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Getting started with AVITI24™ for clinical research

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Clinical research programs are expanding rapidly, from precision oncology research and minimal residual disease (MRD) research to emerging multi-cancer early detection studies. As applications grow and evolve, clinical researchers face conflicting operating pressures: controlling cost per sample, maintaining consistent turnaround times, and ensuring reliable performance, often without corresponding increases in staff or infrastructure. In this environment, sequencing platforms must do more than generate high-quality data; they must improve efficiency and fit seamlessly into lab operations.

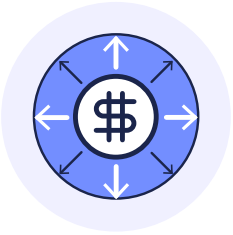
Here, we outline the practical considerations clinical research teams face today and how AVITI24 helps address them. We focus on the realities of cost control, turnaround time, workflow complexity, reliability, and future scalability to demonstrate how Element Biosciences enables labs to adopt flexible, end-to-end sequencing workflows with confidence.

Consider your operational priorities

Clinical research labs often juggle lowering cost per sample, improving turnaround times, minimizing hands-on workflow complexity, supporting multiple assay types, and integrating end-to-end workflows that can scale with their needs. Traditional sequencing platforms often force tradeoffs and lock labs into large batch sizes, underutilized runs, or workflows that strain staff and instrumentation.

The AVITI™ family of platforms was designed to address these challenges with cost-effective sequencing workflows across a wide range of throughput needs while integrating smoothly into existing exome, CGP (comprehensive genomic profiling), MRD, and RNA workflows. A broad partner ecosystem allows immediate compatibility with established panels, software, and prep kits, reducing disruption during adoption.

Key capabilities supporting clinical research workflows include:



Affordable Decentralization

Favorable economics with faster turnaround

Accurate Data

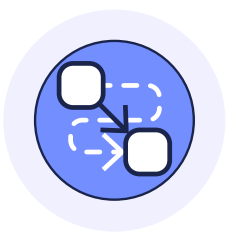
Q40 data with Cloudbreak Freestyle™

Flexibility

Dual independent flow cells for up to 6 run starts per week

End-to-End Solutions

Seamless compatibility with leading assay partners



Simplified Workflows

Rapid on-flow cell target capture with Trinity™

What does this mean for getting started?

AVITI24 allows labs to optimize cost, throughput, and workflow complexity simultaneously—rather than sacrificing one to improve another.

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Build cost-efficient sequencing strategies from day one

Cost per sample is one of the most significant barriers to expanding sequencing in clinical research. Conventional systems often force labs to choose between high-throughput systems that require batching for large runs or lower-throughput systems with poor economics.

One of the guiding design principles behind our AVITI family of sequencers was to deliver mid-throughput platforms with cost-efficiency typically reserved for high-throughput systems, without requiring labs to operate at an industrial scale.

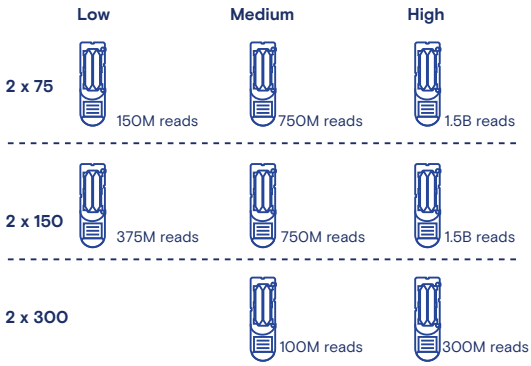
One way we've increased efficiency and lowered costs is by supporting flexibility at every level, from run size to instrument scheduling. Dual independent flow cell architecture allows each side of AVITI24 to operate on its own schedule, emulating two separate instruments within a single platform. With up to six run starts per week and flexible read length and throughput configurations, labs can right-size each run to their application and avoid underutilization or unnecessary cost.

