White Paper

How Particle's Specialty Search Addresses Different Health Conditions

particle

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This white paper discusses the following:

- A brief history of interoperability and an overview of Particle Health's API.
- How our API finds clinical data and addresses its limitations.
- Specialty Search: What is it? What does it do? How does it work?
- Why is Specialty Search vital in the treatment of complex conditions?
- How healthcare organizations benefit from Specialty Search.

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Introduction

Chronic conditions require a Herculean effort to resolve, so healthcare providers that want to deliver exceptional outcomes try to get a complete picture of their patient. For most of history, healthcare data has been scattered across countless networks, making it incredibly difficult for providers to offer the best care possible. Fortunately, due to industry changes, this fragmented information is becoming more accessible.

- Regulatory tailwinds are blowing the industry toward more legally accessible data.
- New clinical data standards like C-CDA and FHIR R4 make exchanging data more accessible across newly developed national networks.
- Payer, provider, and patient expectations for better care are growing, and they understand that it relies on better data access.

Technically speaking, healthcare data interoperability is now accessible, but the reality is that there have been challenges and half measures. Particle Health's mission is to overcome these challenges to enable true interoperability through simple, secure access to actionable healthcare data to improve efficiency and quality of care and outcomes.

Today, the foundation of Particle's technology is robust, scalable, and stable. Our single, developer-friendly API connection to patient data from 70,000+ health systems, practices, and clinics helps providers uncover interventional opportunities, track care outcomes, and drive patient empowerment. But healthcare is complicated, and we must continue leveraging the evolving national ecosystem of data sharing in new ways so providers can further iterate and improve patient care.

This white paper provides context and insight into Specialty Search, our new and expanded Record Locator Service (RLS) capability. Specialty Search is a feature enhancement designed to enable healthcare organizations to obtain exceptionally robust clinical data on patients with complex, chronic diseases.

How Does Particle Work?

Over the years, there have been many approaches to building a layer of interoperability across the healthcare ecosystem. Ad-hoc fax machine empires, integration engine services, and portal scrapers have all had their day.

While these solutions have their place in particular workflows, they fail to meet the ultimate goal of true interoperability: to make all medical records accessible, from different sources, no matter where in the country, via one connection to any healthcare platform.

Particle accomplishes true interoperability through:

- **Our Data:** A network of health information networks linking 270 million+ medical records from 70,000+ provider organizations across the country.
- **Our Platform:** An intuitive, easy-to-use interface that streamlines the process of accessing actionable healthcare information at scale.
- **Our Technology:** All the processing work that happens behind the scenes to locate, query, parse, aggregate, and transform records in our network.

In under a minute, record requests can be sent back to users in several formats, including C-CDA, FHIR R4, or a raw data file. We can do this by leveraging connections to all three major nationwide interoperability networks (CommonWell, Carequality, and eHealth Exchange), which obtain data from providers and EHR systems, along with additional pharmacy and ADT feed data sources.

How does the Particle API know where to locate records?

Record Locator Service (RLS)

Once generated, patient data is almost always part of one private network or another that connects to Particle's platform. But having access to a data network doesn't mean you can automatically search the entire network intelligently for the clinical data you need. The problem with finding that data - and sending it to a new provider - is that the networked data is not indexed. So you have to know precisely where that data resides if you want to find it. That is where a record locator service (RLS) comes in.

An RLS is like a detective for clinical data. It's an algorithm that finds locations where patient data is stored, asking networks connected to our API if they contain records that match the demographic information of the end user's search.

Particle's industry-leading RLS finds records better than any other solution on the market.

- → **~90% Query Success Rate** across all customers.
- → **134 records found** on average for every successful query.
- → **5+ average conditions** found per patient.

Record Locator Service Limitations

A vital component of the health data exchange process is how an RLS can search different networks and health information exchanges for medical records. However, there are limitations to traditional data queries.

No API on the market (including ours) can search every hospital in the country for every patient. Health information exchanges and individual healthcare system networks can't handle the volume of nationwide data. Furthermore, organizations often flag queries outside their system for security and compliance reasons.

These restrictions require provider organizations to target their data queries geographically, searching networks within a certain radius of the patient's home address. As a result, the search results can occasionally omit vital patient encounters and medical records from outside the patient's local geography. Particle leverages other heuristics and patient registries that we're connected to look for records under a patient's previous address, but the process is still primarily geography-oriented.

For years, Particle Health has been working to address the drawbacks of traditional geography-oriented data queries that perform a radius search for a patient's records. Specialty Search is a breakthrough capability to overcome these limitations.

Building on our Record Locator Service: Specialty Search

What Is Specialty Search?

Specialty Search is a condition-oriented expansion to our RLS capability. It enables condition-specific record queries from the top centers of excellence for specific conditions in the United States, whether or not the provider is close to the patient's home address.

