

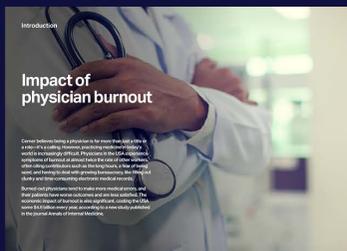
Making a Difference

Vertica Human Interest Stories



Improving patient care quality by helping physicians work more efficiently

Predictive Analytics



Impact of physician burnout

Introduction

Career burnout is a common phenomenon for many healthcare professionals. It is a state of emotional, mental, and physical exhaustion that can lead to decreased productivity, increased errors, and a loss of interest in work. This can have a significant impact on patient care and the overall health of the healthcare system. Understanding the causes and effects of burnout is the first step in addressing this issue.

Predictive Analytics



Illuminating real-time data intelligence so that resources are directed to save lives and improve quality of care

Predictive Analytics



14 Ohioans die every day from Opioid Use Disorder (OUD)

Introduction

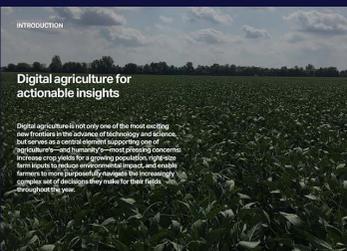
Opioid Use Disorder (OUD) is a chronic condition characterized by compulsive drug use despite harmful consequences. It is a leading cause of death in the United States, with over 47,000 deaths reported in 2019. In Ohio, 14 people die every day from OUD. This is a public health crisis that requires immediate action. Understanding the scope and impact of OUD is the first step in addressing this issue.

Predictive Analytics



Data science and analytics supports an evolution in farm data and farm decision-making

Introduction



Digital agriculture for actionable insights

Introduction

Digital agriculture is not only one of the most exciting new frontiers in the advance of technology and science, but it is also a critical component of our future. It is the convergence of technology and humanity—most pressing concerns. It is the use of digital technologies to improve farm inputs, reduce environmental impact, and enable farmers to make data-driven decisions. This is a complex set of challenges they must face for their right, throughout the year.

Dear reader,

Creating powerful technology involves hundreds of fascinating processes, and the results make all of us proud. But sometimes we lose sight of the positive impact that software has on problems the world faces today. The stories we've included in this e-book help us remember that the real accomplishments are found in our day-to-day humanity, in the ways analytics software is improving the lives of doctors, farmers, researchers, law enforcement officers, transportation workers, and hundreds of others whose work defines the culture we sometimes take for granted.

In the stories we've showcased here, you'll read how the Vertica unified analytical warehouse is helping these organizations achieve their missions in improving the lives of others:

Cerner is helping more than 9,000 global healthcare providers by using high-performance analytics to optimize hundreds of administrative processes that cause physician fatigue and affect the quality of their patient relationships.

The Climate Corporation is using data science at scale so farmers around the world can make management decisions that optimize crop yields, field inputs, management efficiency, and farm profits.

And at **Pulselight**, leaders in healthcare and investigative research are working with data scientists and data engineers to discover individuals most at risk regarding the opioid crisis that has spread across Ohio.

Finding what's meaningful in massive volumes of data is becoming possible when the right combination of technologies and dedicated teams all pull in the same direction. As one healthcare professional says, "There's intelligence hidden in our data." We're working to help that researcher and thousands more like him discover it. That's part of our own mission to make this world a better place to live. I hope you enjoy reading our amazing customer stories.