	AVITI Cloudbreak Freestyle	AVITI24 Cloudbreak Freestyle	NextSeq 2000	NovaSeq 6000
Reagent Cost	$1,680	$1,680	$4,860	$17,575
Gb / flow cell	300	450	540	3000
Exomes / flow cell	24	36	45	250
Cost / exome	$70.00	$46.67	$108.00	$71.03

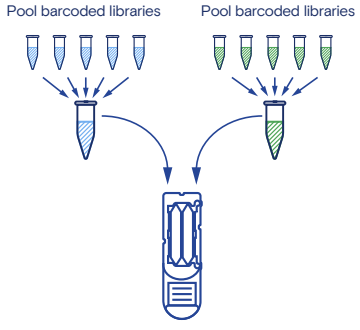
Each flow cell also contains two physically separated lanes, allowing different sample pools to be loaded within the same run. This is particularly valuable for labs running multiple panels with varying sizes and read-depth requirements.

Adjustable

Comprehensive



Addressable



What does this mean for getting started?

Labs can begin with modest sample volumes while still achieving competitive economics, enabling growth without committing to oversized runs or underutilized instruments.

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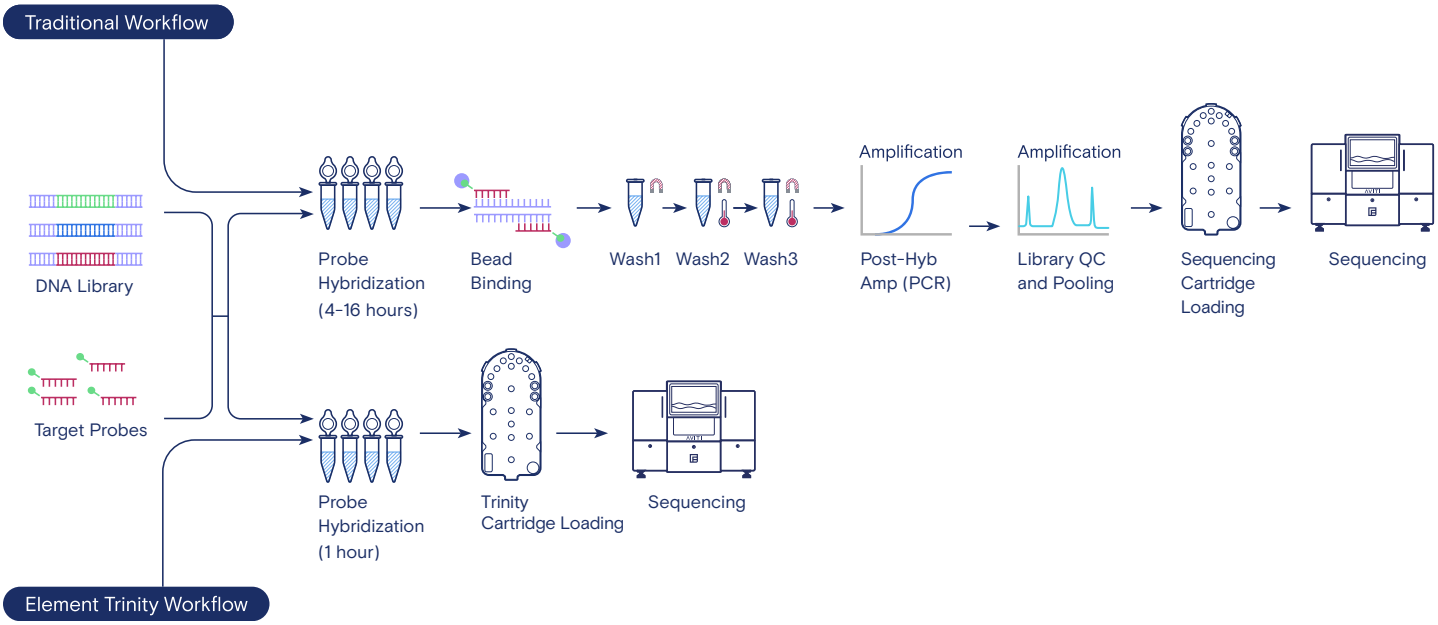
Shorten turnaround times with streamlined targeted sequencing

Targeted sequencing workflows begin long before a sample reaches the sequencer. Traditional workflows can involve multiple manual steps, including hybridization, targeted enrichment, cleanup, and amplification, that demand careful optimization and repeated hands-on intervention. Each step adds time, complexity, and opportunities for variability and error, making the path to sequencing both laborious and resource intensive.

