

# Connected Care:

## Improving Outcomes, Access & Value

ORACLE WHITE PAPER / 2018

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## INTRODUCTION

As we look forward, the state of healthcare in 2025 must – and will – be very different than it is today. Rising costs, a shortage of caregivers, aging populations and evolving consumer expectations are just some of the areas driving this change.

How care is delivered and consumed is also increasingly becoming virtual. Innovative approaches to traditional clinical and business processes can directly impact the patient experience and improve outcomes while also reducing cost.

By expanding upon existing methods, and further leveraging data and transformational technologies, new approaches such as Connected Care are moving into the healthcare mainstream. Fueled by tangible benefits to patients, health systems and payers alike, Connected Care will continue to evolve and most likely become a major enabler in the future of healthcare.

This paper examines the concept of Connected Care. It also discusses real-world examples, the business rationale behind this important trend and the enabling technology needed for embracing innovative care strategies.



## WHAT IS “CONNECTED CARE?”

Ask five people for the definition of Connected Care and you will likely hear five vastly different answers. Most will correctly reference telehealth and remote patient monitoring as aspects of Connected Care. But the concept goes further and embraces virtual medicine, population health, care coordination and long-term patient engagement. This white paper will focus on opportunities and growth related to virtual care.

The World Health Organization (WHO) defines Connected Care as “The delivery of healthcare services, where distance is a critical factor, by using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries.”

The origins of Connected Care are rooted in telehealth. Although some health systems have been offering these services for a while, many experts expect to see this trend increase as virtual medicine increasingly streams patient data, video and test results directly to clinicians. The potential is to make care more convenient and cost-effective, while dramatically improving outcomes in acute and postoperative settings, as well as for patients with chronic conditions.

## WHY NOW?

The growth of digitized patient data, the expansion of connected devices, emerging technologies and new reimbursement models are spurring Connected Care’s evolution from basic telehealth services to modern virtual care.

Healthcare is moving quickly to integrate innovative technologies as payers and providers transition to outcome-driven, value-based care. This puts Connected Care truly at ground zero, where new requirements, enabling technology, consumer readiness and evolving payment mechanisms coalesce.



## IMPACT ON CARE DELIVERY

What will it mean for pediatric groups when parents can get their child home sooner after a stressful hospital stay? Or when parents can use a smartphone attachment to diagnose their child's ear infection without a doctor visit? What would it mean to a patient living in a remote community who is at-risk for a stroke?

Connected Care supports these and a growing list of use cases for both acute and non-acute care, and is also seen as an entryway for bringing additional patients into a provider's delivery system.

Improving stroke outcomes is one use case gaining close attention. Over 800,000 people in the United States suffer a stroke each year. Underserved rural and remote populations often do not have specialists nearby to make life-saving stroke assessments, which reduces the possibility of positive outcomes. For example, patients who receive therapy within three hours of stroke onset may have reduced mortality rates and improved long-term speech and motor functions. The "Golden Hour," defined as 60 minutes from emergency department (ED) arrival time, has been established as the quality standard of care. However, studies have found that less than 30% of U.S. patients are treated within this time window. Connected Care addresses these challenges by linking medical professionals with streaming patient data, to rapidly diagnose and provide treatment. Whether the patient is in an ambulance or a remote community hospital, the ability to connect and reduce time to treatment is the ultimate goal.

Additional use cases are emerging regularly. These include pediatric cardiology monitoring for infants with heart defects, caring for patients at home or in isolated areas, as well as cost-effectively managing populations with multiple chronic conditions in skilled nursing facilities.



## BENEFITS TO THE PATIENT

In addition to impacts on care delivery, Connected Care directly benefits patients in both acute and non-acute situations. For example, incorporating Connected Care into chronic disease management can significantly improve quality of life, allowing patients to maintain independence, prevent complications and minimize costs<sup>1-2</sup>. This is particularly important when patients are managing self-care processes that can range from hypertension to congestive heart failure to home dialysis<sup>3</sup>.

A new report by the Beryl Institute shows how critical personalized care has become<sup>4</sup>. Nearly 90 percent of consumers say patient experience is important in healthcare, while another three-quarters of consumers name patient experience as a key factor when they make healthcare decisions. "Healthcare is in the midst of a consumer revolution that will push it to shift, rethink, and transform in ways it may not yet know," the report's author concludes.

