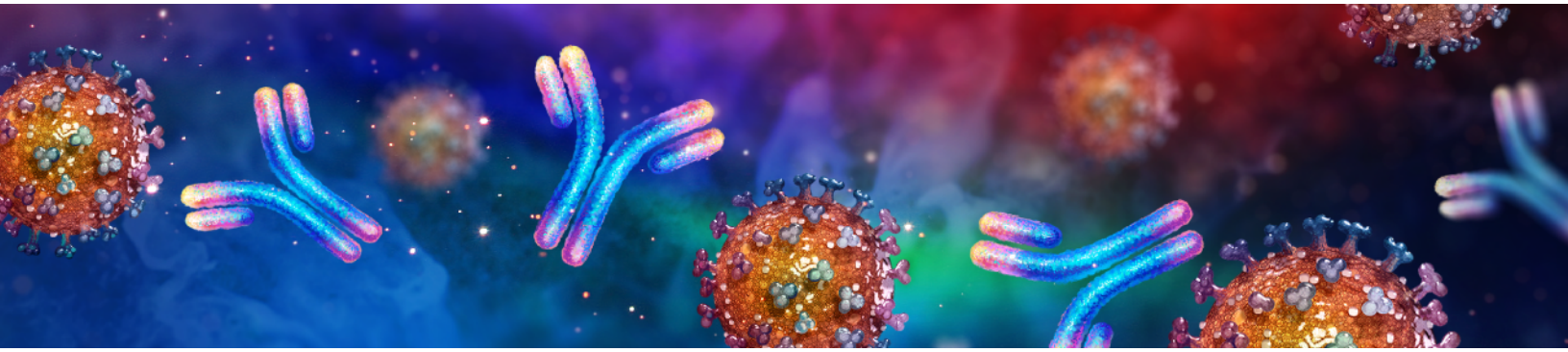
Sanguine



A Global Challenge:

Fighting Infectious Disease with a patient-centered approach

What's Inside?

Introduction

The COVID-19 pandemic has thrust the importance of infectious disease research into the forefront of the minds of the general public. It has never been more evident that there is a desperate need for therapeutics and vaccines to fight emerging threats prior to global devastation as seen due to COVID-19. Infectious disease pressure on public health has intensified in recent years due to many factors, including climate change, globalization, destruction of wildlife habitats causing zoonotic transfer, and increasing resistance to antimicrobial agents.[3] We are constantly facing the threat of re-emerging pathogens, such as influenza or measles and the appearance of new threats, such as novel coronaviruses or antibiotic-resistant bacteria.

In this eBook, we rethink the well-known challenges in infectious disease (ID) research by providing innovative solutions to patient reach, recruitment, retention, and biospecimen collection. You'll learn how Sanguine's patient-led approach and operational experience has been instrumental in meeting the high demands of COVID-19-related clinical research. We were perfectly poised to recruit study participants and collect biospecimens and data through our mobile workforce across the United States. Our leading advantage – a mobile direct-to-patient approach – brings research participation into the patient's home with a primary focus on establishing trusting relationships. We have been industry leaders in the decentralized clinical approach with a patient-centric philosophy that permeates through all facets of our organization.

Fast Facts[1,2]

- IDs cause 10–15 million deaths worldwide annually
- 6/10 top world threats: related to infectious diseases
- Lower respiratory infections in top 5 causes of death globally: 2.6 million (2019)
- HIV/AIDS, malaria, and tuberculosis within top 10 causes of death in low-income countries

INFECTIOUS

- **Coronavirus Disease 2019 (COVID-19)**
- **Hepatitis B (HBV)**
- **Human Immunodeficiency Virus (HIV)**
- **Human Papillomavirus (HPV)**

The COVID-19 pandemic has shown the extraordinary feats of clinical research – yielding three highly effective SARS-CoV-2 vaccines and an arsenal of therapeutics to increase survival and reduce long-term sequalae. We are proud to have had instrumental roles in providing valuable sample collections for 25 clinical studies led by our pharmaceutical partners. The pandemic has also illuminated the advantages of decentralized clinical recruitment and has rapidly transformed the field of clinical research. Sanguine has been at the forefront of this work, providing critical support to leading pharmaceutical and biotechnology companies working to develop vaccines and treatments to end the pandemic.