To address this challenge and simplify the workflow, we developed Trinity on-flow cell hybrid capture technology which shortens hybridization to as a little as 1 hour and eliminates potential sources of human error. The result is a <1 day enrichment workflow that cuts hands-on time roughly in half and enables samples to be processed and loaded on the sequencer in a single 8-hour shift. Compatibility with custom panels of varying target sizes enables predictable loading, consistent on-target rates, and improved library diversity.

With Trinity Freestyle™, labs can use their preferred library preparation solutions, including third-party P5/P7-style libraries and Twist FlexPrep, while still accessing Trinity's speed and performance.



By moving wash steps onto the flow cell and reducing PCR cycles, Trinity not only simplifies workflows but also improves data quality. Labs can process more samples per week by freeing up manual or robotic resources while maintaining robust variant detection with enhanced indel accuracy in exome sequencing and higher on-target rates in custom panels.

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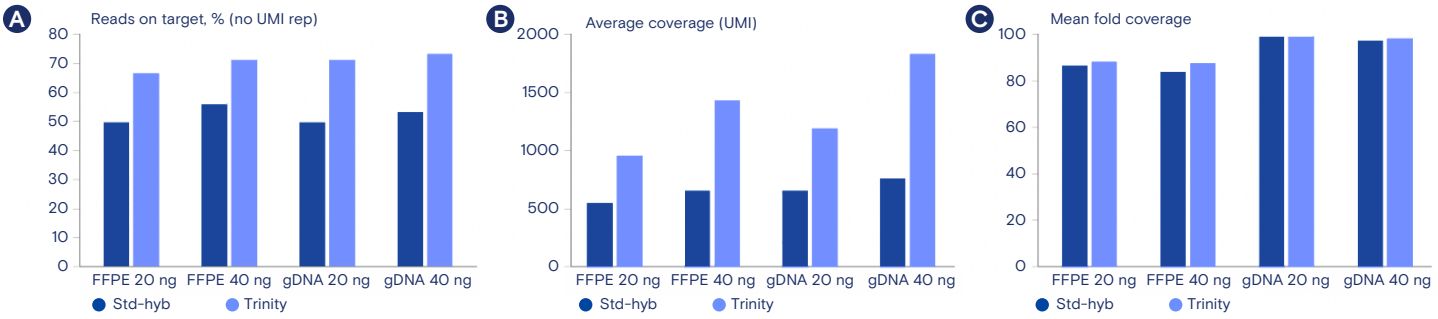
Use Case: Higher quality, faster turnaround for challenging samples

Comprehensive genomic profiling is central to precision oncology research. Using AVITI24 and Trinity, we evaluated an end-to-end workflow combining QIAseq library preparation, a 729-gene QIAseq xHYB CGP panel, and secondary analysis with CLC Genomics Workbench.

Challenging sample types—including FFPE and gDNA reference materials—were processed across varying input amounts and multiple technicians.



Key outcomes included:

- Reduction in total workflow time before sequencing from up to 2 days to less than 8 hours.
- Higher on-target specificity and highly uniform coverage across sample types.
- Consistently achieved >95% SNP detection sensitivity for heterogenous variants.

By reducing cross-hybridization background, minimizing amplification cycles, and limiting sample loss from excess clean-up steps, Trinity generates higher on-target rates and greater library complexity, enabling comparable results with lower input amounts.

What does this mean for getting started?

Labs can reduce operational complexity and standardize enrichment workflows, improving quality and reproducibility across operators while while experiencing fewer failures due to insufficient sample amount.

Connect end-to-end workflows without disruption

Sequencing is only one part of clinical research workflows. It must integrate smoothly with library preparation, capture panels, informatics pipelines, and reporting systems. AVITI24 is designed to drop into existing workflows rather than requiring full pipeline reinvention.

Element partners with leaders across sample preparation, panel design, and analysis to enable plug-and-play flexibility with established processes.

