



**Harbinger  
Group**

# **BUILDING TECHNICAL CAPABILITIES**

to Augment Remote Patient  
Engagement

---

White Paper 2021

# TABLE OF CONTENTS


01	Abstract	
02	Situation Overview	
03	Transformation Post Pandemic	
04	Remote Patient Engagement Model	<ul style="list-style-type: none"><li>Connected Healthcare Ecosystem</li><li>Data and Information Security</li><li>Remote Care and Monitoring</li></ul>
05	Conclusion	<ul style="list-style-type: none"><li>Key Takeaways</li></ul>

# Abstract

The healthcare industry is witnessing accelerated technological disruptions to align with the evolving need of a patient-centric system. All the healthcare stakeholders, including government bodies, are coming up with several proactive initiatives not only to improve quality of care but also to reduce healthcare cost. A substantial body of research and studies establish beyond any doubt that this can be achieved through effective patient engagement and care. The challenge posed by the Pandemic of 2020 has given further impetus to the movement.

In the given situation, the healthcare industry is poised for a technological transformation. We believe that this revolution will pivot around the need for a connected ecosystem mandating data sharing, integrated data / information security across multiple platforms/devices/entities, as also a vibrant framework for remote care and monitoring.

**This white paper examines three technological approaches that are best recommended to build remote patient engagement model**

Read on to get informative insights. 



# Situation Overview



Modern healthcare is becoming complex day by day as the ecosystem needs to cater to constantly emerging challenges in the form of rapidly evolving care models, scalability of patient care in face of population diversity, and accelerating cost of healthcare IT. An integral component that spans across all this is the common denominator - patient involvement.

The goal is to encourage active participation of patients in making decisions related to every little aspect in their care journey.

This gives them a better understanding of their health conditions and helps garner stronger commitment to the rehabilitation process.

CMS (Centers of Medicare & Medicaid Services) and government bodies have taken several proactive initiatives to make healthcare increasingly patient-centric. Initiatives like Meaningful Use, PCMH (Patient-Centered Medical Home), and MACRA (Medicare Access and CHIP Reauthorization Act) are focused on better outcomes and quality of service, at a reduced cost. The ACA (Affordable Care Act) links patient experience and shared decision-making goals to reimbursements in Medicare. It is also proven that organizations scoring high in patient-satisfaction surveys were the ones that instituted and followed best practices for care quality improvements, on an ongoing basis.

Achieving the ideal patient-centric healthcare ecosystem has been a gradual process because it requires significant changes in the infrastructure, overall operations, and patient education. The good part is that the challenges posed by the pandemic of 2020 have given this process a strong impetus

# In a study conducted

to establish the importance of patient engagement in health care and the benefits accrued thereof, 60,185 patients were divided into two groups. One group received “usual” support from health coaches, while the other group received “enhanced” support. The study generated patient engagement outcomes across multiple metrics.

For patients who received enhanced support instead of usual support:

- Total medical costs were reduced by 5.3 percent
- Surgeries were reduced by 9.9 percent
- Inpatient admissions were 12.5 percent lower
- Heart surgeries were reduced by 10.9 percent
- ER visits were reduced by 2.6 percent

From this and many such similar studies that have been undertaken, it can conclusively be deduced that patients and providers can positively impact healthcare costs and patient outcomes through patient engagement.

# Transformation Post Pandemic



The pandemic of 2020 has had a long-lasting effect on the overall healthcare ecosystem. In pre-pandemic days healthcare industry consisted of multiple systems operating independently in conjunction with each other and the patient care management lifecycle was heavily dependent on human interactions. The outbreak of the corona virus brought social distancing and lockdowns that forced the industry to shift to remote care, tele health and mobile health. With the option of in-person engagements forced out, the overall user behavior underwent a drastic change too.

In this changed situation, the healthcare industry had to mitigate the following critical challenges that the situation imposed:

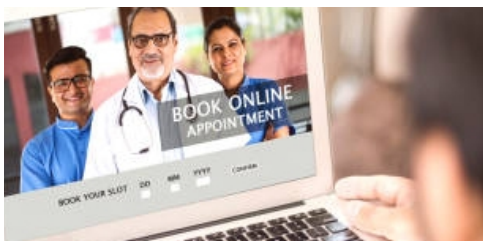
- Patients were required to be treated and monitored remotely using tools like Telehealth and Remote Patient Monitoring (RPM).
- CMS deemed it necessary for hospitals to reduce readmissions under Hospital Readmission Reduction Program (HRRP). During the pandemic, this was a bigger challenge and the need for better communication and care coordination towards improved patient engagement was felt. It was also necessary to identify and discourage non-urgent or non-mandatory hospitalization as well as re-admission in hospitals.
- Medical professionals' bandwidth was critical for pandemic care. Therefore, the other non-essential, 'not so urgent' needs were put on hold.
- Patient engagement became more challenging as the system needed to cater to remote engagement.
- As a result of the patient data being locked in different disconnected systems, patients were either getting incomplete care details, or they were inundated by too much information from many different systems.