CHAPTER 1

Reach, Recruit, Retain

>80% Research studies in the United States experience delays due to recruitment problems

>50% Investigative studies fail to meet enrollment requirements

~30% Average participant drop-out rate across clinical trials[5]

Participation burden represents a critical challenge in retaining ID patients through study completion. For some IDs, such as HIV and hepatitis, the added burden of coping with an incurable chronic disease and the associated stigma complicates patient engagement in clinical research.

Taking a Lean, Virtual Approach

With a mobile workforce of more than 135 phlebotomists nationwide **(Figure 1)**, our virtual recruitment and in-home biospecimen and data collection capabilities are designed to be minimally disruptive to patients' everyday lives. As a result, patient retention is consistently high (93%) across each study we support. Moreover, a high proportion of patients are eager to participate again and over long study periods, meaning the high scientific value of completing longitudinal studies can be realized. By working with researchers to improve study completion rates, we help minimize inconclusive findings and wasted funding, which further motivates patients to contribute to scientific research to further understand their disease and develop therapeutics.

FIGURE 1. Mobile phlebotomy: U.S. Geographic Distribution. The Sanguine mobile workforce reaches 70% of the population nationwide. Our fleet consists of more than 135 phlebotomists, with 80% of patients having had the same phlebotomist throughout the duration of their participation.

As a mobile in-home research services company, we access hard-to-reach patients who may otherwise be far from research sites to participate **(Figure 2)**. Our close relationships with many ID non-profit and patient advocacy groups further supports our ability to increasingly be contracted for translational and clinical studies across this disease group. In turn, investigators benefit from expanded study recruitment reach and sample collection, ensuring continuity in research and study completion. By substantially reducing the workload on site staff and the number of sites required, researchers can expect rapid enrollment and mobilization from a leaner, virtual approach.

Sanguine Stats

93%
Patient retention rate

>4,000
ID patient members

>50
ID studies completed

Geographic Distribution of the Sanguine Infectious Disease Patient Member Community

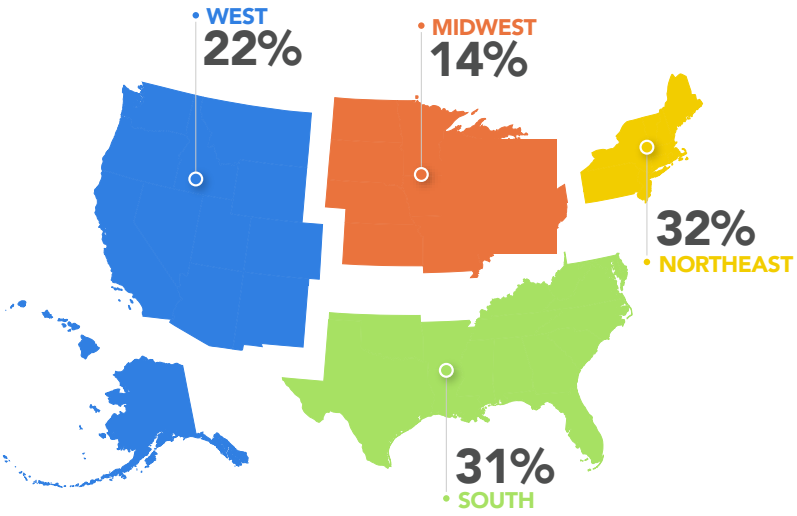


FIGURE 2. A mobile specimen collection approach means streamlined access to increased patient populations. The current Sanguine ID patient community is made up of >4000 members distributed across the United States. Through strategic online and social media recruitment campaigns, and partnerships with patient advocacy groups, this network is always growing.

