Advancing Flow Core Operations with AI

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Why We Set Out to Automate the Flow Core

Two paper-based workflows, one growing compliance and safety gap

QC & Instrument Gaps

- Missing/incomplete QC records
- Rushed warm-up procedures
- Instrument drift not detected early
- No historical QC trending
- Inconsistent QC practices
- Reactive maintenance culture

Access & User Gaps

- Booking conflicts
- Untrained user access risks
- Sample-related clogs and downtime
- Improper instrument configurations
- Poor issue documentation and follow-up
- Manual reconciliation across systems

OUR ANSWER

Two purpose-built Power Apps and an AI assistant that standardize workflows, improve compliance, generate actionable operational data, and keep humans accountable for every decision.

Flow Core Quality Control App

Six checkpoints, one continuous, auditable record — from booking to fleet-level insight

Check Booking

Reservation & Eligibility Verification

- Instrument booked through iLab
- Verify the booking and user requirement
- Instrument availability confirmed

Output: *Qualified user enters workflow*

QC Execution

Instrument Readiness Assessment

- Daily QC, CST, and performance checks completed
- Guided workflow with timers and checklists
- QC metrics, reports & attachments captured electronically

Output: *Instrument readiness documented*

Review

Human Quality Oversight

- QC results reviewed by Core Manager
- Failures, warnings, and deviations assessed
- Supporting documentation validated

Output: *QC record ready for decision*

Approval

Compliance Checkpoint

- Electronic sign-off performed
- QC status updated to PASS or FAIL
- Exceptions documented with justification

Output: *Audit-ready approval record*

Open to User

Controlled Instrument Access

- Instrument released only after approved QC
- User check-in automatically enabled
- Latest QC status and nozzle recommendations displayed