All these challenges resulted in increased demand for information exchange between all healthcare systems that were erstwhile operating in silos. Increased use of healthcare devices and applications in care management also posed immediate concerns vis-à-vis data security.

A quick reset in behavior was also forced on the healthcare professionals who had to adapt to new changes as they realized the inadequacy of existing care and engagement models. Newer options like telehealth and remote monitoring were accepted and adopted by healthcare providers and patients, with supportive response from insurance companies.

The healthcare industry is now poised for another technology transformation that will pivot around the following essentials:



Need for a connected healthcare ecosystem where data and information are shared across multiple platforms, devices, and stakeholders.



Need for better and integrated data and information security across multiple devices and patient's private networks along with all other stakeholders that may be involved in the patient's care.



Need for remote care and monitoring with a faster turnaround to take care of emergencies.



# Remote Patient Engagement Model



To augment healthcare in the prevailing pandemic situation and even after that, there has been an emergence of a lot of connected health devices and remote patient monitoring technologies that can equip the healthcare practitioners, providers, and patients with remote consultative capabilities. These not just entail providing health measures to patients but also transmitting relevant data back to providers, thus facilitating sharing and making of healthcare decisions from a distance.

The primary requisite of a remote patient engagement model is that the hospitals and clinicians need to offer patients access to their health data and allow them to participate in their care journey.

The whole idea is to keep patients as informed as possible about their options for treatment, medications, recuperation, and all other aspects related to the healthcare system supporting them. To accomplish this the system must:

- ✓ Allow patients to view, download, and transmit capabilities with their health data
- ✓ Ensure availability and ease of access to educational content in various forms
- ✓ Keep the patients updated on their health status and possible options, to facilitate shared decision making

Most of the players and systems in healthcare are moving towards the goal of better patient engagement with the help of the above best practices.

The following technologies can help build capabilities that can spur healthcare transformation:

- ❑ Connected Healthcare Ecosystem through Interoperability using Integrations
- ❑ Secure Information Exchange with the use of Blockchain
- ❑ Remote Patient Management enabled by various wellness devices, health portals, and techniques like process automation, data analysis, and AI.





# Connected Healthcare Ecosystem

# The Need

A major impediment in achieving remote care management is disconnected systems. They have a negative impact on the quality of care, overall turnaround time, and healthcare cost. While the government has already recognized the need for interoperability for some time now, this still needs a big push.

For patients to get a holistic view of their care, real-time information exchange between all players, including consultants, hospitals, labs, pharmacies, and insurance companies is very much required. It is also recognized that various healthcare apps and wearable devices available for patients can provide valuable information.

Government regulations such as, The Interoperability and Patient Access final rule (CMS-9115-F) provide a helpful framework to define how clinical and administrative information should be exchanged between payers, providers, and patients. This goes a long way in supporting more efficient care coordination.

# The Approach

## Information Exchange through API

The easiest way of information exchange is using API (Application Programming Interface). CMS has advocated the use of API and provided standards like HL7 and FHIR, as a guideline for their creation and use. The APIs used to integrate multiple systems, applications and devices need to be compliant with these standards.