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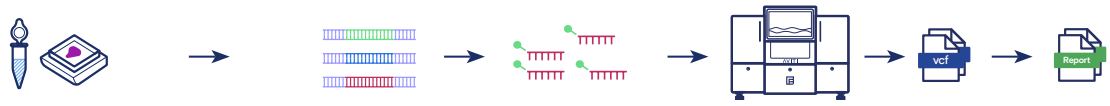
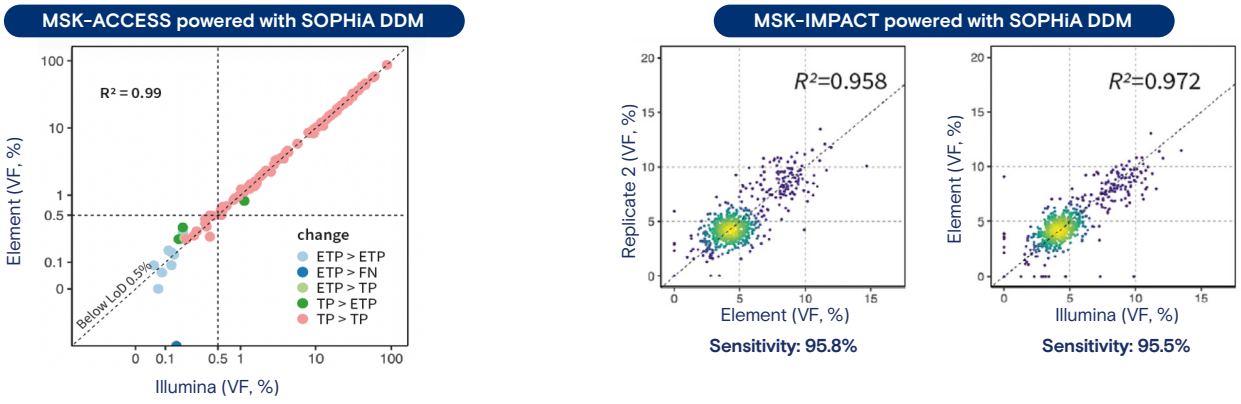


Partner	DNA Extraction, Sample Prep Automation	Library Prep	Target Capture Panel	Sequencing	Secondary Analysis	Reporting
TWIST BIOSCIENCE	Beckman Biomek i5 8 and i7 8+96, Hamilton NGS Star, SPT Labtech firefly, Agilent Bravo B, Revvity Sciclone NGS, Tecan Fluent / Dreamprep, Opentrons Flex NGS	Twist EF2.0, FlexPrep	• Twist CGP, Exome, custom panels; • Trinity Freestyle compatible	Element AVITI AVITI24	QIAGEN CLC Genomics Workbench	QIAGEN QCI Interpret
Agilent	Agilent Magnis NGS Prep System, Bravo	SureSelect XT HS2	• Agilent SureSelect panels, Avida c/DNA panels • Trinity compatible		SeqOne	SeqOne
QIAGEN	QIAsymphony SP, QIAcube Systems, EZI Advanced XL	QIAseq Multimodel DNA / RNA Lib Kit	• Qiagen HYB CGP, Exome panels • Trinity compatible		QIAGEN CLC Genomics Workbench	QIAGEN CLC Genomics Workbench
SOPHiA GENETICS	Hamilton Clinical STARlet, NGS Star	SOPHIA Genetics Universal Library Prep	• MSK-ACCESS, MSK IMPACT for CGP, Exome, HRD panels • Trinity compatible		SOPHIA DDM	

Use Case: Integrating AVITI24 into established SOPHiA Genetics clinical research pipelines

SOPHiA Genetics solutions are built around a universal library preparation workflow, white glove onboarding, and decentralized analysis and reporting. AVITI24 integrates seamlessly into SOPHiA DDM workflows, allowing laboratories to standardize upstream processes while supporting applications ranging from liquid biopsy and comprehensive genomic profiling to homologous recombination deficiency and germline research.