Specialty Search currently includes the following specialties:

- Oncology
- Cardiology
- Endocrinology
- Orthopedics
- Nephrology
- Pulmonology
- Gastroenterology

What Does Specialty Search Do?

Specialty Search ensures providers who treat complex and chronic conditions can run a record search with unprecedented thoroughness. Organizations that implement Particle's Specialty Search can create interventions and care plans with more comprehensive patient data.

How Does Specialty Search Work?

Specialty Search uses our existing API, and we made it as simple as possible. Customers can add the feature with minimal code and time by adding a new optional parameter to each query made in either C-CDA and FHIR formats.

Why Is Specialty Search Important in Treating and Managing Chronic, Complex Conditions?

Surfacing actionable healthcare data is essential to enable better care and outcomes. Indeed, it is the fundamental goal of healthcare interoperability.

A key component to realizing interoperability is our base level Record Locator Service. Still, we understand that healthcare is complicated and no two patients are alike. Each patient has a unique medical history and care journey, and sicker patients may require more advanced tools.

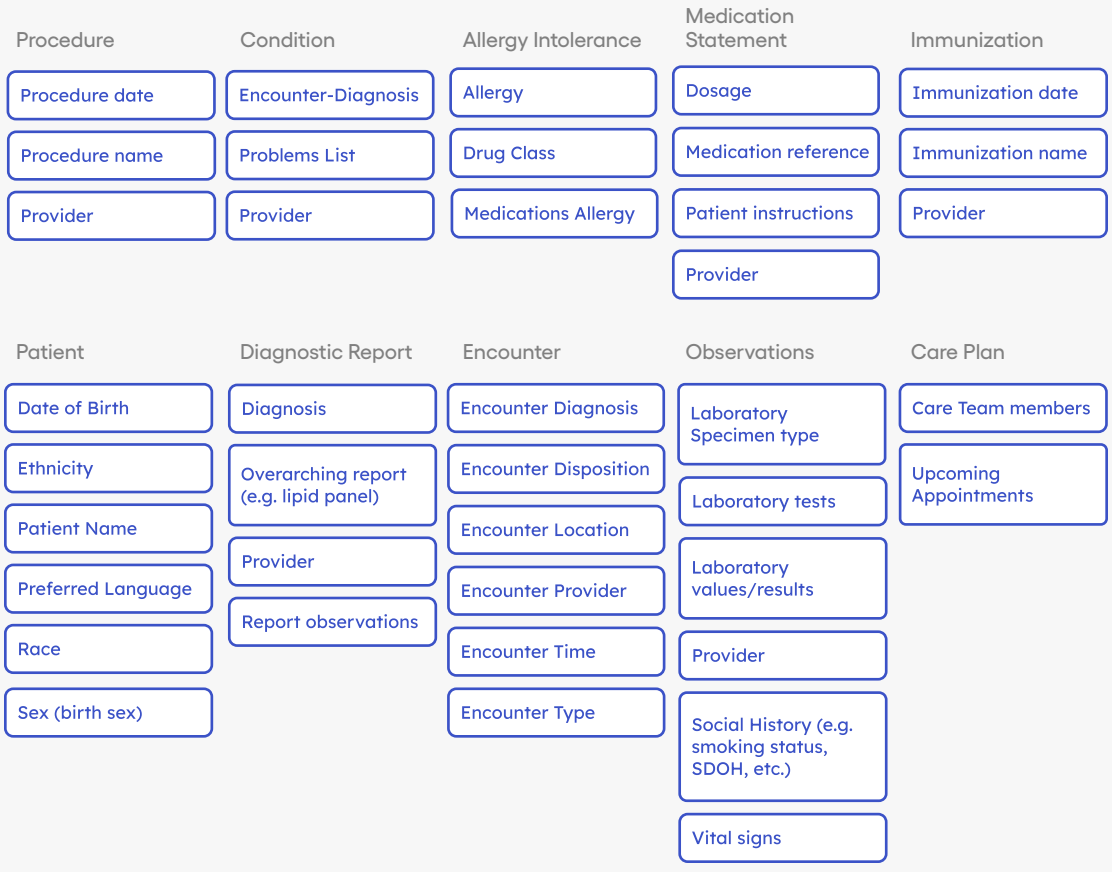
While a standard geography-oriented records search may work for most patients, those with chronic, severe illnesses have more complex medical histories and experience highly fragmented care delivery. They'll see several specialists in addition to their primary care physician (PCP). They'll often move between inpatient and outpatient care settings for treatment. Furthermore, patients will often travel outside their local health system to receive care because better-suited facilities to treat their condition exist outside their geography, or their typical provider network does not offer the treatment they need.

As a result, each episode of care generates a vast amount of data that is fragmented and siloed across different networks that may not be close to the patient's address. Therefore, a geography-oriented RLS might miss this critical information in its search.

