinical communication and collaboration (CC&C) systems are mobile platforms used by clinicians, care teams, support staff, patients and caregivers to collaborate on treatment and care activity within ambulatory, acute, postacute and virtual care venues.

## Why This Is Important

CC&C solutions have traditionally facilitated communication among physicians, nurses, allied health and support staff care teams. CC&C increasingly includes patients, caregivers and family members in the care team, making it a viable tool for patient/provider engagement and, in some cases, virtual care. CC&C can positively affect patient safety, care team efficiency, nursing productivity and morale, care coordination, and patient throughput challenges.

## Business Impact

CC&C systems represent the convergence of conventional inpatient communications with modern channels to:

- Access and view critical results
- Collaborate with the care team in real time
- Engage the patient and caregiver in treatment and care
- Enhance the patient experience and reduce care team toil
- Improve patient safety and care quality measures
- Initiate or participate in virtual care encounters
- Manage medical device alarms and notifications
- Optimize care handoffs and transitions

## Drivers

- New care collaboration channels are vital at the point of care and during transitions of care. They are essential to satisfy increased consumer and patient expectations and key care quality performance measures that affect provider reimbursement and revenue.
- Due to the persistent need of healthcare providers to improve operational efficiency, CC&C systems increasingly take advantage of patient data held in systems, such as patient flow, bed management, location services and resource scheduling systems (for example, on-call, physician, nursing).
- Real-time integration with the electronic health record (EHR), application ecosystem partners, such as nurse call, alarms and notifications middleware, and resource scheduling systems provide CC&C systems with the robust patient context necessary to support patient and provider workflows.
- Care teams must collaborate on patient care synchronously (voice) and asynchronously (text), capture and share critical test results, and manage device alarms in real time.
- The COVID-19 pandemic has made facilitating virtual care encounters a critical CC&C capability.

## Obstacles

- **CC&C value proposition** — CC&C is often confused with secure messaging and conventional unified communications services.
- **EHR megasuite dominance** — Megasuite enterprise agreements that include less competitive CC&C solutions constrain CC&C buying by displacing healthcare provider IT budgets for third-party alternatives.
- **Interoperability challenges** — CC&C solutions are part of an emerging care team collaboration ecosystem that includes interactive patient care, nurse call, and alarms and notifications middleware. The ability of CC&C solutions to share data work with adjacent point-of-care systems is critical but not well understood. This confusion contributes to buying hesitancy.
- **Cloud adoption** — Many CC&C systems are deployed in the cloud. CC&C procurements can be deferred or delayed if the healthcare provider does not have experience with cloud deployments or an appreciation of the strategic value of the cloud.

## User Recommendations

- Focus CC&C care team toil reduction initiatives on the tasks that erode nurses' morale and well-being and contribute to clinician burnout.
- Favor CC&C solutions to include patient engagement capabilities to improve care quality, such as pre- and post-treatment follow-up, real-time family and caregiver communications, and virtual bedside rounding.
- Improve care team collaboration by deploying CC&C solutions that interoperate with nurse call, interactive patient care, resource scheduling systems, and alarms and notification systems.
- Comprehend the vendor product roadmap and associated time frames to determine how closely they align with your business priorities before purchasing a CC&C platform.
- Select a CC&C product offering that aligns with CC&C critical capabilities, including alarm management, analytics/reporting, care team collaboration, critical results, interoperability, patient/family engagement, voice integration, and secure messaging.

## Sample Vendors

Andor Health; DrFirst; Epic Systems; Mobile Heartbeat; OnPage; Oracle (Cerner); PerfectServe; Stryker; symplr; TigerConnect

## Gartner Recommended Reading

[Quick Answer: How Will Clinical Communication and Collaboration Platforms Evolve?](#)

[Magic Quadrant for Clinical Communication and Collaboration](#)

## Unified Communications for Healthcare

Analysis By: Barry Runyon

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

**Definition:**

Unified communications (UC) platforms provide telephony, conferencing, collaboration, messaging and video capabilities as on-premises, hosted and cloud-deployed services. These communication and collaboration channels and technologies are used by healthcare provider call/contact centers, patient engagement applications, clinical communications and collaboration systems, and electronic health record (EHR) platforms to connect care teams, community clinicians, consumers and patients.