Validation studies demonstrate that Element sequencing data provides the accuracy and reproducibility required for downstream analysis without workflow modification. In liquid biopsy research using the MSK-ACCESS panel for cfDNA, clinical samples sequenced on AVITI showed highly consistent variant fractions, including detection of known variants down to 0.5% variant allele frequency. Validation of the MSK-IMPACT panel for CGP similarly demonstrated consistent variant fractions across AVITI replicates and in direct comparison with high-throughput Illumina systems using FFPE reference material.



Together, these results show how AVITI can be deployed as a drop-in sequencing platform within established SOPHiA DDM pipelines, supporting multiple clinical research focus areas through a single library preparation workflow.

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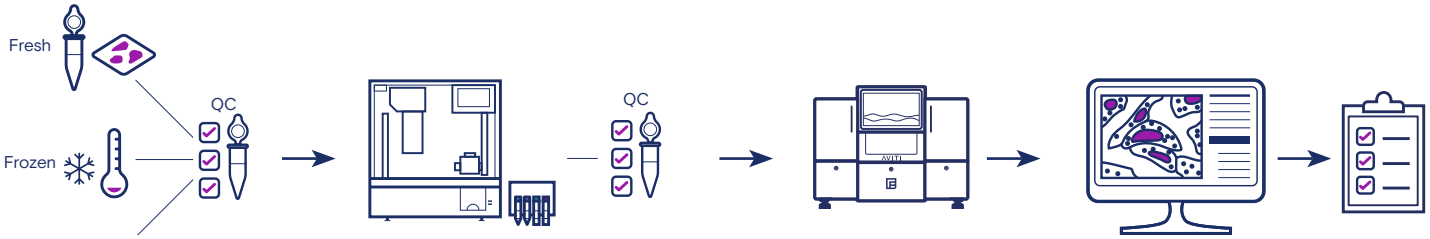
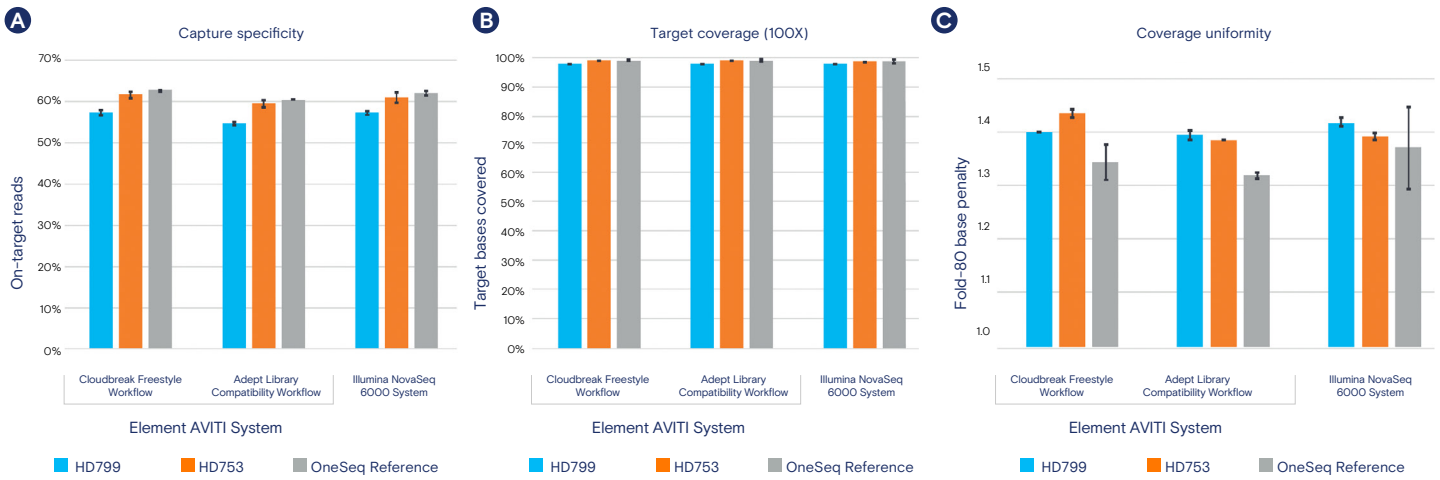
Use case: Fully integrated pipeline with Agilent SureSelect and Magnis demonstrates robust low-VAF sensitivity across FFPE tumor samples.

