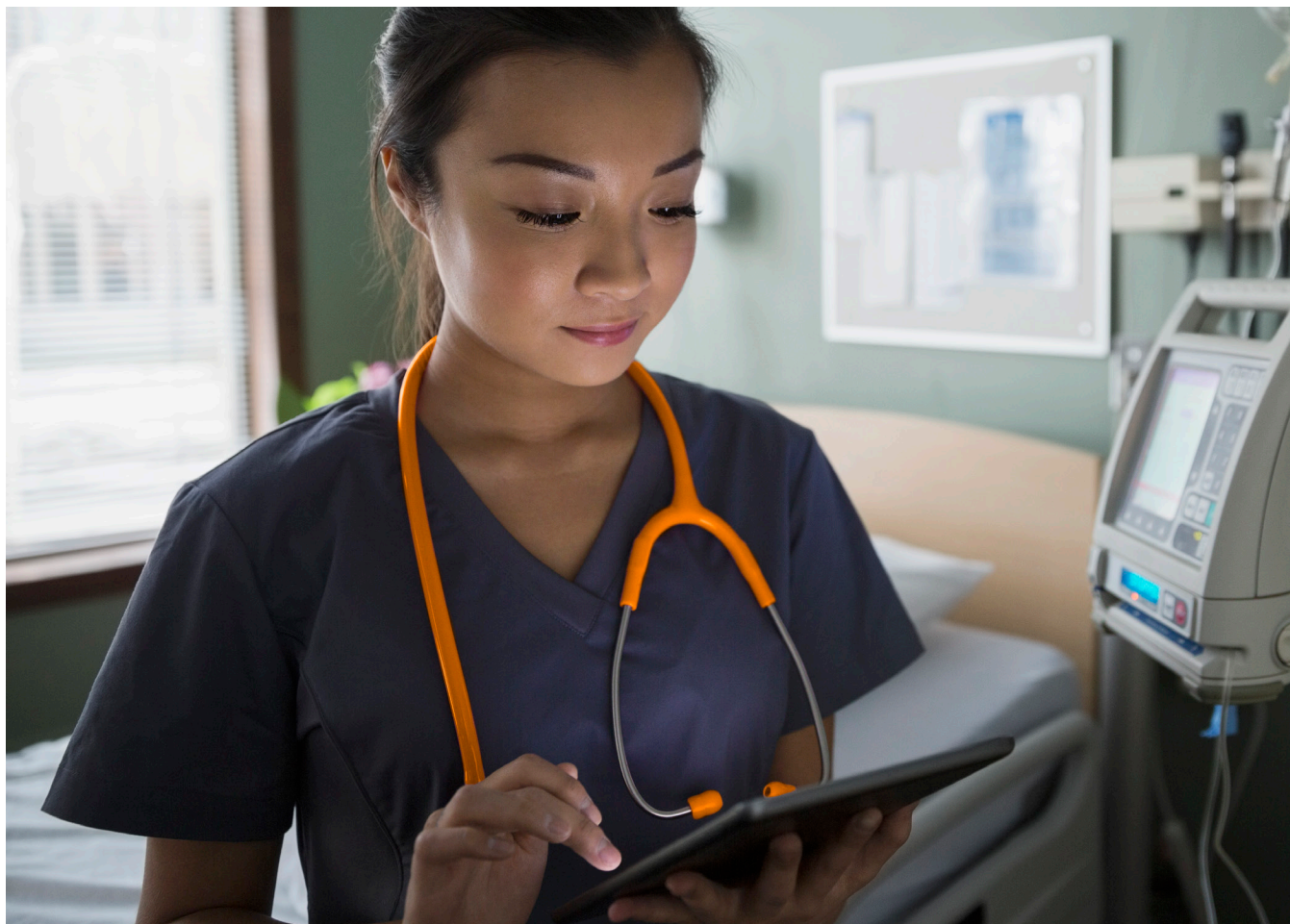




Big Data, Advanced Analytics and AI

WELCOME TO THE REVOLUTION IN HEALTHCARE



A few years ago, McKinsey predicted a “big data revolution” in healthcare.¹ But even the most sage prognosticators would have been hard-pressed to predict just how thoroughly data is revolutionizing the entire healthcare industry, impacting patient expectations and outcomes, quality of care, telemedicine, pharmaceutical research, payment systems and more.