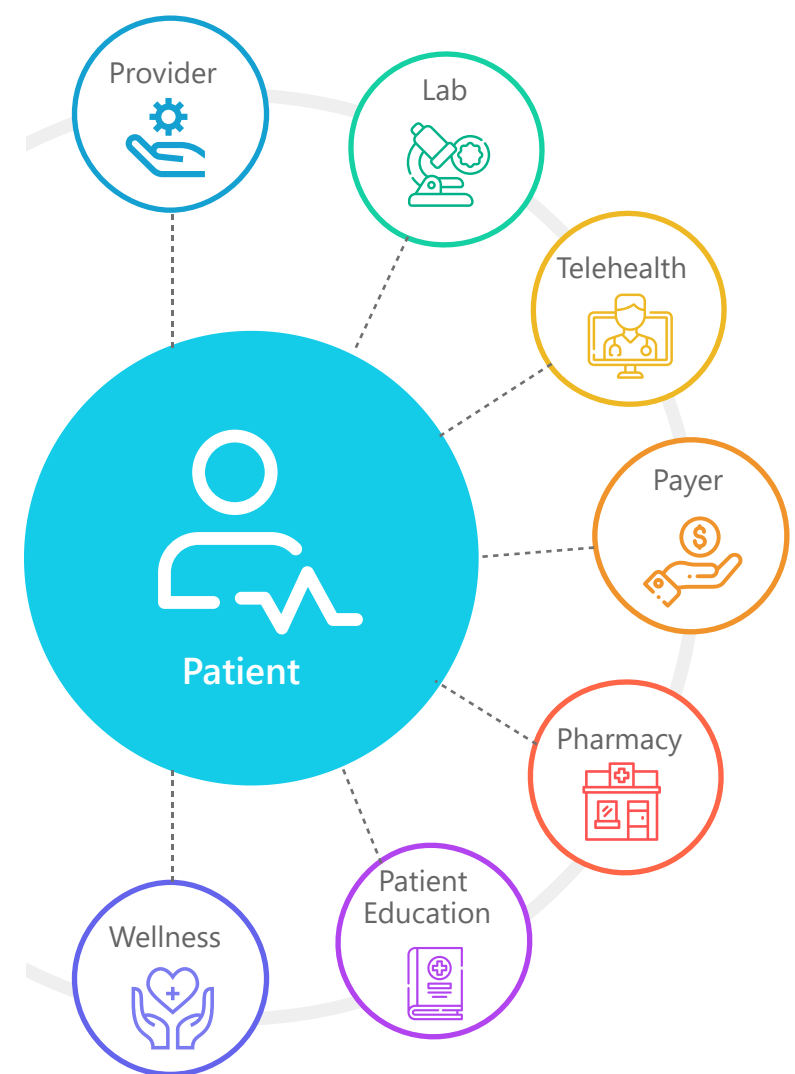


Figure 1: The illustration above identifies multiple sources of information related to patient care. Availability and exchange of all this information helps in stitching the longitudinal view of patient health.

The APIs available in healthcare ecosystem can be categorized into two types -

## 01 EHR and EMR APIs

The government has mandated EHRs and EMRs to enable APIs for quicker data access and exchange across platforms. These APIs (connectors) are built by the EHR and EMR platforms and typically made available through API gateways. These APIs create, update, and retrieve all information related to a patient’s record.

## 02 OpenAPIs

Multiple Open APIs are available for use to augment the healthcare product functionality. Some examples are:

- **Scheduling API** – to schedule patient appointment
- **Ancillary API** – to exchange information not stored in core healthcare systems like, pharmacy, telehealth, labs and so on.
- **IoT and Activity Tracker API** – to get data from wearables and activity tracking devices for health monitoring.

The following table includes examples of some OpenAPIs available at different API marketplaces

Open API	Functionality
Google Cloud Healthcare API	To exchange data between healthcare apps and Google iCloud
Human API	With patient’s prior permission, these APIs collect data from financial claims, medications prescribed by pharmacies, lab tests and others, for further studies
DrChrono API	Billing management platform API
HealthKit API	APIs that work with IoT devices like Apple Watch and iPhone
GE Healthcare API	APIs for healthcare workforce management software
BetterDoctor API	APIs to provide real time attested provider data
Box API	APIs for secure document exchange between healthcare systems

# API Integration Methods

API integration with existing systems can be accomplished in multiple ways as explained in the diagram below.



Figure 2: Multiple ways of API integration

- The link can be a point-to-point integration through connectors. These connectors can be readymade or custom built, taking advantage of APIs or via file transfer.
- Healthcare Interface (integration) engines like Mirth Connect, InterSystems or Rhapsody, solve the problem of sharing and exchanging data between healthcare applications using recommended protocols.
- The use of Enterprise Service Bus Platforms like Dell Boomi can also enable healthcare systems to easily share information. One

has to ensure that all integrations adhere to prescribed healthcare data exchange standards and regulations.

**The healthcare applications and platforms accessible on the internet via cloud or data center are definitely more aligned to the new ecosystem as compared to on-premise stand-alone solutions.**





## Illustration

Healthcare Provider and Payer systems can be integrated with the external ancillary systems. These integrations can be achieved either through custom connectors or by using standard integration engines like Mirth Connect, Rhapsody, Dell Boomi, or others. Some use cases are:

- An Electronic Health Record (EHR) integration with external radiology, pharmacy, clearing house or even drug data bank using Mirth Connect interface engine on HL7 and FHIR standards.
- A payer system integration with appeals & grievance system using Dell Boomi.
- A Practice Management system integration with scheduling software using REST APIs.

All these integrations add a lot of value to products and help the patients and physicians to get a holistic view of their care details.