**Why This Is Important**

Unified communications systems facilitate communication and collaboration among physicians, nurses and support staff. They enhance patient/provider engagement through call/contact center integration, improving alignment and collaboration with community and affiliated physician networks. They are the common infrastructural underpinnings for clinical communication and collaboration, nurse call, interactive patient care, and virtual care systems.

**Business Impact**

UC plays an important role in healthcare as it:

- Positively affects patient safety, care team efficiency and effectiveness, nursing productivity and morale, care coordination, and patient handoff and throughput challenges.
- Reduces the administrative and operational toil contributing to clinical burnout and staffing shortages.
- Creates new channels to engage the patient and caregiver in their care and treatment, and enables virtual care encounters.

## Drivers

- Persistent need of healthcare providers to improve operational efficiency.
- Increased adoption of mobile devices and platforms to support workforce and care team collaboration.
- The need to contain costs by extending the communication capabilities of legacy systems.
- Provider participation in value-based care (VBC) arrangements driving the need to improve patient experience and care quality measures.
- Clinical staff shortages that continue to drive up labor costs and pressure to do more with less making UC a critical capability.

## Obstacles

- Lack of a formal UC project or program within the enterprise's IT strategy.
- Confusing and overlapping messaging by UC and PBX vendors delaying procurements.
- Lack of a clinical champion to advocate for UC with peers and health system leadership.
- Inadequate stakeholder involvement leading to resistance to potential UC-related workflow changes.
- Lack of appreciation of the strategic value of the cloud and UC-as-a-service (UCaaS) value proposition.

## User Recommendations

- Generate interest and support among enterprise leadership by formally establishing UC as a technology program within your IT strategy.
- Educate leadership about the UC value proposition and the relationship between UC investments and enterprisewide communication collaboration, patient and family engagement, total experience, and virtual care initiatives.
- Decommission aging PBX vendor solutions in favor of next-generation UC or UCaaS platforms.

## Sample Vendors

8x8; Cisco; Microsoft; RingCentral; Zoom Video Communications

## Gartner Recommended Reading

[Magic Quadrant for Unified Communications as a Service, Worldwide](#)



## Entering the Plateau

### Next-Generation Interactive Patient Care

Analysis By: Veronica Walk, Gregg Pessin

**Benefit Rating:** Transformational

**Market Penetration:** 20% to 50% of target audience

**Maturity:** Early mainstream

#### Definition:

Next-generation interactive patient care (IPC) extends IPC beyond its traditional inpatient engagement role in acute care settings. It includes digital capabilities that engage patients, family members and caregivers across the entire care continuum — home, ambulatory, acute and postacute. It retains many of the capabilities of first-generation IPC systems while being increasingly interoperable with applications and systems within the care team collaboration (CTC) application ecosystem.

#### Why This Is Important

Next-generation IPC enhances patient satisfaction and improves care outcomes. Patient experience is not the result of a single encounter but the composite of all administrative, patient management and clinical touchpoints during the care journey. As healthcare providers enter value-based contracts, they increasingly assume financial risk (often related to payer reimbursement rates) for patient experience and care outcomes associated with the entire episode.

#### Business Impact

Healthcare provider organizations can use next-generation IPC to:

- Improve care quality measures, clinical outcomes and patient satisfaction scores.
- Enable continuous care team engagement with patients and proxies during prehospitalization, inpatient stay and postdischarge.
- Reduce care team documentation burden, improve patient education, and enhance care team collaboration and response times.

#### Drivers

- Improving the patient experience and increasing longitudinal patient engagement are top objectives for healthcare provider organizations. Likewise, these objectives are increasingly incentivized through value-based care agreements.
- Patients, as consumers, have heightened expectations for digital interactions and want the flexibility to access care on their preferred device or channel.
- Clinician burnout and workforce shortages continue to challenge the industry. Next-generation IPC helps reduce the burden on the care team and increase workforce capacity by empowering the patient to control their own environment, communicate their needs and participate in care activities.
- As healthcare organizations modernize or build new facilities, next-generation IPC solutions are part of their “hospital of the future” or “smart room” strategies and marketing campaigns.
- IPC vendors are repositioning their solutions as longitudinal patient engagement platforms capable of supporting patients throughout the entire care continuum. They continue to adopt open APIs to share work and data with their ecosystem partners.