Benefits also exist to improve treatments and population health. By evaluating vital sign data over time, clinicians can better predict a health issue or correlate factors that may improve treatment effectiveness. Additionally, physicians are assisted by machine learning algorithms applied at the patient-level. Patterns can be detected by subtle changes in weight or cardiac rhythms as an indicator of a more serious issue. Equally useful is analyzing "big data" across population groups for researchers to identify patterns by age or demographic that if addressed, could improve or predict outcomes, increasing overall population health.

## BUSINESS VALUE

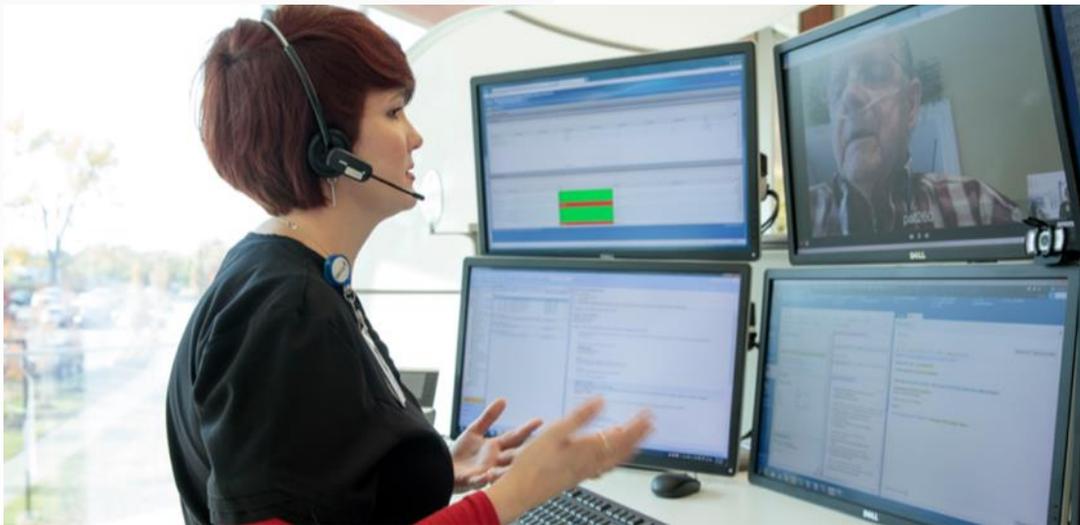
Patients and caregivers aren't the only ones who benefit from Connected Care—this strategy is also good for business. It provides both top and bottom line financial benefits, and supports the Quadruple Aim objectives for reducing per capita cost while improving clinician satisfaction, population health, and the patient experience.

The financial benefits of Connected Care includes growing virtual medicine as a new top line revenue stream, while also enabling healthcare organizations to reduce cost and improve care.

For example, nearly 3 million transports are made annually from skilled nursing facilities (SNFs) to Emergency Departments (EDs) at a cost of almost \$4 billion in transportation and ED visit costs. On average, the typical ED visit, including round trip ambulance service, costs \$2,500. The cause of these emergency visits is that SNF physicians are often off-site or unavailable when patient assessments and care recommendations are most urgently needed. As a consequence, residents often must be transported off site to receive appropriate care.

According to research conducted by the Kaiser Family Foundation, 30% – 67% of hospitalizations among SNF residents could be avoided with interventions such as Telehealth technology<sup>5</sup>. The Center for Technology and Aging points out an additional benefit: “A reduction in unnecessary transfers of frail patients not only reduces costs for the SNF but alleviates stress for the patient, which may further complicate their condition”<sup>6</sup>.

Additional benefits include reducing readmissions by more effectively monitoring patients post operatively, and improved clinician efficiency. Nurses are able to monitor more effectively a larger patient group – either across a hospital, SNF, or when a patient is at their own home.