Compliance and Quality Assured

Sanguine utilizes two internationally-recognized IRBs (Advarra and WCG IRB) for review and approval of all study protocols, specific study documentation, and study participant-facing information. Both Advarra and WCG IRB are organized and operates in compliance with: FDA, OHRP, and International Conference on Harmonization (ICH).

Sanguine operates under an electronic informed consent process which executes 21 CFR part 11 compliant e-signatures, and Sanguine systems interacting with study participant information are HIPAA-compliant.

Let's Talk

CHAPTER 2

Sanguine in the ID Field

Although the 'covidization' of scientific research has dominated the attention of the research community since early 2020, Sanguine has substantial previous experience working in other infectious diseases, such as HIV and viral hepatitis. Our expertise in sample collection, patient engagement and recruitment have helped power many basic science and translational research studies aiming to provide treatment and cures for some of the most problematic infectious diseases. Taking a direct-to-patient approach allows for the collection of comprehensive data related to disease state and management which can be individualized and harnessed to yield reliable clinical endpoints that can be incredibly difficult to capture by way of conventional study designs.

Direct-to-Patient Workflow

We partner with researchers in the pharmaceutical industry to optimize study designs and remove sample collection barriers by making it convenient for patients to participate. By adopting our direct-to-patient workflow for sample collection **(Figure 2)**, researchers maximize their study's potential through increased reach for recruitment and convenient in-home sample collection for study retention. By enabling longitudinal sampling, this virtual study model provides researchers with invaluable biospecimen samples over an extended period of time within translational, and therapeutic interventional or observational studies. Moreover, integrating electronic surveys and questionnaires or technology-based patient-reported outcome data to supplement biological samples is entirely feasible to provide an all-inclusive view of study participants.

Event-Based In-Home Specimen Collection Workflow

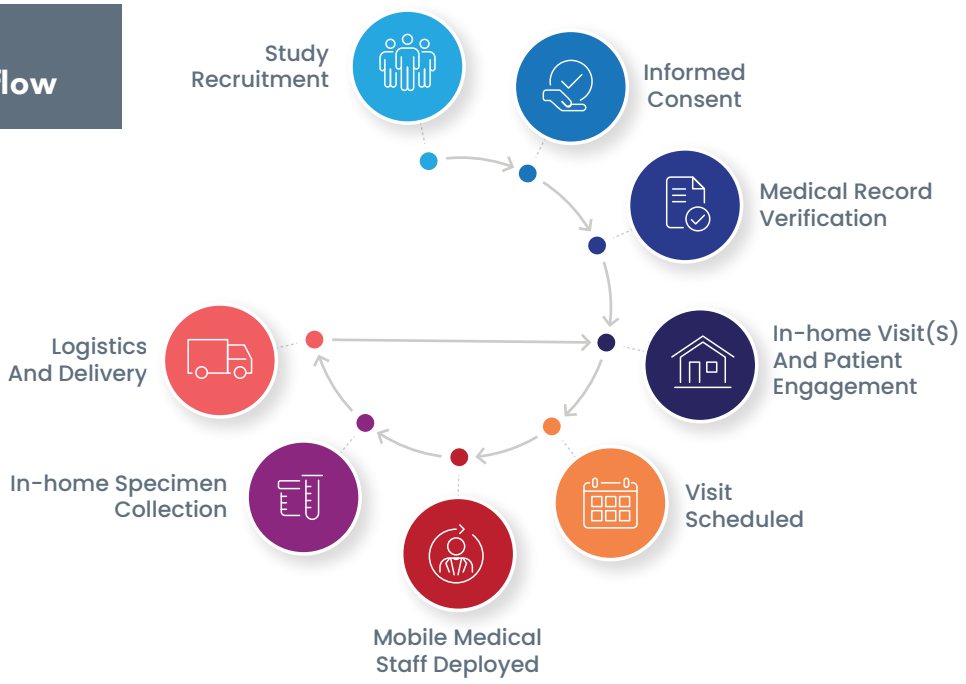


Figure 2. A direct-to-patient approach means access to patient samples with decreased participation burden and increased sampling, as needed. Samples and patient-reported outcome data can be collected based on study criteria to investigate disease activity and mechanisms, response to therapeutics or other study-specific endpoints.