## Obstacles

- Next-generation IPC must overcome the traditional view of IPC as merely a source of patient education and entertainment in an acute care setting.
- Taking advantage of IPC interactive capabilities will require a significant investment in high-definition “smart” TVs or tablet devices, and the necessary network infrastructure and bandwidth to ensure these devices are responsive and highly available.
- Next-generation IPC requires interoperability with the CTC and digital front door application ecosystems.
- The digital literacy of healthcare providers’ patient population could impact the next-generation IPC adoption.

## User Recommendations

- Position next-generation IPC solutions as part of your inpatient patient engagement strategy and as part of an enterprise patient engagement strategy. Incorporate next-generation IPC solutions into the plan whenever building or renovating a facility.

- Improve patient satisfaction across their longitudinal journey by leveraging next-generation IPC to improve care coordination, providing pre- and posthospitalization support and engaging with patients outside the hospital.
- Contain costs and improve time to value by selecting next-generation IPC solutions that leverage existing technology infrastructure.
- Evaluate next-generation IPC solutions on their ability to interoperate with existing CTC solutions to improve the coordination and exchange of information between the care team and the patient.
- Prioritize vendors offering integrated analytics and data sharing with revenue cycle management systems to understand better staff utilization, tasks, costs and capacity planning.

## Sample Vendors

Aceso; eVideon; ExtendedCare; Get Well; Lincor; Oneview Healthcare; pCare

## Gartner Recommended Reading

[Market Guide for Next-Generation Interactive Patient Care](#)

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

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

[Quick Answer: What Technologies Can Reduce Clinician Burnout and Increase Workforce Capacity?](#)

[Next-Generation Interactive Patient Care: Win More Deals by Meeting Healthcare Buyers' Requirements](#)

## Health Information Exchange

Analysis By: Barry Runyon

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

**Maturity:** Mature mainstream

**Definition:**

A health information exchange (HIE) is an interoperability, data management and information-sharing platform. It facilitates the secure interchange of patient electronic health information among independent healthcare entities, such as providers, payers, diagnostic laboratories, public health agencies, trust networks and other HIEs. HIEs employ purpose-built technology platforms to acquire, aggregate, archive, enrich, analyze and share EHI among legitimate stakeholders.

**Why This Is Important**

The HIE value proposition centers on the timely distribution and sharing of patient information, intended to improve the safety, quality, continuity and cost of care. Access to up-to-date longitudinal views of patient medical records can reduce medical errors and mitigate redundant diagnostic testing. In the U.S., HIEs that provide access to patient-centric, normalized clinical and social determinants of health data form the basis of a ubiquitous national health information network (NHIN).

**Business Impact**

Participating in local/private, regional and state-sponsored HIEs provides:

- Timely patient information sharing among vested stakeholders that optimizes patient management processes and reduces readmissions through improved care coordination.
- Access to up-to-date health records that mitigates the risk and expense of unnecessary diagnostic testing.
- Secure health data exchange that facilitates population health management and value-based care initiatives and forms the basis of the NHIN.

## Drivers

- HIEs address the abiding need to manage and coordinate care across various care venues and care teams — from primary care to acute care and postacute care settings.
- HIEs facilitate care transitions across settings by pushing patient event notifications (e.g., admission, discharge and transfer [ADT] messages), provider alerts and associated data.
- HIEs provide a complete picture of a patient's health and can inform clinicians about the patient's medical history, past encounters and individual preferences, including health problems, allergies and medication lists.
- Where other laws or regulations do not govern consent, an HIE can capture and enforce a consistent consent model and enable access to information about a patient's care preferences and advance directives.
- The population-level data and analytics captured by HIE activity are essential for managing chronic and high-risk patient populations, and informing public and community health program requirements and planning.
- In the U.S., HIEs are poised to become essential as the federal government continues to promote interoperability and information sharing (e.g., the Trusted Exchange Framework and Common Agreement) and actively enforce information blocking rules, as mandated by the 21st Century Cures Act.