**Colin Mahony**

Senior Vice President and General Manager, Vertica

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Part One

Cerner Corporation

Improving patient care quality by helping physicians work more efficiently

At a glance

Industry:

Healthcare

Partner:

Cerner Corporation

Location:

Missouri, USA

Context:

Help physicians spend more time with their patients and less time on processes and administration

Our Response:

Vertica Analytics Platform

Impact:

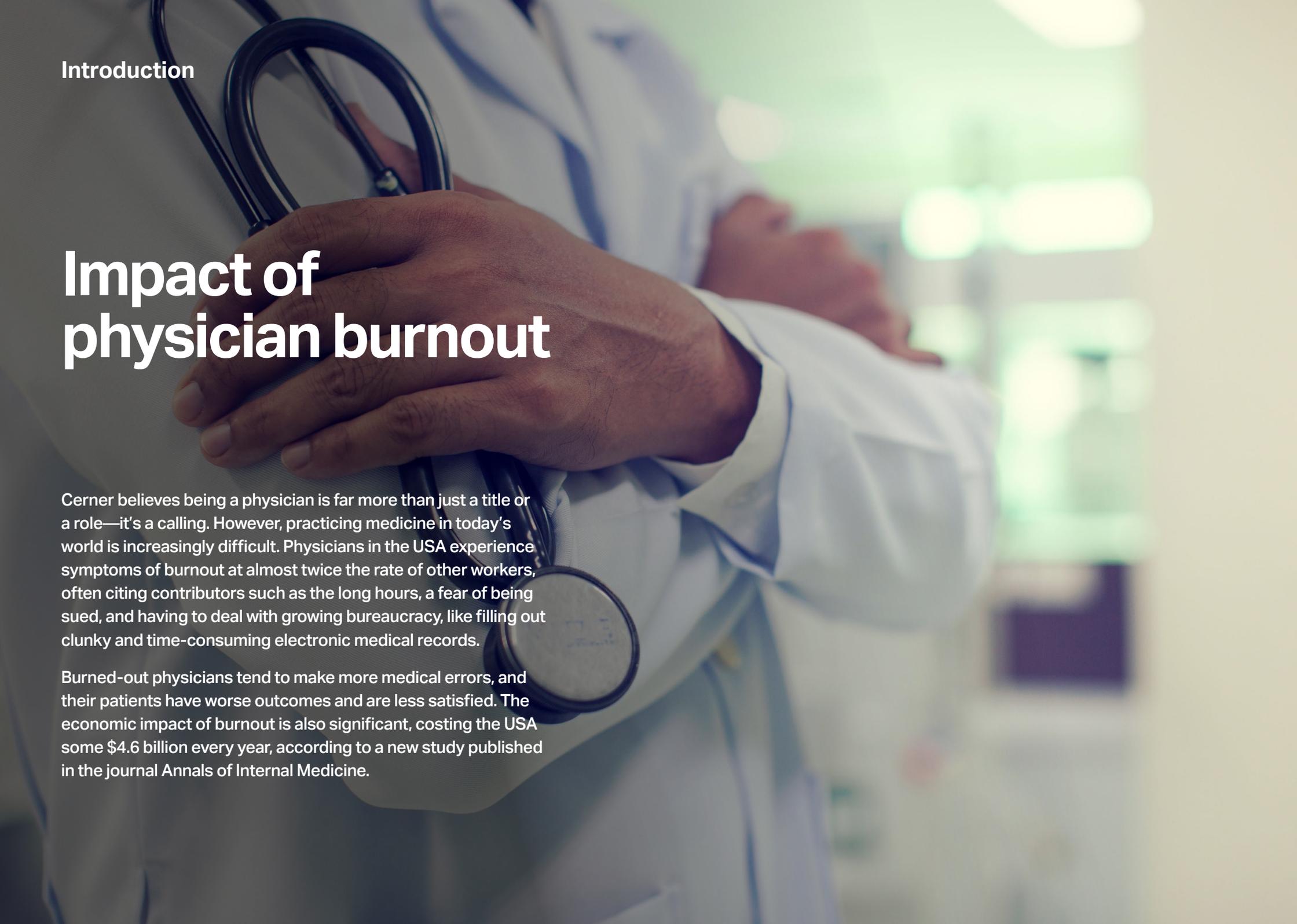
- Better patient care by streamlining physician's workflow to save time
- Faster patient diagnosis through easy access to fast treatment success
- Patient-centric healthcare improves care quality

Focus Area:

Predictive Analytics



Cerner is a leading supplier of health information technology solutions and services. Its solutions optimize processes for healthcare organizations ranging from single-doctor practices to entire countries, and for the pharmaceutical and medical device industry.