## GROWTH OF THE VIRTUAL HOSPITAL

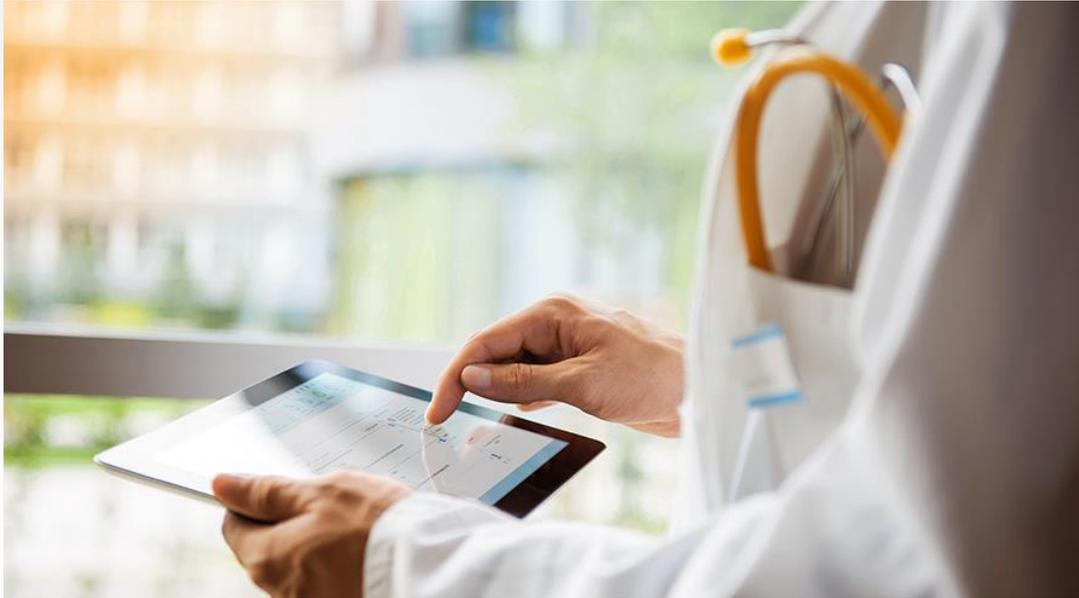
The technology-driven world of today has provided us with a great opportunity to incorporate digital innovation into the delivery of healthcare. Specifically, the ubiquity of cellular service, growth of Internet of Things (IoT) enabled devices, and the ability to apply machine learning against vast amounts of data. These collective technologies support and facilitate the flow of information to improve outcomes, increase care coordination and encourage greater patient empowerment.

The growth of virtual hospitals is becoming reality, thanks to these new technologies. The premise of virtual hospitals is to ensure that the benefits of modern medicine are available to all, including patients in remote or poor rural communities who do not have access to care. Connected Care and remote patient monitoring are keys to success in the virtual hospital and will increase in significance as mainstream care-delivery models evolve.

But not every healthcare organization is prepared for the opportunities and challenges associated with Connected Care. Many still see the strategy simply as an extension of tried-and-true telehealth methods. And while telehealth remains a growing market—it’s expected to reach USD 2.8 billion by 2022<sup>7</sup> – it doesn’t fully embrace the opportunities associated with the latest digital technologies. Unfortunately, even some organizations that do grasp the potential of Connected Care still struggle

with it, burdened by legacy technology and cultural inhibitors. These roadblocks impair collaboration among caregivers and engagement with patients, and make it difficult to fully achieve the Connected Care vision.

Fortunately, a clear path to Connected Care is emerging, thanks to maturing technologies and shared industry practices.



## TECHNOLOGIES THAT ENABLE CONNECTED CARE

Connected Care is rapidly progressing beyond traditional delivery programs thanks to digital innovations that are entering the mainstream in hospitals, clinics, doctor's offices and home-health services. Four key technology pillars underpin modern Connected Care.

- Remote Patient Monitoring Devices with Wireless / Mobile Connectivity
- Internet of Things (IoT) Cloud
- Autonomous, Extensible Cloud Services
- Analytics, including Artificial Intelligence (AI) & Machine Learning

### Technology Pillar #1: Remote Patient Monitoring Devices

Caregivers and patients can now take advantage of a growing variety of devices, ranging from familiar wristband devices that track your heart rate, to more sophisticated FDA regulated class II medical devices that enable virtual examinations, in-home EKGs, and other data required by clinicians for diagnosis and treatment. These units collect information and relay it across secure internet connection to caregivers.

Virtual exams allow remote patients to consult with a clinician face-to-face while sharing vital signs, cardiopulmonary and diagnostic data, and medical images in real-time. Thus, a clinician can conduct a remote patient test and then view, interpret, and record the patient's data, while advising a patient remotely anywhere, anytime.



### Technology Pillar #2: The Internet of Things (IoT) Cloud

Internet of Things (IoT) enables data to stream from a remote monitoring device, for real-time viewing by clinicians while simultaneously logging the data into a secure cloud repository for continued analysis.

It is helpful to think about the IoT data created by a device in three stages. First is the initial creation, which takes place on the device, and then sent over the Internet. Second is how the IoT Cloud Service collects and organizes that data. Third is the ongoing use of that data for the future.