## Obstacles

- HIE provider participants can be competitors, especially those serving the same patient population — a disincentive for HIE participation.
- Operational HIEs often lack a sustainable business model or funding source. Many pursue new revenue opportunities, such as data management, quality and analytics, and direct-to-patient and consumer services.
- Data quality and semantic obstacles must be overcome to establish high confidence in HIE-provisioned patient information.
- Opt-in and opt-out consent models are insufficient for ensuring patient privacy, and HIEs will be challenged to implement more-granular consent management.
- HIE technology platforms are costly and complex to implement, maintain, and support. IT service delivery models, such as the cloud and managed services operational models, can mitigate these challenges but will increase HIE costs.
- Attracting and safely including the patient, family and caregiver as HIE users will require B2C capabilities that most HIEs lack.

## User Recommendations

- Predicate all HIE involvement on clear, pragmatic and achievable information-sharing goals.
- Favor HIE platform vendors with a global presence and deep experience in standards-based healthcare interfacing, interoperability, clinical data exchange and large-scale workflows.
- Join or monitor the proceedings of the Strategic Health Information Exchange Collaborative (SHIEC). SHIEC is a good source of industry information and HIE best practices.
- Plan to participate in a local or regional HIE. U.S. healthcare providers increasingly see the value of exchanging patient data with community physicians and public health agencies.

## Sample Vendors

Change Healthcare; Deloitte; Epic; Health Catalyst; Infor; InterSystems; NextGen Healthcare; Oracle (Cerner); Veradigm

## Gartner Recommended Reading

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

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

## 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](#)

## Content Services Platforms for Healthcare

Analysis By: Barry Runyon

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

**Definition:**

Content service platforms (CSPs) for healthcare are next-generation enterprise content management (ECM) platforms used to create, store, distribute, discover, archive and manage unstructured content for operational and clinical purposes. CSPs use repositories, workflow engines, database and system connectors, messaging interfaces, and APIs to do their work. CSP use cases include document and records management, back-office automation, e-discovery, and workforce collaboration.

**Why This Is Important**

The growing volume of healthcare providers' unstructured content must be managed for clinical, operational, administrative and compliance needs. Unstructured clinical content must be linked to the patient's electronic health record (EHR). Unstructured content housed and maintained by CSPs includes output from office productivity tools (such as Microsoft 365), scanned documents, clinical documentation, reports, and non-Digital Imaging and Communications in Medicine (non-DICOM) images.

**Business Impact**

CSPs significantly impact healthcare:

- CSPs continue to displace departmental document management systems to automate vertical business processes and satisfy workflow and data management requirements for regulatory compliance, e-discovery and intranet, website, and portal publishing.
- CSPs complement EHR systems by linking structured transactional patient data with unstructured data captured and managed outside the EHR (such as unstructured content acquired during virtual care encounters).

## Drivers

- CSPs supersede document management and ECM systems. Document management and ECM focused primarily on being a monolithic repository with limited support for line-of-business applications (such as the EHR). In contrast, the CSPs focus on integrating these applications and coexisting as foundational platforms.
- Healthcare delivery organizations (HDOs) are moving toward an enterprisewide approach to document management. All unstructured data acquired during care delivery is increasingly organized around the patient and indexed to discrete data obtained and housed by patient management, operational and clinical applications, messaging interfaces, APIs, and health information exchange.
- The business value and use of unstructured data continue to increase in importance, with the recognition that unstructured content is a rich source of operational and clinical intelligence.
- Technologies and tools available to mine and gain insight from unstructured data (for example, natural language processing [NLP], optical character reading [OCR], machine learning [ML]/AI, interoperability advances) are more accessible (low code) and reliable.
- A large percentage of the longitudinal medical record consists of unstructured data. E-discovery and legal hold requirements in healthcare providers continue unabated.
- Without a vendor-neutral archive (VNA), the CSP platform can house non-DICOM images and media.

## Obstacles

- The lack of an enterprisewide strategy and approach to document management.
- HDOs still have multiple departmental document management systems embedded in their various administrative, business and clinical workflows. These are challenging to discover and disrupt.
- Decommissioning legacy document management systems and migrating their contents to new platforms can be complex and costly. Solution vendors often have “good enough” capabilities to store and integrate unstructured data, such as binary large object (BLOB) repositories.