Introduction

Impact of physician burnout

Cerner believes being a physician is far more than just a title or a role—it's a calling. However, practicing medicine in today's world is increasingly difficult. Physicians in the USA experience symptoms of burnout at almost twice the rate of other workers, often citing contributors such as the long hours, a fear of being sued, and having to deal with growing bureaucracy, like filling out clunky and time-consuming electronic medical records.

Burned-out physicians tend to make more medical errors, and their patients have worse outcomes and are less satisfied. The economic impact of burnout is also significant, costing the USA some \$4.6 billion every year, according to a new study published in the journal *Annals of Internal Medicine*.

Improving physician's experience

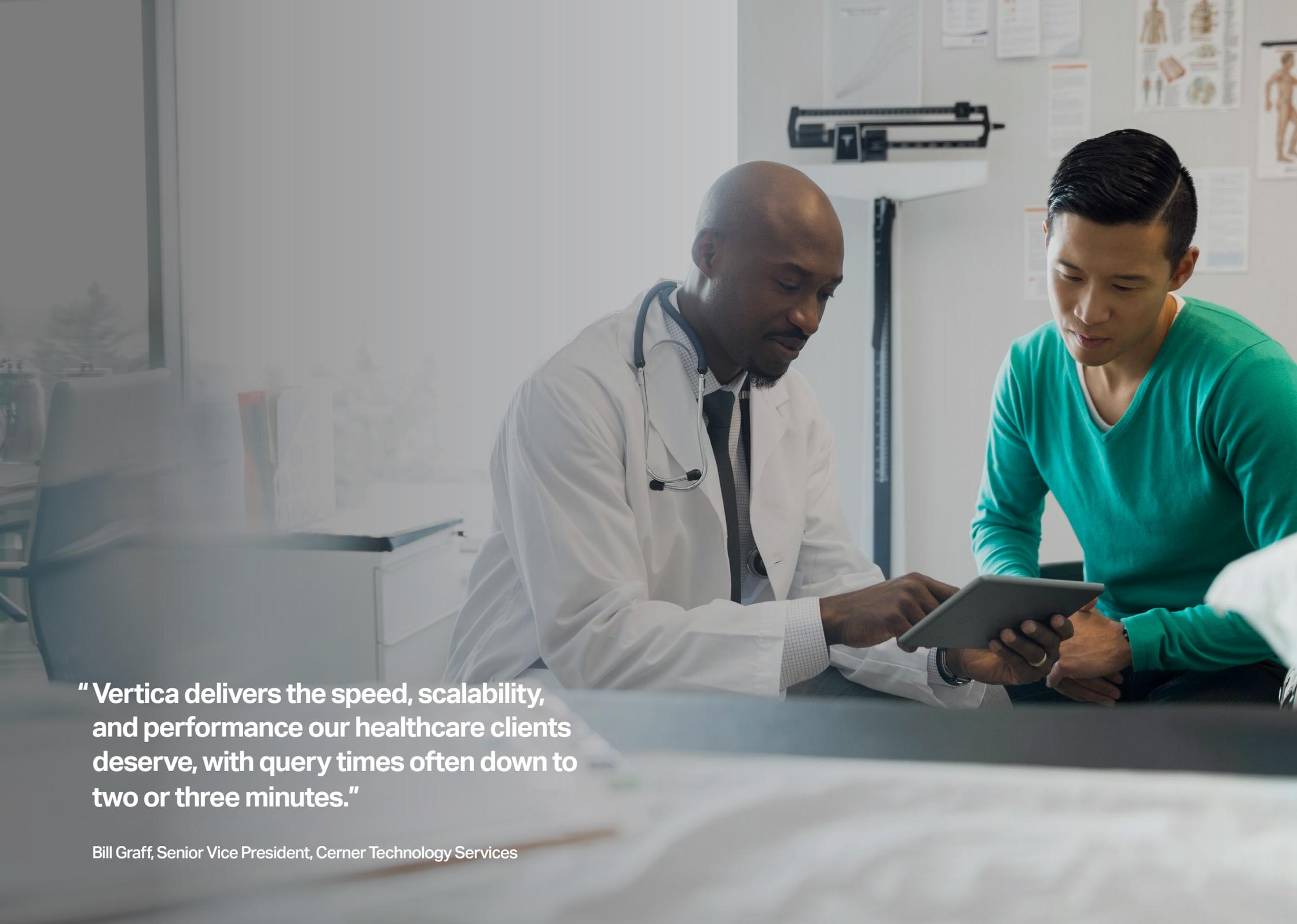
Cerner's *Millennium* solution platform provides Electronic Health Records for over 9,000 global healthcare providers, but also helps those providers optimize processes to accelerate and improve patient care delivery.

