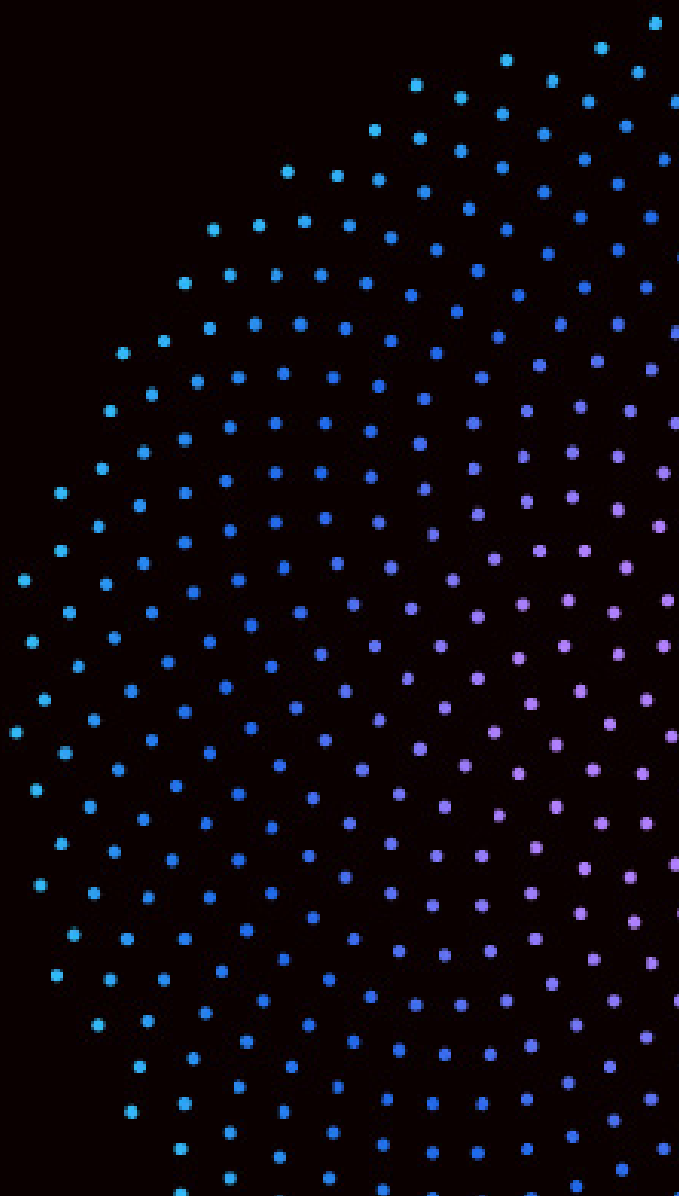
Flywheel

Enabling *Real-Time Clinical Trials* with Centralized Imaging Data Management



> Real-time clinical trials (RTCT) are becoming a reality. As the FDA and U.S. Department of Health and Human Services (HHS) work to accelerate drug development through pilot programs that report endpoints and data signals in near real time, biopharma companies will soon be expected to follow suit.

However, processing and managing imaging data in near real time presents a significant hurdle. Between the complexity of imaging files, the fragmented nature of data collection and shifting regulatory requirements, biopharma companies, CROs and other affiliated third parties need a plan of attack to make clinical trial imaging data instantly readable by regulators without breaking data privacy and governance mandates.

In this white paper, we'll explore how biopharma companies can prepare for RTCT, meeting emerging data mandates while accelerating safe paths to market.

Navigating Shifting Requirements and Expectations

The FDA first announced two sponsor-run trials in April 2026 to pilot the new RTCT protocols: AstraZeneca's TRAVERSE, a phase 2, multisite trial for mantle cell lymphoma; and Amgen's STREAM-SCLC, a phase 1b trial exploring treatment for limited-stage small cell lung carcinoma. These have now been folded into a larger HHS initiative called Operation TrialBlazer. These pilot trials look to serve as a model for what future RTCT protocols would look like, but RTCT is not yet a formal mandate.

In the current trial model, participating sites upload data to CROs for trial analysis and management. CROs have acted as secure "black boxes" by design to protect trial integrity by preventing bias and maintaining compliance with data privacy regulations such as HIPAA and GDPR. CROs batch process data at regular intervals and send relevant results around efficacy and safety back to the sponsor at predetermined times, while the FDA only sees data during regulatory milestones.

The batch model, which is largely unchanged since the modern trial framework was established in the 1960s, means that sponsors get access to cleaned, aggregated data only after weeks-long cycles, delaying go/no-go decisions. Meanwhile, the FDA receives safety data episodically in expedited reports for serious events, but there's little continuous visibility into emerging aggregate signals.

RTCT seeks to address both gaps

With prespecified, adaptive trial designs, sponsors can:

- Act on interim data through protocol-defined rules
- Stop futile arms earlier in the process
- Reallocate resources or adjust dosing and cohorts throughout the trial life cycle instead of at database lock

With RTCT, regulators can:

- Get faster insights into safety signals
- Help limit negative patient outcomes
- Enable more informed decisions on trial progression

Critically, this level of visibility must still maintain trial integrity with firewalled interim data access that maintains blinding and doesn't introduce operational bias into trial conduct.