Without an accurate, comprehensive history of every patient, providers can't assess patient-specific needs and develop and coordinate the most effective care plan possible. Furthermore, the increased complexity of their conditions increases the risks of omissions and errors, making surfacing the correct data at the right time even more essential.

Specialty Search is crucial to the treatment of complex, chronic diseases. It ensures that providers have the most comprehensive data and provides a simple, seamless way to deliver the most critical patient information to the right person at the right time. This data can have a substantial impact on how treatment is ultimately delivered.

In the following sections, we'll provide a brief overview of why we've launched this seminal functionality for the following conditions - Oncology, Cardiology, Endocrinology, Orthopedics, Nephrology, Pulmonology, and Gastroenterology.



Particle accesses the USCDI V2-V3 dataset from EMRs and other network participants. Our ultimate goal is to make this data actionable.

Oncology

The US cancer care delivery system is highly fragmented, leading to higher healthcare costs, inferior quality of patient care, and unnecessary procedures and treatments.

One of the primary culprits of fragmented cancer care is information overload and complexity. Advances in oncology therapies, medications, research findings, and precision medicine have accelerated in recent years. This welcome acceleration has led to breakthroughs that have revolutionized cancer care and improved outcomes for countless patients. However, it also entails increased complexity, making diagnosis, treatment evaluations, and ongoing disease monitoring and management difficult for oncologists.

Furthermore, cancer patients have diverse disease presentations.Their unique data and medical history is vital to matching them with the most precise, effective, and safest treatments.

To apply and qualify for specialty therapies, cancer patients frequently attempt to collect their medical records from every provider they've seen. Patients go to great lengths to give providers the whole picture to inform their clinical assessments and treatment recommendations.

However, it's difficult for cancer patients, their families, and their partners to gather the data, especially when their care journey takes them to several care settings and regional and national centers of excellence that don't have access to each other's network.

With Specialty Search enhancement, our RLS compiles records from Centers of Excellence across the country without regard to the patient's home address, collecting hard-to-find data from the most likely healthcare settings that oncology patients traveled to for care. This:

- **Enhances the patient experience** by removing the burden of collecting and formatting their medical records, leading to more productive discussions between provider and patient.
- **Simplifies assessing patient's medical history, enrolling them in appropriate treatment programs, and creating effective care plans** because received data sets are already parsed and mapped to an EHR-compatible format (either C-CDA or FHIR).
- **Improves clinical efficiency** by delivering insights to providers immediately, allowing them to spend their time and energy delivering high-quality care and improved outcomes.

Cardiology

Record fragmentation is a significant barrier to delivering the best care for heart failure patients. Patients with cardiovascular conditions typically receive care in many healthcare settings and are exposed to unnecessary medical procedures and diagnostic tests. They also experience extended hospital stays and readmissions. Fragmentation is exacerbated for patients living in rural areas, as significant rural-urban disparities in cardiovascular care access exist.

- **One hundred thirty-six hospitals closed in rural areas from 2010 to 2021**, resulting in longer travel times and delays in medical services and treatments for cardiac conditions.[1]
- Even if patients can receive treatment, accessing follow-up care after discharge proves just as difficult. **Rural areas only have 10% of the nation's primary care physicians, and three specialists per 10,000 people.**[2]
- Beyond challenges with access to care, research sites a **relative lack of "intensity of care," or a lack of resources and infrastructure in the rural setting**, as another factor that may contribute to these rural-urban disparities.[3]

These access disparities have led to severe inequity in care quality and outcomes in cardiovascular health.

- **14.2% of individuals in rural areas have at least one CHD, vs. 11.2% in small metropolitan areas and 9.2% in urban areas.**[4]
- **Mortality rates from cardiovascular disease in rural areas were 21% higher in rural areas vs. urban areas.**[4]

While statistics indicate the need for better access and coordination of cardiology care across rural geographies, they fail to illuminate the reality of the challenges.

Take the following scenario:

> While onboarding a new patient, a cardiologist in Birmingham, Alabama, requests the medical records for a new CHF patient using a traditional geographically targeted record locator service. But the patient went to Vanderbilt University Medical Center in Nashville, TN, to receive a triple bypass.
>
> While the patient informed the cardiologist of the bypass, they would need the complete clinical summary and discharge notes

> containing critical details that the cardiologist should consider in their treatment plan. This omission can cause treatment plan failures and suboptimal outcomes down the road.

If the cardiologist had access to Specialty Search, they would have received the complete clinical summary of the bypass, leading to:

- A more informed discussion about the patient's history and the patient recalling crucial details of the procedure, leading to treatment decisions that **improve the patient's experience, outcomes, and overall wellness.**
- **More accurate assessment of the patient's condition** with the complete picture and relevant data such as **chart blood pressure, ejection fraction, cholesterol, and HDL/LDL content** on an ongoing basis to support chronic care management for preventative care planning and improved quality of life.
- **Optimal care plans that align with clinically recommended standards from the start**, plus opportunities for preventative interventions to reduce the risk of costly hospitalization.