Cerner has built some 2,000 Response Time Measurement System ("RTMS") timers into the *Millennium* platform. These RTMS timers track how long certain functions take, such as accessing or adding patient information or entering an order for medication or a medical procedure. Every month, Cerner collects over 10 billion RTMS timers. These help Cerner gain insight into how individual physicians and other users actually use *Millennium*, and how its use can be improved to enhance care delivery.





“As our numbers grew, we began to approach the upper limits of our analytical capability, given the volume of data we were collecting,” says Bill Graff, Senior Vice President, Cerner Technology Services. “Some of our users would issue a query at 5:00 p.m., as they leave for the day, hoping they would have a result when they return at 8:00 a.m. the next morning.”



"Vertica delivers the speed, scalability, and performance our healthcare clients deserve, with query times often down to two or three minutes."

Bill Graff, Senior Vice President, Cerner Technology Services

Coaching to give physicians more time with patients

Graff continues: “Vertica delivers the speed, scalability, and performance our healthcare clients deserve, with query times often down to two or three minutes.”

“Vertica also helps us analyze the workflow of physicians as they treat patients,” explains Dan Woicke, Director of Enterprise System Management at Cerner. “We can virtually sit on their shoulder to see how they use the application and make suggestions about using it more efficiently.”

For example, a user might routinely search through common orders in a hospital, rather than creating a folder or list of favorites. Using

“With partners such as Micro Focus we hope to reduce physician burnout by saving them valuable time, enabling them to focus solely on their patients, leaving it to us to worry about streamlining administration and reducing costs.”

Dan Woicke, Director of Enterprise System Management, Cerner

the folder could reduce a physician’s time spent searching, and lower the risk of error, ultimately enabling them to spend more time caring for patients.

“If a physician isn’t using a time-saving feature effectively, we can contact them and suggest a more efficient workflow for them,” says Woicke. “We can coach our customers into using *Millennium* more effectively, to give them more time to spend with patients.”

Improving patient safety and quality of care

User workflow analysis in *Millennium* also holds promises to improve quality of care. Predictive analytics are used to create a database, mapping patient outcomes based on past treatments, steering physicians towards a course of treatment with a greater likelihood of success.

Cerner's patient-centric healthcare solutions ultimately lead to improved healthcare delivery, better outcomes, and healthier, happier patients. Exactly what healthcare providers, and Cerner, hope to achieve.



Woice concludes: "With partners such as Micro Focus we hope to reduce physician burnout by saving them valuable time, enabling them to focus solely on their patients, leaving it to us to worry about streamlining administration and reducing costs."

Part Two

The Climate Corporation



Data science and analytics supports an evolution in farm data and farm decision-making

At a glance

Industry:

Agriculture

Customer:

The Climate Corporation

Location:

Missouri, USA

Context:

Leverage data and data science to help farmers around the world make management decisions that optimize crop yields, field inputs, management efficiency, and farm profits.

Our Response:

Vertica Analytics Platform

Impact:

- Reduce the impact of hunger around the world
- Minimize environmental impact
- Sustainable and innovative farming with higher yield

Focus Area:

Predictive Analytics



The Climate Corporation is dedicated to creating technologies that transform field data into meaningful insights to help farmers sustainably enhance yield potential, improve efficiency, and manage their risk.