In fact, there is not a single aspect of the healthcare ecosystem that is not being dramatically impacted by data analytics—and that was true before COVID-19. Now, amid a global pandemic, the challenges are even greater. The need for speed, agility, resiliency and accuracy is more crucial than ever, and if possible, the overall stakes are even higher.

To meet these challenges, healthcare organizations must approach data management and analytics as their single most important opportunity and strategic imperative—not just to make sure the organization can survive, but to save lives and improve the quality of life for patients and employees.

Strategic data management, advanced analytics and artificial intelligence (AI) will enable healthcare organizations to turn real-time insights into real-time actions that drive compelling use cases and unmatched outcomes. Organizations must be able to:

Leverage all data types—structured, unstructured and semi-structured—in real time and at unprecedented volume and velocity.

Eliminate silos and integrate data from all locations—data center to multicloud to edge to Internet of Things (IoT).

Maximize resiliency, agility, performance and consistent quality across all data, regardless of when, where and how it is created.

Ensure security, data protection, governance, regulatory compliance and control throughout the data lifecycle, across all infrastructures, while mitigating risk and costs.

Deploy the latest innovations in real-time advanced analytics, machine learning and AI to ensure the entire organization—clinicians, patients, administrators, caregivers, researchers and everyone else—is data-centric and data-empowered.

This industry brief explores the ways big data is reshaping healthcare. We look at compelling use cases, including COVID-19, and explore technologies and data analytics models that are essential to driving successful healthcare outcomes. Finally, we discuss the benefits of a hybrid cloud platform and why leaders across the healthcare ecosystem are turning to IBM and Cloudera to ensure they are maximizing advanced analytics and AI across all data.

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The data revolution in healthcare

The market for big data in healthcare is growing at a compound annual rate of 19.1% and is expected to reach more than \$67 billion by 2025. The research, by Allied Market Research, cites several key factors:

- Rising demand for analytics solutions to aid population health management.
- A shift from a pay-for-service model to a value-based care model.
- Preference for cloud-based analytics solutions and emerging trends such as telehealth and innovation in genomics.²

But the numbers don't tell the whole story.

The healthcare ecosystem encompasses a wide range of activities and business models. Data has become the driving factor and differentiator across this broad ecosystem, impacting:

Direct patient care such as telesurgery, remote diagnosis and monitoring and, increasingly, broad-based telehealth services and patient visits.

Patient experience, with a growing focus on mobile solutions to support population wellness and preventive care.

¹ “The Big Data Revolution in U.S. Healthcare: Accelerating Value and Innovation,” McKinsey & Co., April 1, 2013

² “Big Data Analytics in Healthcare Market Worth \$67.82 Billion by 2025, Says AMR,” Allied Market Research, May 7, 2020



Administrative, insurance and payment processes, including the evolving role of electronic health records (EHR) systems as a hub for insurance and record-keeping as well as care-related data.

Research and development to accelerate the time to market for new drugs, medical equipment, clinical trials and more.

Time-sensitive critical response to emerging diseases like COVID-19, where data and analytics are essential to mitigating and managing disease outbreaks, creating effective vaccines and developing best practices in disease management and care.

Real-time, real-world use cases

COVID-19, in fact, provides something of a microcosm of both the challenges and opportunities in leveraging data across the entire healthcare ecosystem. COVID-19 has brought to the forefront advanced big data and analytics technology for detecting propensities and patterns for diseases and diagnoses.

Big data and advanced analytics are driving the ability to track the spread worldwide, identify clusters and trends, monitor healthcare resources and create best practices in treatment results. The impact is being felt across the entire healthcare ecosystem. For example:

Frontline caregivers: Providers have multiple—and competing—issues to manage. These include the availability of personal protective equipment (PPE) for staff; the number of ICU beds, ventilators and test kits available; and when the hospital will reach capacity. They also must closely monitor the pace of patient admissions to ensure appropriate nurse-to-patient ratios and the flexibility to create new staffing models if care team members become infected with the virus.