## User Recommendations

- Take inventory of your niche departmental document and content management systems to identify candidates for decommissioning and replacement by an enterprise CSP platform.
- Identify line-of-business applications that work with business documents and ensure the foundational CSP supports the most critical applications.
- Move unstructured content stored on file servers and in niche departmental document management applications to a CSP, so that this content can be accessed and managed at an enterprise level.
- Position CSP as an essential and strategic component of an enterprisewide information infrastructure supporting your business and clinical applications, workflows, and digital transformation initiatives.

## Sample Vendors

Box; Hyland Software; IBM; Kofax; Laserfiche; Microsoft; OpenText

## Gartner Recommended Reading

[Magic Quadrant for Content Services Platforms](#)

## Appendixes

See the previous Hype Cycle: [Hype Cycle for Real-Time Health System Technologies, 2022](#)

## Hype Cycle Phases, Benefit Ratings and Maturity Levels

**Table 2: Hype Cycle Phases**

(Enlarged table in Appendix)

<i>Phase</i> ↓	<i>Definition</i> ↓
<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 constraints replacement	Maintenance revenue focus
<i>Obsolete</i>	Rarely used	Used/resale market only

Source: Gartner (July 2023)

## Document Revision History

[Hype Cycle for Real-Time Health System Technologies, 2022 - 24 June 2022](#)

[Hype Cycle for Real-Time Health System Technologies, 2021 - 12 July 2021](#)

[Hype Cycle for Real-Time Health System Technologies, 2020 - 8 July 2020](#)

[Hype Cycle for Real-Time Health System Technologies, 2019 - 26 June 2019](#)

[Hype Cycle for Real-Time Health System Technologies, 2018 - 25 July 2018](#)

[Hype Cycle for Real-Time Health System Technologies, 2017 - 17 July 2017](#)

[Hype Cycle for Real-Time Health System Technologies, 2016 - 12 July 2016](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2015 - 2 July 2015](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2014 - 24 July 2014](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2013 - 31 July 2013](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2012 - 31 July 2012](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2011 - 4 August 2011](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2010 - 26 July 2010](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2009 - 28 July 2009](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2008 - 25 June 2008](#)

[Hype Cycle for Healthcare Provider Technologies and Standards, 2007 - 11 July 2007](#)

[Hype Cycle for Healthcare Provider Technologies, 2006 - 3 July 2006](#)

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## 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](#)

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

[Use Gartner's Model to Assess Real-Time Health System Maturity and Plan Investments](#)

[Emerging Technologies and Trends Impact Radar: The Real-Time Health System](#)

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Table 1: Priority Matrix for Real-Time Health System Technologies, 2023

Benefit ↓	Years to Mainstream Adoption			
	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational		Clinical Communication and Collaboration IoT for Healthcare Next-Generation Interactive Patient Care	Ambient Intelligence for Healthcare Care Team Collaboration Next-Generation Nurse Call Patient Event Bus Process Automation for Healthcare RTHS Platform RTHS Supply Chain Smart Care Venues	Digital Twins for Healthcare
High	Health Information Exchange	Content Services Platforms for Healthcare Enterprise Imaging Platforms Healthcare Interoperability Positive Patient Identification Resource Scheduling for Healthcare RTHS Command Center Unified Communications for Healthcare	API Management for Healthcare CIAM for Healthcare CPS Risk Management for Healthcare Next-Generation Contact Center Next-Generation EMPI Patient Throughput and Capacity Management	

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Moderate		C/EM for Healthcare	Legacy Decommissioning Patient Privacy Monitoring Wayfinding for Healthcare	
Low				

Source: Gartner (July 2023)

Table 2: Hype Cycle Phases

Phase ↓	Definition ↓
<i>Innovation Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
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<i>Years to Mainstream Adoption</i>	The time required for the innovation to reach the Plateau of Productivity.

Phase ↓

Definition ↓

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

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Source: Gartner (July 2023)

Table 4: Maturity Levels

Maturity Levels ↓	Status ↓	Products/Vendors ↓
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Source: Gartner (July 2023)