# Data and Information Security



## The Need

It is imperative to ensure that the exchange of sensitive information between all the stakeholders in the healthcare ecosystem is secure. This becomes more acute because of the sensitivity required while handling personal information. It also demands a level of trust not existing previously, between all systems.

Interoperability using API, while following all the recommended healthcare standards like HIPAA, Hi-Trust, HL7, FHIR, can be used for such secure data exchange. However, the adoption of blockchain adds more value with its inherent security in data exchange transactions as well as decentralized data control, as described in greater detail below.

## The Approach

Blockchain is a data structure that holds transactional records and ensures security, transparency, and decentralization. As outlined in the diagram below, it provides a programmable mechanism that allows access to data distributed across a network of participants. The validity of the data is controlled through consensus of all the stakeholders. Blockchain can be public, private, or for a consortium.

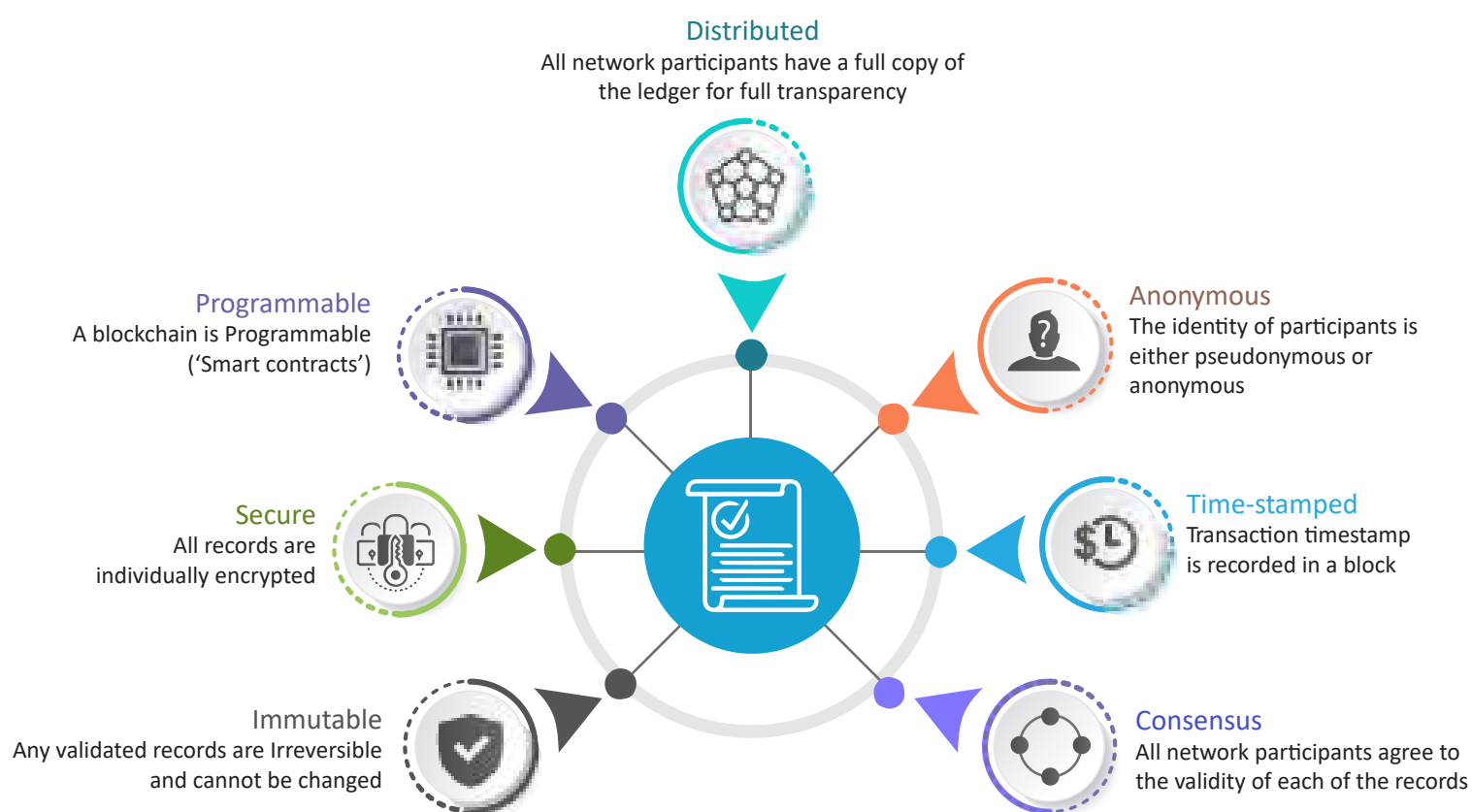


Figure 3: Blockchain attributes

As a result, Blockchain can be considered as the technique facilitating data exchange to achieve patient centric interoperability. It also enables easy collaboration between many parties in the healthcare ecosystem to solve complex problems requiring a longitudinal view of transactions and interactions in care management for a patient.