Health plans: Payers must quickly rethink their rules and policies for care coverage while managing an influx of new and costly claims. Emerging care technologies such as telehealth add another data set to formulas that determine fee structures, co-payments and deductibles.

Drug and vaccine developers: Top scientists are working closely to identify and scale up development of an effective COVID-19 treatment. They are reviewing and sharing data to determine the efficacy of existing treatments and exploring new ones. They are collaborating throughout the process—from basic and applied research, to clinical evaluation and feasibility studies and human trials, through vaccine production and post-market surveillance.

Medical equipment and supplies manufacturers: Traditional medical device manufacturers are working independently and together, sharing data with



nontraditional organizations that have stepped up to speed production of supplies and equipment. This requires that data is shared, evaluated and analyzed in real time across much larger data sets with advanced tools such as machine learning and AI.

The COVID-19 pandemic is a turning point, particularly for organizations that have no strategy to leverage all of their data and apply advanced analytics.

But some of the nation's top healthcare organizations and health systems have mature, modern data management and advanced analytics platforms in place, enabling them to respond quickly, definitively and effectively to these challenges. These include:

Yale School of Medicine is using a data science platform to support real-time data acquisition and agile analytics, which are helping determine how many people have been infected, how many beds are available to handle inpatient and ICU care, ventilator capacity and the number of healthcare providers exposed to COVID-19.

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UnitedHealth Group conducted a study that found self-administered COVID-19 tests were just as effective as clinician-conducted tests. As a result, the U.S. Food and Drug Administration updated guidelines to allow healthcare organizations to use self-administered tests for diagnosing COVID-19.

A consortium of pharmaceutical organizations including Novartis and Pfizer have joined with the Bill & Melinda Gates Foundation to share their proprietary compound libraries, enabling them to collaboratively screen for compounds that may work against the coronavirus.

Data is the driving factor and common denominator for all such activities and opportunities. And these examples are just the tip of the iceberg in terms of how data is

transforming healthcare in real time—not just in responding to COVID-19 but across the board.

These organizations have addressed and overcome the critical challenges that limit their ability to leverage all data, no matter where and how it enters the data lifecycle, in what format it is or where it is stored.

What to look for in a platform

Organizations that successfully and strategically manage their data eliminate silos to achieve a unified view of all data sources and types. They manage data at every stage of its lifecycle, from using tools to handle large data sets to applying machine learning and AI to optimize data insights. They also protect their data by ensuring privacy, agility and resiliency with best practices in governance, cybersecurity and regulatory compliance.

All these capabilities are embedded in the enterprise data cloud solution that is built on the Cloudera Cloud Platform (CDP) and available through the tightly integrated partnership between IBM and Cloudera. The enterprise data cloud provides unprecedented agility, resiliency and

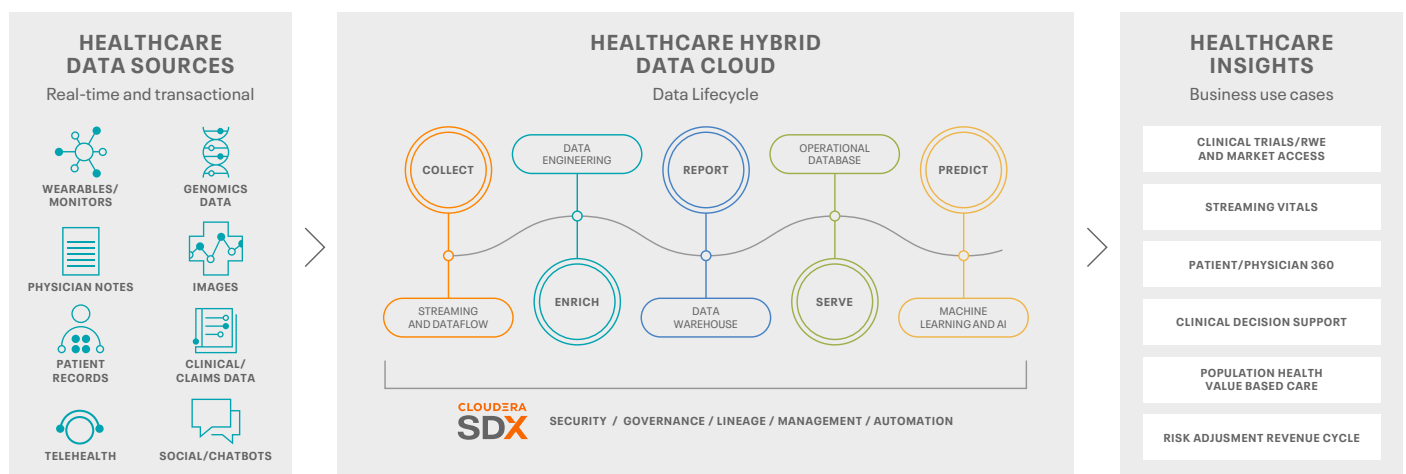
cost savings in how healthcare organizations can leverage all data, all the time.