Endocrinology

On top of the typical challenges associated with care fragmentation in treating severe chronic conditions, patients with diabetes are at an increased risk for developing severe comorbid conditions.

98% of Americans with Type 2 diabetes have at least one comorbid condition, and 90% have at least 2.[5]

Not surprisingly, clinicians can be overwhelmed by the need to address comorbid chronic conditions and patients' diabetes-specific treatment goals. Ignoring concurrent disease management, however, can lead to ineffective control of diabetes-specific risk factors and may miss opportunities to improve patients' functioning, quality of life, and mortality risk.

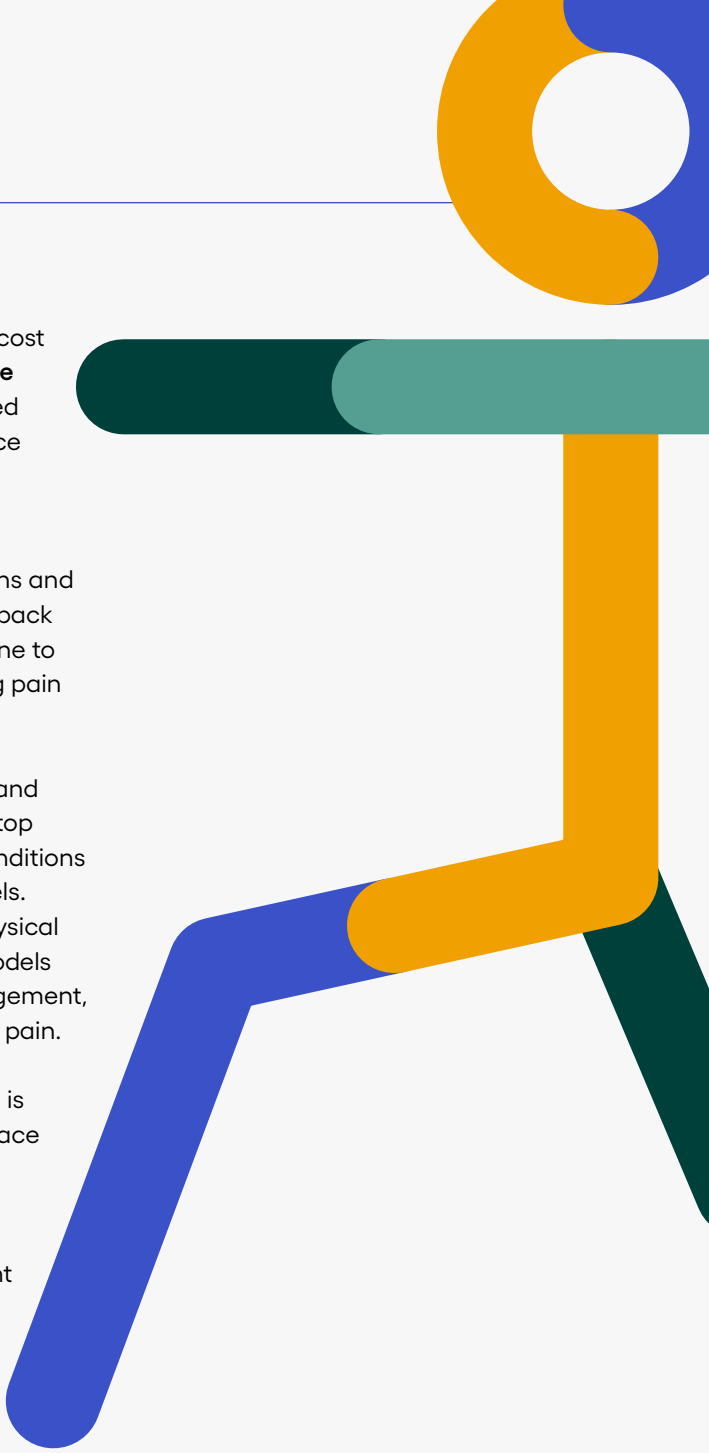
The American Diabetes Association has incorporated the assessment of comorbidities into its care guidelines; however, effective care plans for diabetic patients depend on communication, coordination, and the flow of information between providers and care managers.[6]

But healthcare information systems are designed to store data, not share it, and diabetes patient data is scattered between PCPs, multiple specialists, and different healthcare systems across the country. In addition, when patients transition between healthcare systems, it creates a high risk of discontinuity for their personal health information due to a widespread lack of information sharing. The result is discontinuity of care, waste, and disjointed surveillance across systems and states.