Why Imaging Data Is Difficult to Provide in Near Real Time

Several factors make it difficult to provide instant access to imaging data and to query that data. These include:

Large file size

Imaging files are large and unstructured, consisting of raw pixel data, making them harder to manage compared with text-based medical data, such as lab values and ePRO data.

Multimodal data

File types, such as MRIs, X-rays and CT scans, differ across therapeutic areas.

Data quality

Fidelity and quality can differ greatly depending on how images were collected, on what manufacturer, where and by whom.

Lack of standardized processes

There's no enforced standardization for image interpretation — readers may refer to tumors as lesions or name them by specific tumor types, for example.

Annotation timelines

Because imaging must be analyzed to provide meaningful trial results, inefficient and disjointed reader studies and adjudication cause a natural delay between when data is collected and when it can be reviewed by the FDA and sponsors.

Unblinding risk

De-identification of data needs to happen at data ingest so that no personal health information (PHI) is exposed. In the case of double-blinded reads, each reader must also stay blinded from the other's reads and any relevant clinical information about the subject.

5 Operational Requirements for Imaging in RTCT

1. A Continuous Data Pipeline

What it means: Instead of traditional data batching, RTCT means the minimum-necessary data becomes viewable by all parties as soon as possible.

Challenges: CROs often use proprietary systems with their own data types, requiring file-type conversion, in addition to other data processing. And although CROs run clinical trials on behalf of sponsors, the responsibility is really on trial sponsors to achieve near-real-time visibility with the FDA. This means the sponsor must unite several parties — CROs, sponsors, readers and the FDA — on the same system or on connected systems, with as little lag as possible.

The solution

Sponsors should update service-level agreements with CROs to get faster access to data. Theoretically, this could mean access to data within minutes if a centralized platform that unites CROs, readers, sponsors and reviewers is implemented. But data must be de-identified at ingest to avoid any PHI becoming exposed as it goes live in the system. And further data processing should occur as soon as possible via automation. This means eliminating bottlenecks like manual workflows and email-based or physical data transfers.

2. Preservation of Data Blinding

What it means: In typical clinical trials, information about who is receiving a treatment and who is receiving a placebo stays hidden from both participants and analysts. For the purposes of reporting information to the FDA, the agency is mainly concerned with any sign the drug may be harmful, including side effects and complications; overall trial status, such as how close enrollment is hewing toward goals (e.g., reaching 1,000 participants); and early efficacy signals via reader studies against primary endpoints, such as if a tumor shrank as a result of the treatment.

Challenges: With continuous reporting, the firewall protecting all other data between the FDA and sponsors/CROs would need to hold steady at all times, in real time, which presents governance and technical issues.

The solution

Continuous reporting between a trial and the FDA means sponsors and CROs need to set up a minimum-necessary view for the FDA. Establishing role-based views would allow FDA reviewers to see aggregate signal trajectories without exposing arm-level or site-level details that could unblind sponsor personnel or bias ongoing trial conduct. This would require genuinely new infrastructure, rather than an extension of standard access controls, and it would need to be developed specifically for the imaging-data pipeline problem, as imaging is often the modality most likely to inadvertently reveal treatment effect.

3. Real-Time Anomaly Detection and Reconciliation

What it means: As data streams in, data managers must catch anomalies such as scanner drift, mislabeled DICOM tags and protocol deviations in near real time and be able to quickly reconcile them.

Challenges: Without the buffer of batch-based data analysis and delivery, a bad signal such as a recalibrated scanner or corrupted volumetric read could get reported to the FDA as a real safety or efficacy signal before anyone catches the underlying data-quality issue. Catching an issue like this requires automated, validated anomaly detection built into the ingestion layer. But neither validated automated anomaly detection nor a formal reconciliation workflow currently exists in traditional batch workflows.

The solution

Locked, version-controlled analysis pipelines can help because every file and output are immediately processed and tracked at ingest. Real-time-reported values may later be revised once full QC and adjudication happen, so sponsors also need a formal reconciliation workflow that can explain — with full provenance — why a value reported in real time differs from what ends up in a locked database.

4. Multisite Harmonization

What it means: Once clinical trials reach Phase 3, they may take place across hundreds of sites. Data coming in across dispersed sites and vendors should be harmonized in near real time.

Challenges: Because real-time signal integrity assumes measurements mean the same thing, no matter who generated them, trial sponsors would need to be able to verify that integrity across CRO boundaries.

The solution

Sites and vendors should use the same analytical pipelines across the board. For example, segmentation methodology should be aligned across imaging service providers. This means one centralized infrastructure should be used by all parties to ensure consistency and harmonization.

What Is Required for Data Validation?

Data validation refers to complying with the regulation 21 CFR Part 11. It requires a system to note all changes to data, from upload to annotation and read outputs, including the date, time and who made the change. The system must also lock audit trails, so they can't be changed or deleted.