Following aspects of blockchain give greater control to the patient in the overall data owning and sharing, between multiple healthcare systems. These attributes translate into an ability to securely manage large, fragmented datasets with different stakeholders tasked to maintain the data

### Digital access management

- In-built computational trust in technology
- Credentialling for stakeholders from multiple parties
- Ease of controlling access

### Patient Identity Management

- Management of their own identity by the patients through Public key infrastructure and multi-factored signing
- Centralized identification mechanism resulting in easy patient matching across entities
- Reduction in medical errors and claim denial related to mis-identity

### Data Sharing and aggregation

- Maintenance of the most updated version of data through a consensus mechanism
- Decentralized data management with a single source of truth
- Quick sharing of time-sensitive, critical data without any third party required as intermediary

### Data immutability

- Secure data storage and distribution
- Data governance responsibility being moved away from institutions, thus resulting in less data loss
- Ease of Data persistence resulting in the availability of complete digital history for all involved parties
- Audit Trail



## Blockchain Benefits

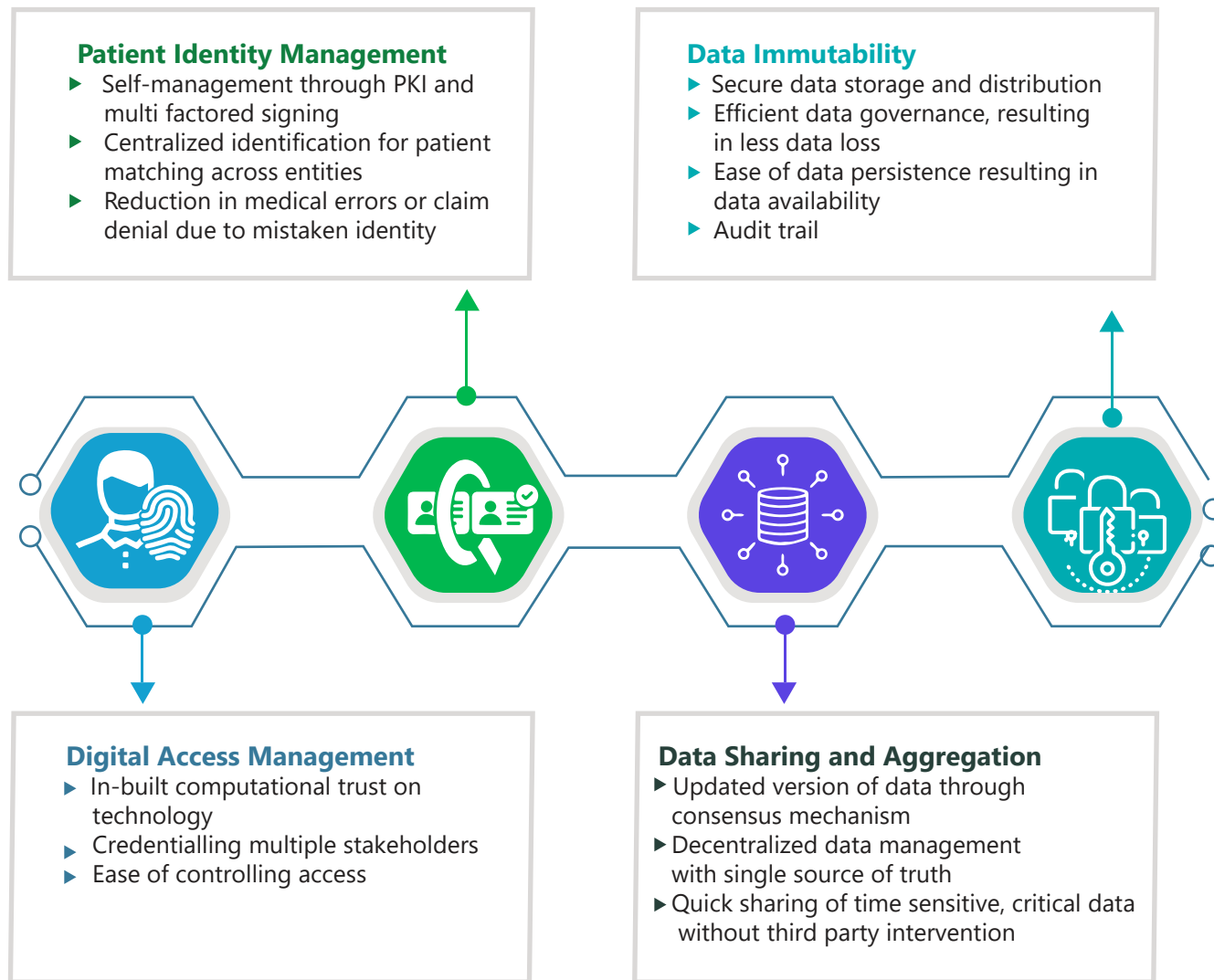


Figure 4: Blockchain benefits

As illustrated above, use of blockchain to tackle systemic issues in healthcare will in turn affect all aspects of healthcare, as we know them traditionally. The aim of creating frictionless interactions between multiple parties of the healthcare ecosystem can be best served through blockchain.

Multiple Blockchains are popular in healthcare segment - Ethereum, Hyperledger and MultiChain to name a few. Suitability of the blockchain network for an application can be determined using below criteria

- Permissioned / Permission Less availability
- Smart Contract Support
- Choice of Consensus Protocol
- Ease of Use and Manageability
- License

Scale of adoption of selected blockchain network also determines the success of the application using the platform, making it an important factor to consider.

The selected blockchain network and provider will determine necessary framework and tools that follow the set standards and guidelines to implement blockchain application.

## Illustration

Healthcare Providers can have a solution based on Hyperledger Blockchain to cater to various needs of handling health data, as enumerated below.

### **Patients can:**

- ❑ Have complete control over their health data in a HIPAA compliant manner
- ❑ Import, store health records in the system and share them with caregivers
- ❑ Allow/remove access for caregivers
- ❑ Audit Trail to track all changes
- ❑ Get holistic view of their condition through access to data records across various care centers
- ❑ Share anonymous health data for clinical research and analytics in future

# Remote Care and Monitoring



# The Need

The healthcare industry's shift to coordinated care and patient centricity also demands support for remote care and monitoring. This is achieved with digital health platforms enabling efficient communication, access to information through integrations, and use of bots and artificial intelligence coupled with data analysis for identifying trends, as outlined below.