With an enterprise data cloud, healthcare organizations can ingest, process, store and analyze any type of data, in the data center, in public and hybrid clouds or at edge locations. Analyzing data at rest, in motion and streaming, healthcare organizations can use advanced analytics, machine learning and AI to identify patterns, detect anomalies and predict potential outcomes.

The CDP offers data warehouse and machine learning services, a data hub service for building custom applications, and a unified control plane to manage infrastructure, data and analytic workloads across hybrid and multicloud environments.

This includes consistent data security, governance and control to safeguard data privacy, ensure regulatory compliance and prevent cybersecurity threats across all stages of the data lifecycle. The enterprise data cloud is built on an open source foundation that avoids vendor lock-in and works in concert with popular EHR systems already in place.

A MULTI-FUNCTION PLATFORM TO DRIVE BETTER OUTCOMES IN HEALTHCARE & LIFE SCIENCES



The benefits of IBM and Cloudera

With the enterprise data cloud, customers benefit by working with two companies that have a long history of leadership in providing advanced data analytics, machine learning and AI solutions to leading healthcare organizations around the world. Benefits include:

Faster ROI, with end-to-end capabilities to enable advanced analytics, machine learning and AI from data lakes and from connecting clouds with traditional infrastructures such as data warehouses or EHR systems.

Industry expertise in building an integrated vision to deliver specific opportunities for healthcare facilities, from a 360-degree profile of patients, to cybersecurity and compliance, to empowering innovation for research, telemedicine and other care priorities.

Security and governance, leveraging Cloudera's Shared Data Experience to ensure that all data is always secure and governed, anywhere, from the edge to AI.

Speed to innovation, with the largest number of contributions to the open source community, ensuring increased availability and interoperability across all vendors.

One-stop support and single-pane-of-glass management to reduce costs, eliminate finger-pointing and maximize availability and agility.

Freedom of choice, which means the flexibility to modernize existing on-premises infrastructure as well as the ability to leverage next-generation hybrid and multicloud platforms.

Is your organization ready to reach the next level in using big data, advanced analytics, machine learning and AI to positively impact patient expectations and outcomes, quality of care, telemedicine, pharmaceutical research, payment systems and response to critical time-sensitive situations such as COVID-19?

Please visit [IBM and Cloudera](#) to make your data work for your organization, whatever role you play across the healthcare ecosystem.

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CLOUDERA

At Cloudera, we believe that data can make what is impossible today, possible tomorrow. We empower people to transform complex data into clear and actionable insights. Cloudera delivers an enterprise data cloud for any data, anywhere, from the edge to AI. Powered by the relentless innovation of the open source community, Cloudera advances digital transformation for the world's largest enterprises. Learn more at [Cloudera.com](#).

The IBM logo, consisting of the letters "IBM" in a blue, sans-serif font with horizontal stripes.

IBM builds data management products with the AI, hybrid, and multicloud future in mind. Its enterprise-grade solutions are designed for robust integration across security-rich environments. To assist with your data lake needs, IBM provides value-added offerings that bring these same benefits to Hadoop implementations like those created by Cloudera.