Specialty Search helps address these challenges for diabetes management by:

- **Filling in the blanks of the patient's story**, not just their diabetes treatments, but also comorbidities and contraindications, so that providers can build patient-centered management and prevention programs.
- **Optimizing clinical efficiency** by enabling providers and care teams to strategically pull diabetes-specific data like A1c values, GFR levels, age, and BMI out of years of medical records.
- **Enabling seamless, transparent communication, coordination, and the flow of information** between providers and care managers to develop and execute care plans that reduce redundant treatments and streamline clinical workflows.

Orthopedics



Musculoskeletal (MSK) conditions are the number one healthcare cost in the United States, **$381 billion annually**, and affect more than **one out of every two adults**. Moreover, the total cost of MSK is estimated to be approximately $600 billion when accounting for lost workforce productivity.[7]

Managing MSK pain is challenging, and traditional surgical and prescription medication treatments have high risks of complications and additional downstream costs. Research shows that 20% to 40% of back surgery patients report having the same or increased pain levels one to two years after their procedure, and 63% of opioid users start using pain medication for back and joint pain.[8]

Given the failures of traditional treatments and the cost in dollars and quality of life, addressing MSK conditions and pain has become a top priority for value-based care organizations. Many address MSK conditions and pain by developing multi-faceted, patient-centered care models. Leveraging digital technologies and multi-disciplinary teams of physical therapists, health coaches, physicians, and orthopedists, these models promise to improve care access and support health literacy, engagement, and the quality of life for countless patients suffering from chronic pain.

However, developing a care model and successfully executing one is drastically different. Health systems, their providers, and patients face significant challenges to see the improved financial, clinical, and quality outcomes these new models promise. Patient-centered, collaborative care requires high-level data access to ensure that each patient receives the right care from the right team at the right time.

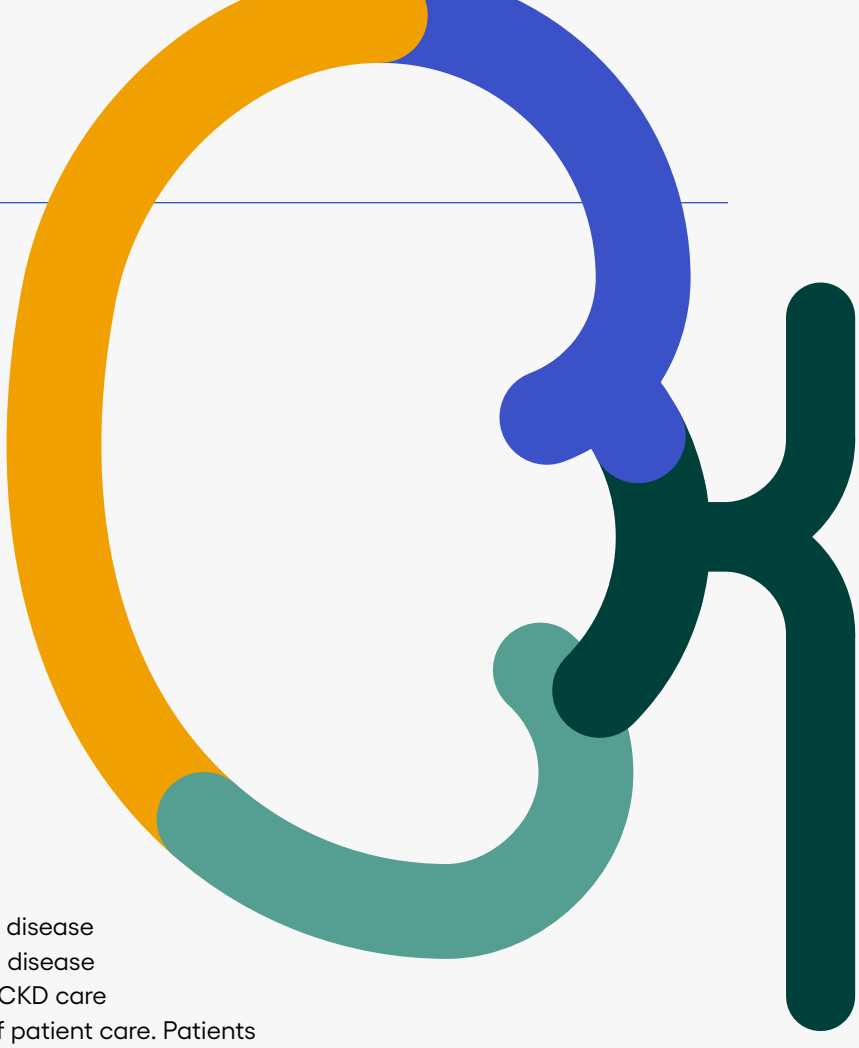
Unfortunately, fragmented and siloed clinical records and datasets limit the care team's ability to develop personalized treatment plans that effectively manage MSK pain. Missing information at the system level leads to improper risk stratification and poor resource allocation for those with severe disabilities who typically require more complex integrated care. While record locator services can aggregate clinical documents within a single system or geographic network, data collected from outside the system is collected using time consuming, error-prone, manual processes.