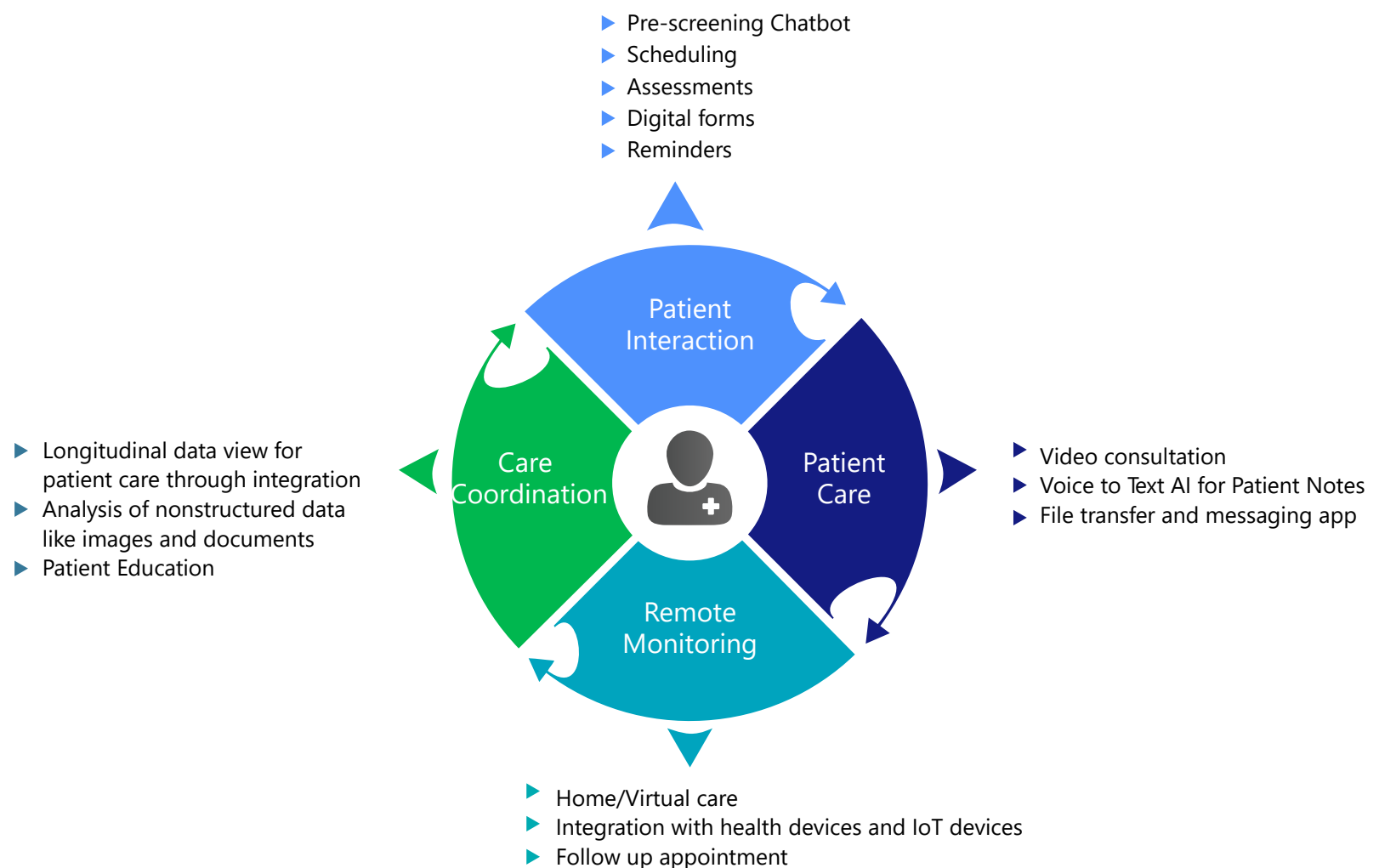


Figure 5: Remote patient care model

Given the backdrop of a typical patient journey, remote patient care can be handled with a four-pronged approach comprising patient interaction, patient service, remote monitoring, and care coordination.

- Patient interaction can start with prescreening chatbots and applications helping in appointment scheduling and reminders through use of techniques like digital forms, to accelerate the overall processes.
- Remote patient service is predominantly managed through video and audio calls and techniques for voice to text.
- Remote monitoring is achieved by portals for follow-up appointments and virtual care.
- Care coordination is enabled by integrations of healthcare systems enabling longitudinal view of care and further data analysis.



# The Approach

Remote care and monitoring can further be made more efficient by increasing operational efficiency through the following technical approach:

## Use of Process automation

- Chatbots can be effectively used for appointment scheduling, claim management, locating lab results, and so on. They not only help in streamlining communication with patients but also free the bandwidth of professionals for more strategic work.
- Handling and analysis of structured and non-structured data is at the core of process automation. It can lead to workflow automation and optimization using rule engines. Extracting information out of complex unstructured data like images and documents can be an example of intelligent automation. Automated image processing for radiology images resulting in improved diagnostic has proven to be an asset in patient care. Data coming out of such image processing can be further used for predictive analysis as well.

Process automation as described above removes the burden of executing mundane, operational processes physically and reduces manual errors. It simplifies handling of huge data and helps in accomplishing many tasks in relatively shorter time. The use of bots is also considered as a digital workforce that enables the human workforce to engage in value sensitive activities.