BOX.1 How Do Patients in our Community Manage Their Disease and Symptoms?

Of the more than 4,000 ID patients in our community, many rely on various therapies to treat their chronic infectious disease. Although many treatments help delay long-term damage, disease management is complex and often difficult, highlighting the strong unmet medical need to improve therapeutics and quality of life.

TOP 5 MEDICATIONS OUR PATIENTS USE TO TREAT THEIR DISEASE:

HIV:
Biktarvy, Genvoya, Triumeq, Tivicay, Juluca

HBV:
Entecavir, Vemlidy, Omeprazole, metformin, prednisone

Increasingly Complex Inclusion and Exclusion Criteria

Specific exclusion and inclusion criteria (e.g., medication profiles, treatment histories) often reduce the number of eligible patients for a study, which hinders progress and statistical power. Our thoroughly curated ID patient community is highly motivated to participate and understand scientific research. Through a patient-led approach, we drastically improve participant retention (93% compared with the 65% industry average).[4] Moreover, we pre-screen and medical record-verify patients for quick recruitment of the most eligible participants. We can satisfy a wide range of inclusion and exclusion criteria based on study design to achieve successful recruitment of the best study participants. **Table 1** highlights the common inclusion and exclusion criteria we support in ID research.

INCLUSION CRITERIA	EXCLUSION CRITERIA
Undetectable HIV viral load defined as less than 350 copies/mL	Nursing or pregnant females
Subjects taking anti-retroviral therapy	Subjects who have taken an investigational product in the last 30 days
	Co-infections with HBV or HCV
	Anti-retroviral therapy use for less than 12 months or non-continuous therapy
	Detectable HIV viral load
	Autoimmune comorbidities
	Use of immunosuppressant medications (corticosteroids or small molecules)
	Subjects who experienced excess blood loss including blood donation defined as 250 mL in the last month or 500 mL in the last two months

Partnering with Sanguine means overcoming hurdles in study design, recruitment, retention, and completion through an innovative virtual model that is patient-driven to energize and engage a home-grown ID patient community to participate. Equipped with a mobile workforce capable of in-home biospecimen and data collection, our patient community members develop trusting relationships with their phlebotomist, allowing for repeat, longitudinal collection. We reduce the burden on patients to increase recruitment capacity and improve study completion rates so that you can make meaningful conclusions that will move ID research forward.

Evidence from the field:

Webinar: How basic science research is propelling translational HIV and COVID-19 discoveries

Did you know?
It is estimated that there is more HIV viral diversity within a single infected individual than there are influenza strains within the world. Although most antibodies produced against these strains are strain-specific, rare individuals produce broadly neutralizing antibodies that can neutralize many HIV strains. For SARS-CoV-2, neutralizing antibodies are almost exclusively made to the spike protein with high diversity. Figuring out how to raise these antibodies from a vaccine or using these as passive immunotherapy is critical to developing vaccines or passive immunotherapies to treat these viruses. Tune in to hear Dr. Pamela Bjorkman talk about the cutting-edge HIV and SARS-CoV-2 structural antibody research she's driving in her lab at the Caltech Beckman Institute.