Output: *Safe and compliant instrument use*

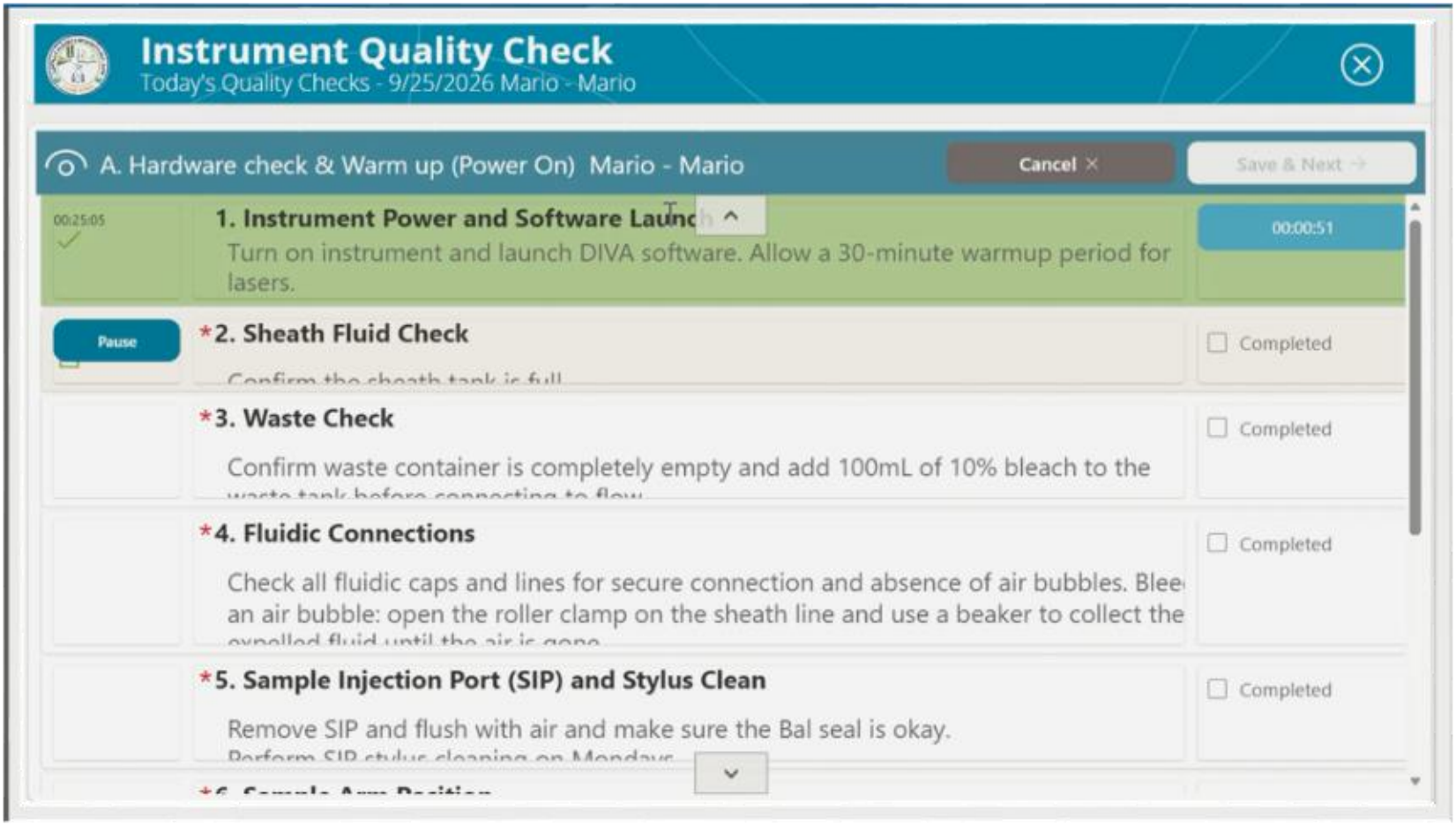
Trend Analysis

Operational Intelligence

- Historical QC results analyzed for drift and recurring failures
- Preventive maintenance opportunities identified
- Fleet health and utilization dashboards updated

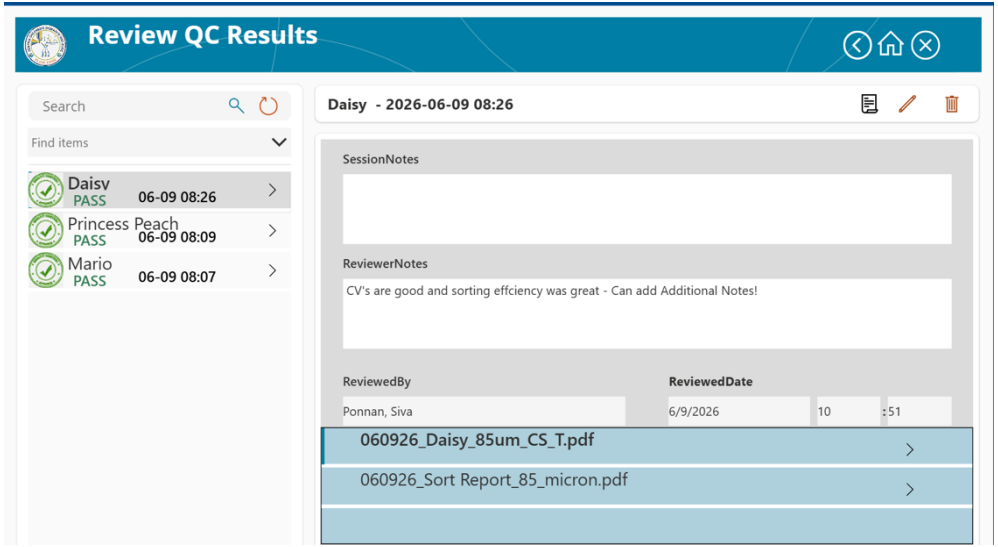
Output: *Continuous, data-driven improvement*

DATA FLOW Booking Data → QC Data → Review Records → Approval Logs → Usage Data → Analytics