## Integration with RPM Tools

- Video Integrations
- OCR and voice to text interfacing Tools
- Integrations with wellness IoT devices



## Data Analysis and AI

- Data handled by RPM tools and process automation can also be analyzed using multiple machine-learning and data analysis algorithms, for meaningful insights. Such data analysis can also help optimize workflows, predict outcomes, and prescribe mitigation.
- Dashboards displaying health information like vital signs and important parameters can be provided to the patients. Dashboards for other stakeholders like hospitals can outline trends in patients' data which can be a basis for predictive analysis of outcomes. Integrations with platforms like Azure IoT Hub can be implemented for such data capture and analysis.



## Patient Education

Lack of health literacy and a true understanding of medical conditions is the reason why patients find it difficult to obtain, process, communicate and understand even basic health information and services. Decoding the available information to make right decision about their own care poses another challenge. As a result, patient education is fundamental to remote patient engagement. This could be handled through quick learning courses, virtual training, information on standard operating procedures, Nudge learning, and so on.

## Patient Portal

This is one of the most effective tools to remotely engage with patients and achieve the following.

- Sharing all treatment, medications, and recuperation data with patients regularly – Secure Patient Portal login
- Giving regular tips on wellness
- Delivering courses for patient education
- Allowing users to share data with other providers through Integration with other systems.

## Illustration

Healthcare Providers can implement Remote Patient Monitoring (RPM) and build a portal with a dashboard.