Sample preparation	Agilent SureSelect library preparation and target enrichment on the Agilent Magnis NGS prep system	Sequencing on the Element AVITI platform	Data analysis and reporting on the SeqOne platform



AVITI Systems can also drop into Agilent tumor profiling workflows for a fully integrated, sample-to-report solution that is easily deployed and offers fast turnaround time. Agilent Magnis produces target-enriched, sequencing ready libraries from SureSelect Cancer CGP and other SureSelect catalog and custom assays with only 15 minutes of hands-on setup for saving time, reducing the need for skilled labor and ensuring consistent results.

The AVITI System provides capture specificity, target coverage, and coverage uniformity comparable to the Illumina NovaSeq 6000 System with the Horizon Structural Multiplex Reference Standard, Quantitative Multiplex Reference Standard fcDNA moderate, and the OneSeq Human Reference DNA samples. The results were the same whether using our Cloudbreak Freestyle workflow that leverages P5/P7 style libraries or the Adept™ Library Compatibility Workflow with AVITI-native indices.



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Use Case: >98% variant accuracy across FFPE and hematologic samples using AVITI

Clinical researchers at Dartmouth Health led by Dr. Parth Shah, hematologist, and Dr. Laura Tafe, pathologist, explored whether a combination of whole exome and whole transcriptome profiling can be deployed in a setting where cost-effectiveness and turnaround time are important, with the goal of providing a more comprehensive view of each individual sample.

Here, the researchers enriched and sequenced whole exomes from a range of 57 FFPE, 22 peripheral blood or bone marrow, 5 reference samples, and 2 controls. The accuracy of AVITI data was extremely high for all variant types in both solid and heme samples, including the FLT3-ITD mutation that is associated with poorer prognosis in acute myeloid leukemia (AML).

The detection of low variant allele frequency mutations is also comparable between platforms.

Accuracy: (TP+TN)/ TP+FP+TN+FN]

Sample Type	Variant Type Tested	True Positive	True Negative	False Positive - reviewed	False Negative	Accuracy
Solid Tumor	SNV-Indel	912	2503	0	0	100%
	CNV	53	11468	0	2	99.98%
	MSI-high	10	36	0	0	100%
	TMB-high	20	35	1	0	98.2%
Heme	SNV Indel	84	922	0	0	100%
	FLT3-ITD	4	18	0	0	100%

Limit of Detection

Variant LOD for	Expected	Detected	%
SNV with VAF from 4.5%-5.5%	30	30	100
Indel with VAF from 4.5%-5.5%	11	11	100
Amplification CN 5	16	16	100
Samples with 10% tumor content	3	3	100

What does this mean for getting started?

You can adopt Element with confidence that your current assays, panels, and analysis pipelines will continue to work, often with improved accuracy or speed.

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Ensure operational reliability from day one

Inconsistent platform performance or unexpected downtime can slow studies and undermine confidence in results. AVITI platforms are engineered for dependable operation through modular architecture, redundant critical systems, optimized thermal and fluidic controls, and precision motion and optics systems.

Mean time before failure (MTBF) ~160 days

A key metric, MTBF, for the AVITI far exceeds comparable platforms which is typically closer to 90 days. Fewer interruptions translate into more predictable schedules and reduced service burden. For added peace of mind, our Plus service plan gives you priority access to our global network of FAS and engineers, for significantly less than competitor platforms with comparable throughput. We offer Installation, Qualification (IQ), Operational Qualification (OQ), and Performance Qualification (PQ) services, including documented records confirming your system is installed and performing to specification from day one.

What does this mean for getting started?

Sequencing on an AVITI platform minimizes disruption and downtime with fewer engineer visits and a lower service call volume.

Plan for your future state

Clinical research programs rarely stand still, and priorities often expand beyond initial assay development into emerging applications such as liquid biopsy, multiomics, and spatial biology. Sequencing infrastructure needs to support this evolution without forcing disruptive platform changes or workflow overhauls.