INTRODUCTION

Digital agriculture for actionable insights

Digital agriculture is not only one of the most exciting new frontiers in the advance of technology and science, but serves as a central element supporting one of agriculture's—and humanity's—most pressing concerns: increase crop yields for a growing population, right-size farm inputs to reduce environmental impact, and enable farmers to more purposefully navigate the increasingly complex set of decisions they make for their fields throughout the year.



Just 1.3% of the domestic U.S. workforce¹ is responsible for producing the food we eat. This small portion of the population manages massive amounts of land; in 2017, U.S. farmers managed just over 2 million farms compared to nearly 7 million in 1935², representing not only a sharp decline in number of farms but a vast increase in the information being managed by each farmer.

The scale of the data coming off any farm is massive, varied, and complexly interrelated. The need for clean data to drive future mathematical model development and thus actionable insights to farmers is great and urgent. The agriculture of the past, with manual notebooks kept inside tractor cabs, has passed but it's not that far in the past. Digital agriculture has evolved rapidly over the last decade and with it digital solutions.

¹ www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy.aspx

² www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/farming-and-farm-income/

The Future of Sustainable Agriculture

Millions of acres of clean data, well curated and organized, across a range of geographical and management conditions, is the future of sustainable agriculture. Vertica Analytics Platform plays a key role in the technology landscape at Climate. Erich Hochmuth, Senior Director of Data and Analytics, comments, "Vertica's analytical and spatial functions allow The Climate Corporation to sift through the diverse datasets and get an accurate lay of the land to enable decisions from the direction of new products to the accuracy of our scientific models."



When it comes to the need to transform the way data is managed on the farm, understanding that data is a key piece. Vertica has enabled critical insights coming out of our trove of FieldView™ data. The team responsible for deployment of the FieldView products use Vertica to better get a sense for how Climate customers are using its apps, and all of the core metrics of success are computed and powered from Vertica.

Maximize Yield Through Advanced Analytics

Agronomic recommendations are made available back to the farming clients via a SaaS application to assist them in picking the best seed for next season. Vertica's analytics and spatial capabilities helped enable Climate's data science teams to build and validate the models powering these agronomic recommendations, and drive insights to help its customers successfully use Climate products.

Hochmuth, on the nature of the data Climate has to correlate and analyze, "At Climate we're working with data not just coming from what's being planted, but from the clouds and weather in the sky down to the composition of the soil that holds the crops in place.

"Vertica's analytical and spatial functions allow The Climate Corporation to sift through the diverse datasets and get an accurate lay of the land to enable decisions from the direction of new products to the accuracy of our scientific models."

Erich Hochmuth, Senior Director of Data and Analytics

Traditional data solutions couldn't make sense of the multitude of data layers a farmer has to care about. Vertica's analytics and reporting functionality greatly reduces the time our teams would need to spend synthesizing data into insights."

Doing More With Less

Hochmuth concludes, "Vertica is a critical technology that helps Climate collect, clean, and organize the big data within FieldView. One of my favorite things about FieldView is how it enables farmers to see all their data in one place. Having access to organized data that paints a clear picture of what's happening on a field is step one; step two is pushing that data a little further to help enable farmers to make the best on-farm decisions they can, raising their yields, their profits, and the sustainability of their land."

This is the real impact of FieldView: doing more with less. Over the next several decades, the demand for food will greatly increase while the land available for, and suited to, the cultivation of crops that the world needs will decrease or remain flat. Data and analytics are driving us toward the future of farming in which we're producing more, making the best decisions possible, and feeding the world.



Part Three

Pulselight

Illuminating real-time data intelligence so that resources are directed to save lives and improve quality of care



At a glance

Industry:

Government

Partner:

PulseLight

Location:

Ohio, USA

Context:

Leverage advanced and predictive data analytics to fight against the opioid epidemic and its cost to human life

Our Response:

Vertica Analytics Platform

Impact:

- Early intervention improves patient outcomes and can save lives
- Better allocation of state resources ensures acute care for the most vulnerable
- Enhanced quality of care

Focus Area:

Predictive Analytics



PulseLight was born from the urgent and rapidly growing need to transform the quality, efficiency and cost of how everyone experiences healthcare. The team includes former executives of healthcare organizations, investigative leaders, data scientists, and engineers. The PulseLight team all want to invent things that significantly improve lives.