Specialty Search helps address MSK pain management challenges by:

- → **Strategically pulling condition-specific data sets** that matter to get care plans right from the start.

- **Coordinating large multi-disciplinary care teams** to MSK patients' care journey with incredible speed and scope.
- Surfacing the most relevant data and insights to track MSK treatment quality and **identify opportunities for preventive interventions that avoid costly surgical treatments.**

Nephrology

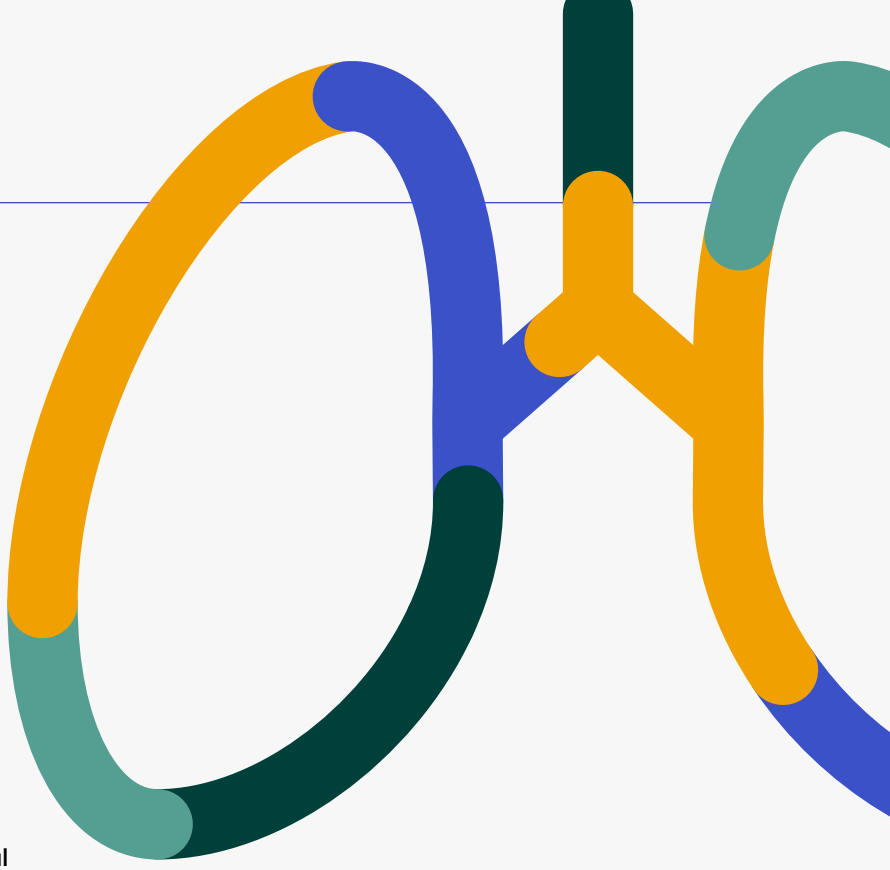


Chronic kidney disease (CKD) is a significant detriment to public health. In the United States, **CKD affects 1 in 7 adults and is the 10th leading cause of mortality,**[9] **with 50,000 deaths reported in 2021.**[10] In addition, there are **~786,000 individuals living with End Stage Kidney Disease (ESKD)** (71% on dialysis and 29% with a kidney transplant), and it costs over **$50 billion** in Medicare-related expenditures annually.[9] Furthermore, it is now well-recognized that premature death and morbidity (especially cardiovascular morbidity) are far more frequent outcomes compared to ESKD.[11]

Despite the tremendous impact of CKD on health, quality of life, and healthcare costs, chronic kidney disease management remains complex. Like many chronic disease states, one of the principal challenges to effective CKD care planning and management is the fragmentation of patient care. Patients with late-stage CKD often have complex medical issues and comorbidities that require attention from specialists and a primary care physician. Unfortunately, the web of multiple physicians often results in inadequate information sharing, communication, and coordination. A study published by The Journal of General Internal Medicine reports that "...primary care providers had difficulty developing working partnerships with nephrologists because there was not timely information exchanged about their shared patients; their roles and responsibilities were unclear; and primary care providers had limited access to nephrologists for advice."[12] The study concluded that better communication tools that improve information exchange and provide comprehensive consultative notes are needed to improve CKD care planning and execution.

The issue is that accessing and exchanging information on complex CKD patients is challenging as medical records and healthcare datasets need to be more cohesive across networks. A lack of timely, accurate, and comprehensive information makes it impossible for nephrologists, PCPs, and other care team members to improve CKD management and outcomes.

With Specialty Search, clinicians start with a complete patient picture so care teams can establish an informed, unified treatment plan to improve patient outcomes and quality of life for those with kidney failure.