Our platforms are built with long-term flexibility in mind. Dual-flow cell architecture allows clinical research labs to run exploratory studies and standard pipelines on the same system, adapting to project needs and maintaining consistency in data generation and laboratory operations. Plus, AVITI24 supports onboard multiomics workflows, providing a path to integrate multiple molecular readouts on a single sequencing platform if your programs evolve.

Beyond initial instrument design, our approach emphasizes durability and compatibility over time. New capabilities are often accompanied by higher prices, surcharges, or restricted access to innovation. AVITI24 was developed with a different philosophy: advancing platform performance through continuous innovation, without introducing new barriers to adoption or use.

AVITI24 now delivers up to 50% more data per sequencing run compared to AVITI, enabled by machine learning–driven innovations that improve performance while maintaining data quality and workflow consistency. These advances were delivered without changes to consumables pricing, showing our commitment to doing business differently.

A growing global installed base and an expanding ecosystem of library, enrichment, and informatics partners help ensure that AVITI24 remains aligned with the evolving clinical research landscape. As new applications and workflows emerge, our partnerships enable laboratories to adopt innovations incrementally, protecting existing investments while supporting future growth.

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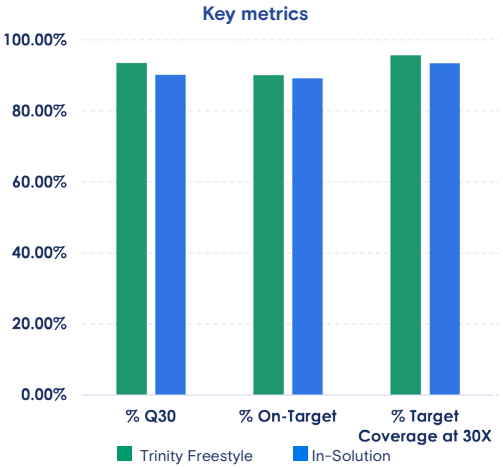
Use case: Trinity Freestyle expands access to rapid on-flow cell hybrid capture.

Trinity Freestyle was developed to broaden access to Trinity's on-flow cell hybrid capture without requiring changes to established library preparation workflows. Trinity Freestyle enables users of Twist EF2.0 and Twist FlexPrep libraries—both based on traditional NGS P5/P7 adaptors—to access Trinity's speed and performance while preserving existing protocols, indexing options, and workflow convenience.



	Trinity Freestyle	In Solution
Reads PF	1.016B	1.074B
Fold 80	1.32	1.36
% Duplication	1.3%	2.0%
Mean Target Coverage	66.4X	62.3X

Results based on down sampled data for 2x150bp.

Validation data generated with Twist Exome 2.0 show that key performance metrics, including sequencing accuracy, percent on-target reads, fold 80, and coverage evenness, are matched or improved with Trinity Freestyle compared to solution-phase capture. Consistent with the original Trinity workflow, variant calling performance is also improved, supporting confident downstream analysis.

What does this mean for getting started?

You can launch clinical research studies today with confidence that the same system can support new applications, increased scale, and integrated multiomics as your program evolves.

A clear path to getting started

Element enables clinical research labs to reduce costs, shorten turnaround times, streamline targeted sequencing, and integrate into existing pipelines with minimal disruption.

With industry-validated accuracy, reliable performance, global support infrastructure, and an ecosystem of end-to-end partners, transitioning to Element is straightforward and low risk for clinical research labs.

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Design with intent

At Element, we innovate to meet researchers where they are today and where their science is headed tomorrow. We build platforms around real lab needs: reliable performance, practical workflows, and room to grow so you can focus on discovery. And we keep evolving what we deliver, so your platform stays aligned with new applications, new questions, and new possibilities.

Explore our platforms:

VITARI™

A high-throughput benchtop sequencing platform designed to remove compromises and is built for what comes next (shipping in H2 2026).

AVITI24

Seamlessly integrates high-quality sequencing and onboard 5D multiomics into a single dual platform.

AVITI

A flexible mid-throughput sequencing platform designed for everyday reliability and high-quality results across a range of applications.

Start your AVITI24 journey today.

elementbiosciences.com

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