5. Cross-functional Alignment

What it means: Once the technical framework for real-time signal sharing has been shown to work, you'll need to determine whether your organization has the internal coordination to implement it.

Challenges: The RTCT model collapses the traditional distance between data collection and regulatory submission. That means the firewall that historically separated data science teams (who process imaging data) from regulatory affairs teams (who manage FDA interactions) no longer works.

The solution

Sponsors should establish cross-functional RTCT working groups now, while the pilot programs are still happening. These groups should include biostatisticians, imaging scientists, regulatory strategists and IT/infrastructure owners — and they should be reviewing the specifics around the program together.

Three Stages of RTCT Readiness

Not Ready

- Using multiple solutions spread across different business units and therapeutic areas
- No contractual language securing access to imaging data from CRO during or after trial
- Using on-premises imaging storage

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In Progress

- Investment in cloud infrastructure and data lakes
- Contract language in place to access imaging data during and after trial
- Standardized imaging data processing pipelines in place or in development at the enterprise level

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Ready

- Using a centralized imaging platform that can be securely accessed by all relevant parties with role-based access
- Automated pipelines that de-identify and standardize imaging data at ingest
- Data validation and audit trails to track any changes made to data

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A Practical Roadmap

You can start preparing for RTCT now by setting a timeline and key milestones to reach over the next 12 months.

0–3 months: Assess your existing data strategy and map out where your data lives. This may include data in the cloud and on premises, stored in different data silos, from current and previous trials, in data lakes, and across different vendors' platforms and third parties. Get buy-in from various stakeholders.

3–6 months: Invest in centralized infrastructure that can connect data from the cloud and on-premises storage, so it can be accessed by all necessary parties. Create a proof of concept for an R&D system that will serve current clinical trials. Assembling a cross-functional working group can help with the planning and investment phase.

6–12 months: Connect all your platforms to create one ecosystem where all data can be securely accessed and tracked. Create new service-level agreements and start onboarding business units and CROs to your new system. Finally, run a pilot trial to test the viability of RTCT deployment.

What This Means for Clinical Trial Stakeholders

RTCT affects all parties involved in clinical trials. Sponsors, CROs and imaging core labs will need to work together to adhere to this all-but-certain future.

Sponsors

Because sponsors own the relationship with the FDA, they'll need to do the actual reporting while figuring out how to maintain blinding — even if the CRO is doing the raw imaging work. Sponsors will need to put the infrastructure in place to support streaming data access along with the audit trails to support the work. They'll also need to renegotiate contracts with CROs to ensure data flows steadily into this new system.

The good news: Enabling this access also increases a sponsor's ability to make go/no-go decisions early on. They'll also be able to more readily find secondary endpoints for further exploration, so they can salvage trials that may not have served their initial endpoint and discover other uses for existing drugs.

CROs

Once sponsors start working near-real-time access into contracts, relying too heavily on in-house systems and manual processes won't cut it. CROs will have to adopt new technology to meet new standards for data access and analysis and eliminate any delays without sacrificing blinding or risking bias.

The good news: With a validated, standardized data portal in place, CROs can complete their work more efficiently, saving time and resources so they can take on more clients.

Imaging Labs

The labs and reading centers that review and annotate images face some of the biggest technical hurdles here, from maintaining de-identification and blinding to standardizing reader protocols and terminology. If they

haven't already, they should begin moving toward standardized language at the point of read. This means pushing reads into a single platform, rather than separate tools for viewers and forms, and auditing current de-identification and blinding enforcement.

The good news: Creating a faster, cleaner reader workflow will shorten the ingestion-to-signal timeline. Increasing automation reduces manual work and time, allowing labs to take on more clients. And using a system with locked, versioned audit trails reduces risk during inspections.

How Flywheel Helped A *Top 10 Biopharma Organization* Create Near-Instant Access to Trial Data

A leading global pharmaceutical company spent three years developing an in-house platform so they could analyze imaging data earlier in the clinical trial process. Flywheel helped the company create a unified platform that brought together secure access to trial data, reader studies and automated analysis in a singular, customizable platform, **saving the company 33% on initial development costs** and enabling AI model development from existing trial data. **Learn more.**

Get Started Now to Be Ready for the Future of Clinical Trials

Flywheel is already working with 10 of the top 20 biopharma companies and several leading medtech organizations to create near-instant access to clinical trial imaging data. Flywheel brings together trial sponsors, sites, reading centers and CROs on one unified imaging data platform that connects with PACS, cloud storage, data lakes and scanners.

Through Flywheel Gears, containerized algorithms that can be easily deployed on the platform, data can be de-identified at ingest and instantly run through a chained pipeline that eliminates manual processing work and ensures reliable, repeatable results. We also offer 21 CFR Part 11 compliance with Flywheel Validated, which adds audit trails, digital signatures and approval workflows to the platform. And our Professional Services team can help you integrate Flywheel around existing workflows to build a new imaging ecosystem that supports faster access to trial data.

Start planning a new future for your clinical trial workflows

Schedule a demo

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