### To Showcase

- Real-time health information – both immediate and historical
- Alerts to patients and caretakers when permissible limits of health parameters are crossed
- Patient report with categories and demographics
- Trend details from the data collected from the internet connected wearable
- Stats of patients who missed data capture through devices

### To Achieve

- Risk classification – low, medium, high, with alert intervention
- Identification of high-risk patients, management of treatment plans, and improvement in patient care
- Reduction in hospital readmission
- Creation of patient health summary dashboard
- Analysis of sensor and device data using pre-trained cognitive services API and custom developed machine learning model to generate trends on Power BI.



# Conclusion

The Healthcare ecosystem has been witnessing a lot of innovation and transformation. In 2020, came the global pandemic that pushed the boundaries further and accelerated digital disruption. With the option of in-person engagements forced out, the overall user behavior underwent a drastic change and the healthcare industry had to jump on to the 'digital transformation' bandwagon.

The driver for change is not only technology but also a quick reset of behavior from the different stakeholders – the payer, the provider, and the technology partner. With distant treatment becoming mainstream, multiple patient devices got added to the care journey and a need for interoperable devices that were connected across the healthcare system became necessary.

The success of this new framework largely depends on quick adoption of technology and tools, which in turn throws the spotlight on a very important aspect - patient engagement. Another imperative that this system mandates is data security. The advancement in technologies has added value in every aspect – remote monitoring, to better participation of the patients in their own treatment, to knowledge sharing, predicting, and preventing illnesses to increased efficiency and ultimately reduced costs.

## Key Takeaways

- Healthcare needs a more **connected ecosystem** where data can flow from one system to another seamlessly. This will improve the patient experience as well as quality of care. This will also reduce the turnaround time and healthcare cost.
- **Data security and privacy** are now more important because of patient's involvement in their care journey bringing in more and more wearables and IoMT devices.
- A reset towards **remote patient care and monitoring** for all non-emergency consultation and care is required. More adoptions of healthcare wearables and IoMT devices will help do this efficiently.



# About Harbinger

Harbinger Group is a global company providing software technology services for independent software vendors and enterprises. Since its inception in 1990, Harbinger has developed a strong customer base of organizations worldwide that includes high-tech start-ups in Silicon Valley, multi-national product companies, and in-house IT teams of large organizations.

Harbinger Group leverages the latest digital technologies to build software solutions in HR Tech, Health Tech, WorkTech and Learning Tech domains, and helps solve complex business problems in these areas for organizations across industries.

For over ten years, Harbinger has enabled many Health Tech companies in delivering quality care, meeting government compliance requirements, and improving patient engagement. Our Health Tech team has an extensive knowledge of healthcare regulations and standards combined with deep expertise in connected healthcare and healthcare intelligence.

## Authors



### **Pankaj Ojha**

Business and  
Technology Leader

Pankaj Ojha is a business focused Technology leader with 15+ years of experience working on digital platforms. He has successfully led multiple technological transformations for Harbinger Group' global clients in the Healthcare sector. Pankaj's current area of interests includes Patient Engagement, Data Science, and Integration.

Contact:

**[pankaj@harbingergroup.com](mailto:pankaj@harbingergroup.com)**



### **Prachi Kulkarni**

Senior General Manager,  
Technology

With over 20+ years of experience in HRTech, Healthcare, and eLearning domain, Prachi has proven expertise in design and implementation of innovative products and robust platforms in large enterprises and start-ups. She also contributes to technology incubation and is instrumental in navigating product roadmaps to successful releases, with new technologies.

Contact:

**[prachi.kulkarni@harbingergroup.com](mailto:prachi.kulkarni@harbingergroup.com)**

# Additional Resources

**Harbinger develops a Blockchain platform for a leading global Blockchain solution provider**

<https://harbinger-systems.com/wp-content/uploads/2017/12/Harbinger-develops-a-Blockchain-platform-for-a-leading-global-Blockchain-solution-provider.pdf>

**A comprehensive healthcare app to replace the traditional call-bell system in a hospital, thus improving communication and enhancing patient satisfaction**

<https://harbinger-systems.com/wp-content/uploads/2017/02/A-hospital-patient-care-app-for-an-Android-based-smartwatch.pdf>

**Intelligent remote patient monitoring with data-driven decisions**

<https://harbinger-systems.com/blog/2020/10/intelligent-remote-patient-monitoring-with-data-driven-decisions/>

**Healthcare integration – a one-stop answer to providing the best patient care**

<https://harbinger-systems.com/blog/2020/11/healthcare-integration-a-one-stop-answer-to-providing-the-best-patient-care/>



Harbinger partners with Health Tech product companies to redefine and modernize their products for providers, payers, employers, and patients.

Write to us [contact@harbingergroup.com](mailto:contact@harbingergroup.com) for a quick consultation on Health Tech solutions.