Instrument Quality Check
Today's Quality Checks - 9/25/2026 Mario - Mario
A. Hardware check & Warm up (Power On) Mario - Mario
Cancel
Save & Next
00:25:05
1. Instrument Power and Software Launch
Turn on instrument and launch DIVA software. Allow a 30-minute warmup period for lasers.
00:00:51
Pause
*2. Sheath Fluid Check
Completed
*3. Waste Check
Confirm waste container is completely empty and add 100mL of 10% bleach to the
Completed
*4. Fluidic Connections
Check all fluidic caps and lines for secure connection and absence of air bubbles. Blee
an air bubble: open the roller clamp on the sheath line and use a beaker to collect the
Completed
*5. Sample Injection Port (SIP) and Stylus Clean
Remove SIP and flush with air and make sure the Bal seal is okay.
Completed

QC App in Practice: Guided, Timed, Auditable

A real reviewed session from the production app



Review QC Results — reviewer notes, attached PDFs, and sign-off

- Step-by-step checklist with live timers for warm-up and cleaning steps
- Every session is reviewed and digitally signed off before it counts as PASS
- Reviewer notes and attached PDFs (sort reports, CVs) stay with the record permanently

Flow Core User Log App

Enhancing user experience while generating operational intelligence

RESEARCHER BENEFITS

Smart Scheduling & Access

- iLab-integrated reservations and calendar reminders
- QC-gated check-in ensures instrument readiness
- Real-time instrument status visibility

Guided Experiment Workflow

- Step-by-step instrument startup and shutdown guidance
- Nozzle and instrument-specific recommendations
- Standardized operating procedures at point-of-use
- Reduced user error and troubleshooting time

On-Demand Support

- Cyto-Captain AI assistant available 24/7
- Instrument troubleshooting guidance
- SOP and knowledge-base search
- One-click escalation to Flow Core staff

Continuous Feedback

- Quick post-session survey and immediate issue reporting
- Suggests workflow improvements
- Closes the loop on overall user experience

DATA CAPTURED FOR CORE OPERATIONS

Every interaction becomes operational intelligence:

User Activity
Bookings, check-ins, utilization hours

Operational
SOP completion, workflow logs, bottlenecks

Support & Issues
Common problems, escalations, demand trends

Strategic Analytics
Utilization dashboards, forecasting, staffing

4 data streams → 1 analytics view

FLOW: Reservation → Check-In → Workflow Activity → Support Requests → Feedback → Operational Analytics

Flow Core Instrument

Home

Mario Themed



Warm up

This is required for all weekend and holiday usage.



Check In

Appointment



*Shutdown

If you are the last user of the day please shutdown



History

A record of all your usage.



Feedback

Please let us know how we are doing.