Longitudinal research leads the way for chronic hepatitis B (HBV)

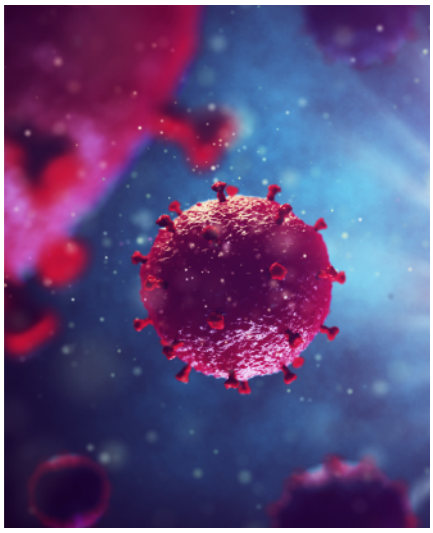
Understanding chronic HBV and how it persists in some patients is of critical importance to developing viable therapeutics. Uncovering pathways related to chronic viral infection and identifying novel therapeutics is of critical importance in treating HBV. To support research by Arbutus Biopharma, we leveraged our relationships with patient advocacy groups and outreach initiatives to enroll a narrow eligible population of HBV patients rapidly to ensure study success. Longitudinal sampling can capture valuable disease-relevant samples linked to chronic disease progression and can yield useful biomarkers to further understand progression of chronic infectious diseases. Key biomarkers can also be harnessed to support efficacy studies of novel therapeutics to improve disease both symptomatically and long-term.

Read Case Study >

Peer-Reviewed & Published: how we're helping drive scientific discovery

Researchers who partner with us take advantage of direct-to-patient sampling and rapid recruitment to meet study needs – collecting valuable biospecimens and patient data for basic research, translational, and therapeutic interventional or observational studies.

HIV Research



We collected and isolated T-cells and PBMCs to allow researchers to characterize molecular pathways relating to transcription factor repression of HIV-1 gene expression, published recently in *PLoS Pathogens*.[5]

Read about how we collected CD4+ T cells to support research to develop and characterize a small molecule capable of inhibiting HIV-1 transcription as a latency-promoting agent, in hopes of achieving a functional cure for HIV.[6]

We supported scientists from Merck with HIV+ blood donor samples to uncover novel pathways related to HIV persistence to be able to use latency-reversing agents, such as HDAC inhibitors, to trigger immune-mediated cell killing.[7] Learn more here.

Viral Hepatitis Research

We worked with Arbutus Biopharma to longitudinally collect blood specimens and data that allowed them to identify a novel small-molecule inhibitor of the PD-1/PD-L1 axis to potentially treat chronic viral infections. Recently published in *Nature Communications*.[8]

Read about how we collected samples for Gilead Sciences to characterize the phagocytic leucocyte subsets involved in the clearance of hepatitis B surface antigen (HBsA) in blood ex vivo from chronic hepatitis B infected individuals versus healthy donors.[9]

Read about how our samples helped AbbVie analyze the effect of several therapeutics on circulating microRNAs as biomarkers of hepatitis C replication.

CHAPTER 3

Ahead of the curve: pioneers in decentralized trial design

As COVID-19 brought detrimental effects to traditional clinical research studies, with about 80% of all non-COVID-19 trials stopping or pausing at the onset of the pandemic,[10] our model was perfectly suited to navigate the challenges with minimal disruptions to research activity. The pandemic ushered in a decentralized, patient-centric model as the primary viable option for clinical research. We have spent years building this model – with our AI-driven extensive patient database, extensive mobile research team across the United States and patient-focused at-home visit approach. Our experience with mobile at-home clinical research design and diverse recruitment strategies were pivotal in the success of many of our COVID-19 research studies. This at-home participation design was required for sample collection during the infectious phase of the COVID-19 disease, where quarantine guidelines made traditional study designs impossible. Our successful model allowed us to push forward with ease in all clinical studies, while others had to pivot and redesign from scratch.

Due to the pandemic, the field of clinical research has realized something that we at Sanguine have known since our inception: the true power of the at-home mobile study approach.

The power of bringing the study to the participant:

- **Reduced administrative burden on sponsors/PIs**
- **Increased participant diversity**
- **Higher retention**
- **Patient-centric**
- **Shortened timelines**
- **Faster recruitment**
- **Reduced costs**
- **Accelerated therapy development**

Case Study: How Sanguine rose to challenge of the COVID-19 pandemic.