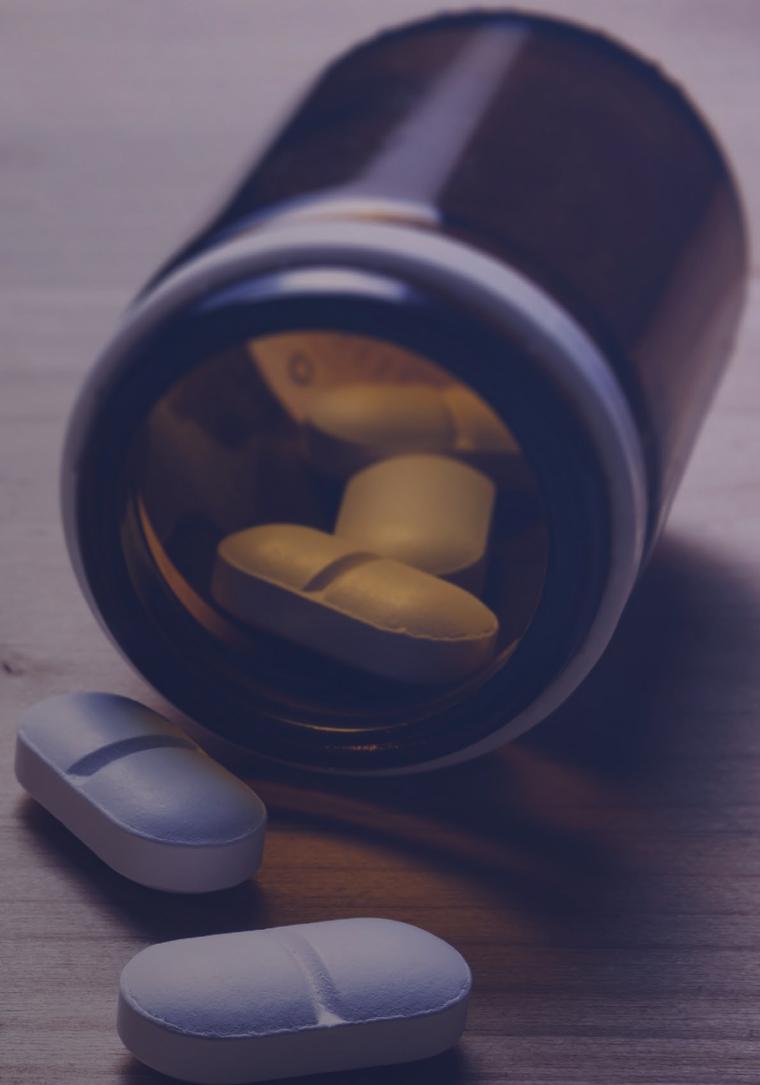
Introduction

14 Ohioans die every day from Opioid Use Disorder (OUD)

With an opioid abuse epidemic taking hold all across the USA, Ohio has the second largest death rate from opioid abuse of all the USA states, with at least 14 Ohioans dying every day from Opioid Use Disorder (OUD). This makes it the leading cause of injury-related death and is an indication of how serious the opioid epidemic is. Between 2001 and 2016, overdose deaths more than quadrupled.

Four in 10 adults with OUD are on Medicaid. Medicaid is the largest source of funding for medical and health-related services for people with low income in the United States, providing free health insurance to nearly 75 million low-income and disabled people. Apart from the obvious cost to human lives, there is also an economic cost for the Medicaid plan to take into account. The medical cost of looking after a person with OUD is double that of the medical costs of a person without OUD. This gets worse over time, because as the OUD develops, the risks of long-term health effects, and overdose, increases exponentially, along with the cost factor.