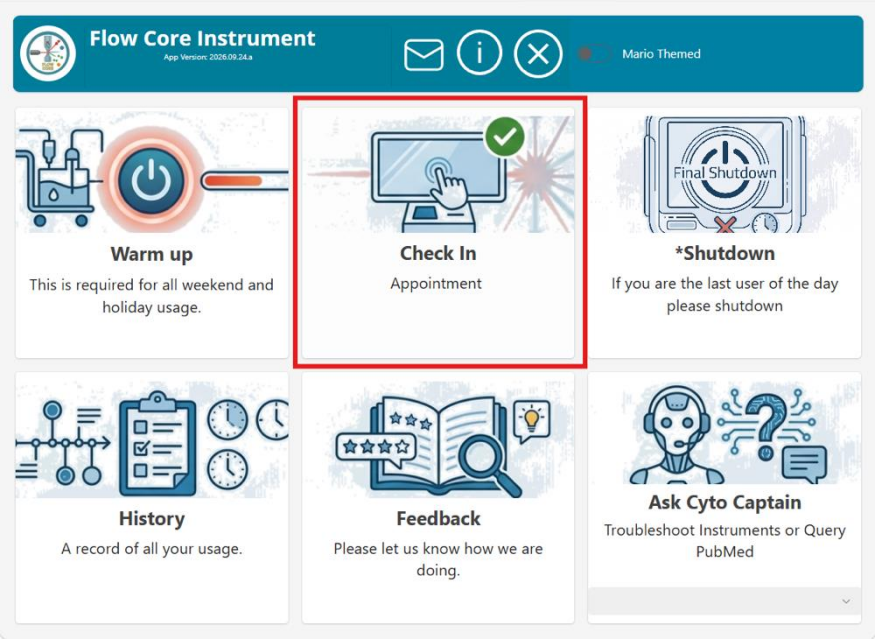
Ask Cyto Captain

Troubleshoot Instruments or Query PubMed

Princess Peach

User App in Practice: Check-In to Escalation

A real check-in session from the production app



Calendar Check-In — today's reservation, one tap to begin

- **Dashboard Sync:** Automatically displays accepted iLab reservations on the user's dashboard.
- **Automated QC Gate:** Verifies QC status prior to unlocking Check-In.
- **Pre-Start Guidance:** Presents latest QC results and nozzle instructions via a pop-up prompt.
- **One-Tap Escalation:** Pre-populates Flow Core contact details and subject line for quick issue routing.

Cyto-Captain: An Agentic Assistant for the Flow Core

Built into the User App — available 24/7 via barcode login

Lab Support

Troubleshoots instrument issues from user-reported comments and errors

Issue Analysis

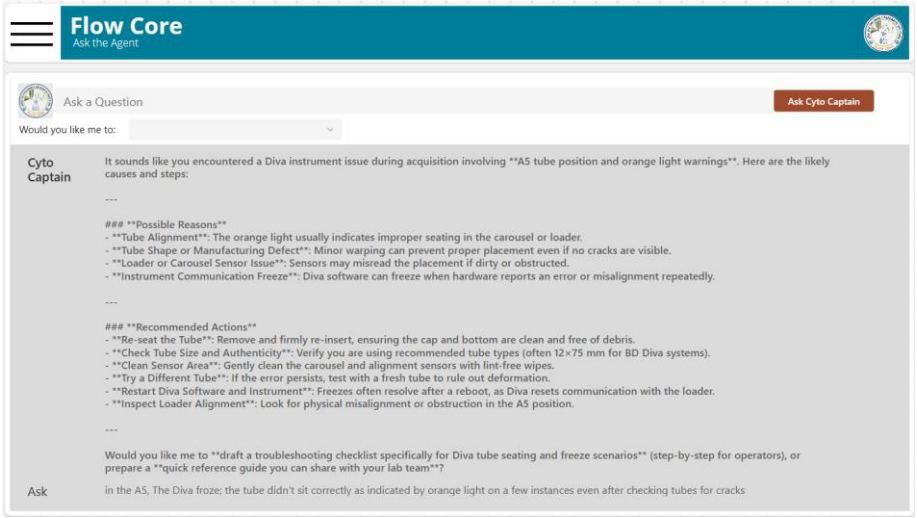
Identifies the most likely causes from reported symptoms

Guided Resolution

Step-by-step instructions to resolve the issue

OMIP and Research Assistance

Answers science questions; summarizes relevant PubMed literature



Real Cyto-Captain session: diagnosing a tube-seating / carousel error

Keeping AI Accountable: Guardrails by Design

How we addressed the "ethics" in AI advances, ethics, and workflows

- **Human-in-the-loop —** Cyto-Captain recommends; core staff and managers decide and act. No autonomous control of instruments or records.
- **Grounded, sourced answers —** Responses pull from SharePoint SOPs, trained data base and PubMed — not open-ended generation.
- **Full audit trail —** Every QC review, override, and escalation is timestamped and attributed for GCLP compliance.
- **Building a Connected Digital Ecosystem —** Unified Platforms: Microsoft Power Apps, SharePoint, Microsoft Teams, Outlook, iLab, and Copilot Studio — provides a framework for future AI-assisted capabilities.

Transforming Daily Operations Through Data and Accountability

BEFORE		AFTER AUTOMATION
Paper QC records	→	**Digital audit-ready records**
Manual approvals	→	**Electronic review workflows**
Limited visibility	→	**Real-time dashboards**
Reactive troubleshooting	→	**Structured issue tracking**
Verbal communication	→	**Documented escalation process**
Isolated data	→	**Connected operational intelligence**

Automation is not about replacing people.

It's about giving researchers and core staff better tools, better data, and better visibility to make informed decisions.

THANK YOU

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Siva Ponnan, Ph.D.

Seattle Children's Research Institute

Flow Core Automation

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