Not all data can be streamed in real-time, especially in extremely remote locations, but the data can still be collated and sent across in batches. Either way, the fundamental requirement is that each transaction on each device is put in at the right time-stamp for sorting and time series analysis.



### Technology Pillar #3: Autonomous, Extensible Cloud Platform

Like a self-driving car, autonomous capabilities allow back-end technologies, such as the underlying database, data warehouse and analytics – to take care of themselves. This includes simplified setup, automated patching and instant scaling to avoid downtime. These factors are extremely important as patient data increases, with a need to reduce IT costs while ensuring security and performance.

Database administrators now spend almost 75 percent of their time maintaining systems instead of focusing on higher-level work. As data becomes even more complex and fragmented, autonomous capabilities will automate the administrative tasks so IT and clinicians can focus on getting insights from the data, which ultimately will improve patient treatments and outcomes.

Additionally, many countries require patient data to stay within its borders. Oracle's unique "Cloud at Customer" offering provides all the autonomous features and benefits of cloud, but located at a customer site.



### Technology Pillar #4: Advanced Analytics, AI & Machine Learning

IoT alone is powerful, but its impact is multiplied when combined with Artificial Intelligence (AI) and machine learning. The ability to look back at time-series data to recognize and correlate patterns has the most far-reaching benefits for Connected Care.

Similar proactive analyses can drill into patient data to predict those at risk of chronic conditions, such as diabetes, or may be vulnerable for heart disease, COPD or other serious problems. Just as importantly, AI can weigh the risk factors to prioritize which patients only require monitoring versus those who require immediate and targeted intervention to keep them safe.

To be clear, AI won't replace the expertise and experience of trained healthcare professionals. But by sorting through large volumes of information and finding trends and correlations, the technology gives caregivers more resources for making informed decisions based on real world data.

For reasons like these, AI adoption is poised for an upsurge in healthcare settings. Eighty-four percent of senior healthcare leaders expect AI to revolutionize information gathering and patient interactions, according to research by the management consulting firm Accenture.<sup>8</sup>



## TIME TO ACT

The latest digital innovations are creating opportunities for reshaping how healthcare organizations deliver patient services, improve outcomes, enhance clinician satisfaction, and manage costs more effectively. But doing so requires transformative technology that supports tomorrow's Connected Care use cases, today.

### Connected Care Use Cases

Use Case	Benefits
Stroke Care for Rural & Remote Communities	<ul style="list-style-type: none"><li>• Reduced door to needle time</li><li>• Improved patient outcomes</li><li>• Reduced readmissions</li></ul>
Myocardial Infarction (MI) Emergency Treatment	<ul style="list-style-type: none"><li>• Reduced door to balloon time</li><li>• Improved patient outcomes</li><li>• Reduced readmissions</li></ul>
Pediatric Cardiology Infants with Single Ventricle Syndrome	<ul style="list-style-type: none"><li>• Reduced ED visits</li><li>• Improved patient outcomes</li><li>• Maximizing the effectiveness and efficiency of the care team</li></ul>
Skilled Nursing Facilities	<ul style="list-style-type: none"><li>• Reduced Medicare penalties from unplanned ED visits &amp; readmissions</li><li>• Reduced transportation costs</li><li>• Maximizing the effectiveness and efficiency of the care team</li><li>• Improved management of chronic conditions</li></ul>
Clinical Trials	<ul style="list-style-type: none"><li>• Reduced dropout rate</li><li>• Reduced travel requirements</li><li>• Reduced study costs associated with site visits</li></ul>

Table 1: Use cases and benefits associated with Connected Care.

## HOW ORACLE SUPPORTS HEALTHCARE TRANSFORMATION

Oracle has a long and growing presence in healthcare worldwide, including payers, providers, academic medical centers and specialty care. Oracle Cloud is the most powerful, unified cloud solution suite available today, redefining how healthcare can transform and innovate in a digital world.

### LINKS FOR MORE INFORMATION

<ul style="list-style-type: none"><li>• <a href="#">Oracle Internet of Things (IoT)</a></li><li>• <a href="#">Oracle Artificial Intelligence</a></li><li>• <a href="#">Oracle Big Data Analytics</a></li></ul>	<ul style="list-style-type: none"><li>• <a href="#">Oracle Autonomous Database</a></li><li>• <a href="#">Oracle Cloud Platform</a></li><li>• <a href="#">Oracle Healthcare</a></li></ul>
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