At the start of the pandemic, we recognized the clinical need for COVID-19 patient samples and data to understand the novel SARS-CoV-2 virus. We proactively activated a multi-pronged recruitment strategy to build our patient database across the United States and collect patient samples for studies. Through our ongoing partnerships with leading pharmaceutical companies, such as Pfizer, EpiVax, Inc and Vir Biotechnology we have supported 25 COVID-19 research studies to date, of which three have been published.[11–13]

Our database of >1000+ participants keeps growing with comprehensive patient-reported data, such as:

Acute and long-hauler symptoms

Vaccination status

Vaccination side effects

Longitudinal collection of whole blood, serum and plasma samples

Engaging with the Infectious Disease Community: Webinars

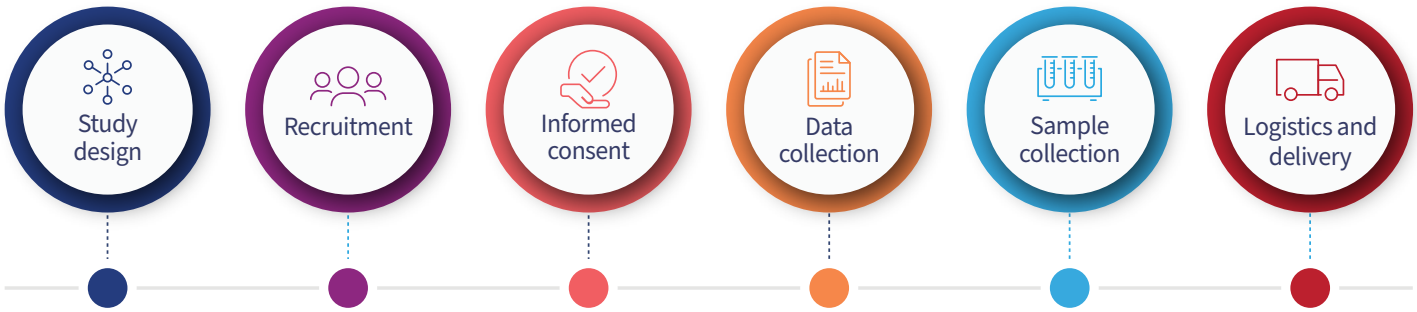
At the onset of the pandemic, we leveraged our expertise and clinical connections to drive COVID-19 discussions and innovation amongst subject matter experts. Click here to hear insights related to emerging concerns of the rapidly changing pandemic, policy and infrastructure gaps and opportunities, and the importance of establishing public/private partnerships to drive therapeutics and vaccine development.

The pandemic has propelled the scientific world towards higher expectations of faster, more adaptable and more diverse clinical studies. We have risen to the challenge with ease and played a pivotal role in driving COVID-19 research. Innovative strategy is at the core of what we do as your partner in clinical research. Our mobile at-home and multi-faceted recruitment strategies maximize efficiency and success in clinical studies.

Conclusion

Conducting clinical research comes with a high cost and a high study drop-out rate but working with Sanguine sets your study up for the greatest chance of success. The complexities of ID research and considerations for study design and achievable endpoints requires a partner who offers a tailored approach. Working together, we can ensure efficient recruitment, retention, and engagement coupled with high-quality longitudinal sample collection during key physiological disease events. We bridge researchers with patients—giving you access to a powerful platform for advancing biomedical research and having a tangible effect on patients' lives.

Get to market faster with a fully integrated services solution



About Us

Sanguine Bio is a pioneer of in-home biospecimen collection and a leader in direct-to-patient recruitment and digital health innovation. We partner with researchers to expedite and complete studies across various medical conditions, supporting complex inclusion/exclusion sample and data collection criteria for longitudinal and cross-sectional study designs. Our growing community is made up of more than 70,000 medical record-verified, highly engaged, patient members, and more than 100 advocacy groups, allowing us to seamlessly work with the pharmaceutical industry on more than 1,000 pre-clinical and clinical condition-specific research studies to date.

Sanguine

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