The children of Ohio are also suffering due to the heroin and opioid epidemic. Teachers in Vinton County, Ohio, buy shoes for their students whose addicted parents send them to school in footwear held together with tape. The foster care and child-protection system in Ohio now houses close to 14,000 children, many of whom were removed from their families because of addiction.



Use data analytics to identify at-risk patients, before it is too late

Jason Helmandollar, Healthcare Solutions Lead at Pulselight, explains further: “The situation is critical and needs urgent support. With help from grants, we are able to bring data analytics innovation to Ohio. We have a real window of opportunity to identify at-risk patients, before it is too late for them. The data we have at our disposal consists of millions of records from Medicaid claims, all regional hospitals, doctors, pharmacies, the FDA, etc. By leveraging the power of analytics we want to support targeted intervention, education, and policy-making—saving lives and costs. We needed a solution to help us combine and correlate massive volumes of data in real-time to give us the instant feedback we need to act immediately.”



The goal is to make data actionable and accessible to all types of users. With analytics and action working together, at-risk patients can be located geographically for early intervention or education. Problematic prescribers and pharmacies can also be identified in this way.



**"Vertica illuminates
the intelligence
hidden in our data."**

Jason Helmandollar, Healthcare Solutions Lead, Pulselight

Processing 1.5 billion records daily to gain meaningful insights into patient's lives

The Pulselight solution architecture supports state-wide data sharing. It consists of a data layer that takes in huge volumes of data from a variety of sources. The data is fused, cleansed, and enriched, before it passes through the Vertica Analytics Platform for real-time metrics correlation.

Helmandollar comments: "Leveraging Vertica, we can transform our data into analytically useful metrics, from a patient, prescriber, and pharmacy perspective. With so many data sources we can correlate information on a patient's average daily morphine

milligram equivalents (MME), their average daily supply, even if it encompasses multiple and overlapping prescriptions, dangerous drug combinations, their time on opioids, and a treatment, overdose, and diagnostic history."

Taking millions of prescriptions and extrapolating this into a per-day MME picture for individual patients soon adds up, and the Pulselight system can process up to 1.5 billion records each day. To get meaningful insight, a high performance data analytics solution is the only answer, according to Helmandollar: "Vertica illuminates the intelligence hidden in our data. Through an interactive web-based application, it gives our stakeholders real-time answers to complex questions, so that state resources are allocated where they have the greatest impact on lives and costs."

"Vertica helps us simplify a huge volume of complex and hard-to-find data with lightning speed, enabling us to meet our mission of identifying individuals at high risk of overdose."

Irene Manautou Williams, CEO, Pulselight

Analytics and action work together for early patient intervention

Pulselight, leveraging the power of Vertica, uses data analytics to identify, stratify, and locate short-term at-risk patients. Analytics is then followed up through physical action, in the form of urgent outreach, education, or intervention programs. For example, based on Pulselight's analytics, educational letters are sent to patient populations, or notification letters to the providers who are over-prescribing. The outcomes are fed back into the system, so that results are measured and tracked over time, and patient programs are adjusted or repeated where successful.



Irene Manautou Williams, CEO of Pulselight: "Early intervention is key in combating the opioid epidemic and avoiding associated cost escalation. Vertica helps us simplify a huge volume of complex and hard-to-find data with lightning speed, enabling us to meet our mission of identifying individuals at high risk of overdose."

In the case of letters to providers, Pulselight can see that the number and amount of opioid prescriptions decrease for those notified providers, or those who attend educational sessions. With at-risk patients, the Pulselight system shows that certain individuals have their first treatment for substance use disorder after outreach has been made.

By optimizing the available data, Pulselight can focus on the most vulnerable populations, such as children, the elderly, or neonatal abuse cases, for immediate impact. Helmandollar concludes: "Vertica helps us identify and predict high risk providers, pharmacies, and patients. Early intervention means we connect high risk patients with education, training, treatment, wellness programs, and substance abuse services. This improves the quality of care, reduces costs, and ultimately saves lives."