Pulmonology

Chronic obstructive pulmonary disease (COPD) is recognized as a significant threat to public health, affecting **~29 million Americans** and costing **$49 billion annually**.[13] Despite advances in diagnostics, therapeutics, and treatment methods, the costs in dollars, quality of life, and mortality continue to rise.

Evidence shows that applying chronic care management (CCM) models to COPD treatment has significantly reduced hospitalizations and ED visits and improves patient quality of life. However, most COPD care traditionally consists of emergency treatments for COPD exacerbations. **COPD exacerbations are responsible for 75% of the annual $49 billion spent on COPD.**[13]

Treating COPD is complex, and there are several barriers to delivering optimal care and improved outcomes to this vulnerable patient population, one of the most significant being a lack of care coordination. COPD patients typically experience complex and fragmented care delivery. As a result, their medical records are scattered across several siloed networks. Without an accurate, comprehensive history of every patient, providers can't assess patient-specific needs and develop and coordinate the most effective care plan possible.

Surfacing the correct data at the right time to treat complex conditions like COPD is paramount. With Specialty Search, provider organizations can query the top pulmonology centers across the country for their patient's pulmonology-specific records. The additional information fills in the blanks of the patient's story, giving care teams the breadth, depth, and context needed to build the best possible care plans and coordinate them across the care team, preventing expensive hospitalizations due to COPD exacerbations and improving quality outcomes.

Gastroenterology

Digestive diseases rank third among illnesses in total economic expense in the United States, causing more hospitalizations than any other condition and costing an estimated total of $136 billion in annual healthcare expenditures.[14] [15] Furthermore, 62 million Americans are diagnosed with digestive disorders annually, ranging in severity from acute and self-limiting to chronic and debilitating.[16]

Among the most burdensome and expensive chronic gastrointestinal diseases is inflammatory bowel disease (IBD). IDB refers to two conditions (Crohn's disease and ulcerative colitis) and is characterized by chronic inflammation of the gastrointestinal (GI) tract. Even though the prevalence of IBD is only 0.4% in the general population, it leads to severe complications requiring hospitalization, surgical procedures, and mortality.[17] With its incidence on the rise and its disproportionate cost relative to disease prevalence, IBD management is an issue of considerable concern for public health.[17]

Like many of the conditions discussed in this paper, studies suggest that a multidisciplinary team-based approach to IBD management improves the quality of life and care and lowers costs, but these are rarely implemented in practice. Challenges such as a lack of practical team-based care models and guidelines, communication and coordination between patients, PCPs, and specialists, and gaps in care continuity have slowed the widespread adoption of multidisciplinary team models in the delivery of IBD care.[17] Moreover, high-volume IBD centers of excellence provide better outcomes than non-specialist centers and offer practical examples for long-term care and management of patients with IBD.[18]

Sadly, IBD centers of excellence are unavailable for many patients, and they often only resort to these facilities when their local providers cannot provide the required treatment. Furthermore, the average patient does not have the luxury of receiving all their care from a single facility or network, making the COE-centric care delivery model unrealistic for most patients.

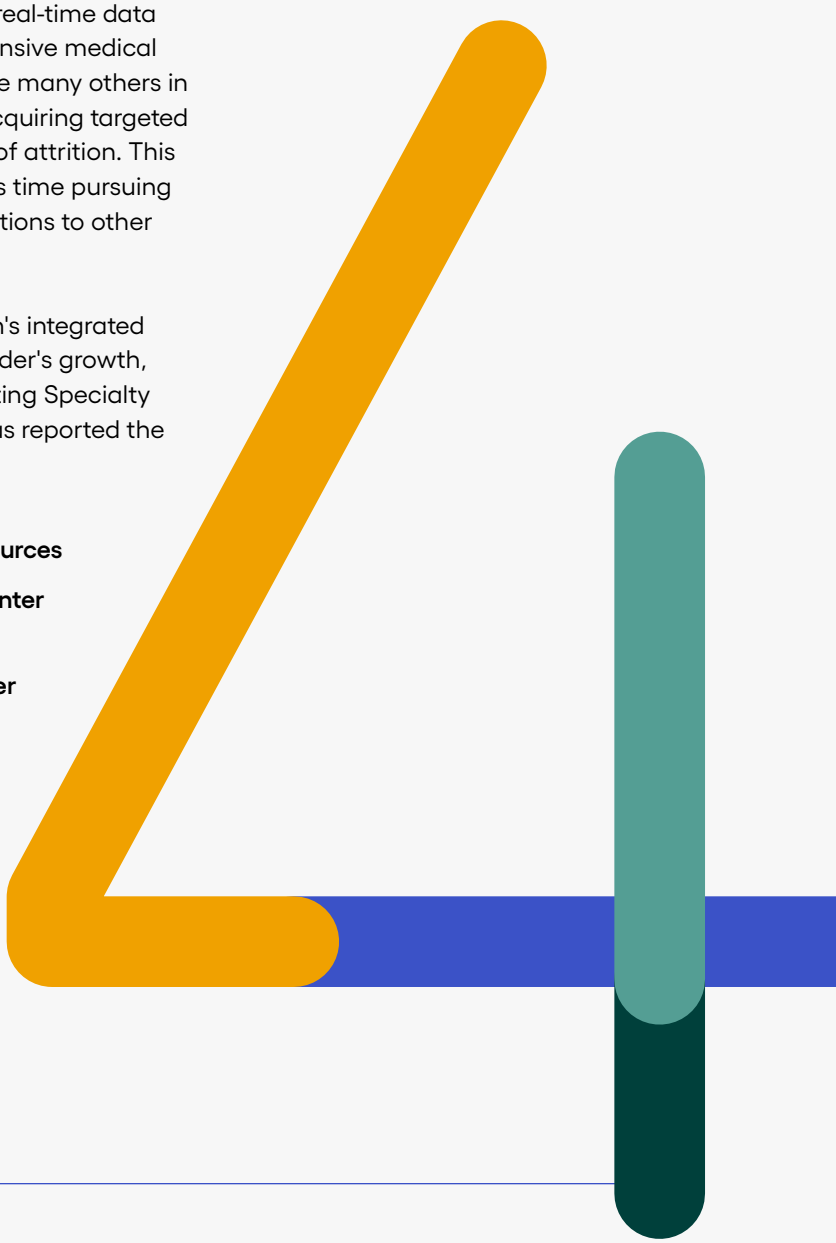
Readily available, comprehensive patient data at the point of care is essential to realizing the benefits of collaborative care models in decentralized treatment delivery. With Specialty Search, multidisciplinary care teams can access vital GI-specific medical records for their patients, enabling:

- **Improve patient experiences and outcomes** through patient-specific disease management programs informed by the most complete history possible, risks, and comorbidities.
- **Preventative management programs and intervention opportunities** that reduce unnecessary, redundant treatments and tests.
- **More continuous care between care team members** because data is structured in standard formats, ensuring the patient's entire care team is working with the same information.

How Do Healthcare Organizations Benefit From Specialty Search?

Through a beta customer, we've already seen significant evidence of Specialty Search's ability to impact treatment through real-time data insights. The ability to quickly gain access to comprehensive medical histories is central to everything this customer does. Like many others in their space, they have long been forced to approach acquiring targeted healthcare records from source institutions as a game of attrition. This approach overutilizes operational resources and wastes time pursuing a series of faxes, phone calls, revised releases, and solutions to other obstacles that inhibit access to patient data.

Access to consolidated data streams via Particle Health's integrated network-of-networks was a key driver for this care provider's growth, scalability, and service improvements. Since implementing Specialty Search on top of Particle's core API, the organization has reported the following results:



- **25% of queries found documents from additional sources**
- Those queries found **an average of 4.2 more encounter locations per query, an increase of 91%**
- **25% of queries that previously returned no encounter locations now identified sources**
- 12.5% of patients who previously did not have sufficient medical record data to facilitate enrollment in a given expanded access clinical program have since successfully enrolled (and received access to crucial and time-sensitive care therapies)
- **50% increase in program enrollment** in the first month of operations with the Specialty Search feature.
- Beyond program enrollment and specific

treatment access, **additional returned records for all patients (i.e., 43%) enabled assessment of their treatment options for presentation to their care team and better management and care of their condition.**

Specialty Search has ensured that the customer receives as many clinical records from as many sites and as quickly as possible. In turn, they can deliver insights and services to patients and physicians when needed so they can spend their time and energy where it is better spent: on treatment.

Conclusion

Over the past few years, regulatory and technological changes have made patient data and ways to access it exponentially more accessible. This readily-accessible patient data is at the core of our API, and we've seen providers use this data to uncover interventional opportunities, track care outcomes, and drive patient empowerment.

Even though our RLS is already best-in-class, we understand that the needs of our customers are constantly evolving and that there is always room for improvement. We have long recognized the limitations of traditional geography-oriented data queries, and Specialty Search gives our RLS a colossal upgrade.

The conditions covered in this paper are some of the most challenging, costly, and complex disease states to treat. They significantly drive adverse care outcomes and increased costs to the healthcare system. By providing more breadth and context into these complex patient populations, provider organizations can properly risk stratification, better utilize resources, and develop care plans that improve outcomes and lower costs.

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White Paper

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About Particle Health

Particle is shaping the new standard for healthcare data exchange with a user-friendly API platform. We create intuitive experiences for developers, build scalable infrastructure that product teams love, and collaborate with innovative leaders launching data-driven healthcare solutions. Particle's API helps healthcare providers access data from over 70,000 health systems through a single integration — and FHIR-enabled medical records for over 270 million patients via a single query.

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