

# Fine-Tuning Epic Beaker:

Optimizing Orders and Streamlining  
Communication between Clinical Teams  
and Lab to Reduce Pre-Analytical Errors



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# Session Overview

- About Us
- Project Overview
- Novel Way to Set Default Blood Collectors
- Push Notifications for Cancels, Redraws, and Declined Add-Ons
- Optimization of Specimen Type and Source
- Summary and Acknowledgements

# About Us

**Honeydew**  
CONSULTING

**ACL**  
Laboratories  
Now part of  ADVOCATEHEALTH

# Ryan Matos

## Honeydew Consulting

### Beaker and Reporting Contractor

Ex-Epic reporting specialist and lab project manager with 12+ years experience in healthcare IT

#### *Focused interests:*

- Leveraging reports and dashboards to improve healthcare delivery
- Lab workflow optimizations with operational champions



# Honeydew Consulting

- Boutique consulting firm of Beaker and Data Innovations experts, with 30 staff based around US
- 11 staff worked with Atrium from 2020-2022 for multi-wave implementation across NC, GA, and AL
- Ryan worked with Atrium 2021-2024 through four implementations (Dec 2021, Apr 2022, Aug 2022, and Mar 2024)
- Learn more at [honeydewconsulting.com](https://honeydewconsulting.com)



# Kaylee Smith, MIHM, MLS(ASCP)<sup>cm</sup>

**Advocate Clinical Laboratories, SE Region  
Technical Specialist II - Microbiology**

Clinical Microbiologist with 6+ years of leadership and project management experience.

*Focused interests:*

- Workflow optimizations to improve laboratory quality.
- Leveraging available tools to increase patient safety and testing accuracy.



# Advocate Health Size and Scope

nearly  
**155K**  
teammates

more than  
**21K**  
doctors

nearly  
**42K**  
nurses

serving nearly  
**6M**  
patients

**68**  
hospitals

more than  
**1K**  
sites of care

delivering nearly  
**\$6B**  
in community benefit

more than  
**\$28B**  
in annual revenue

**3<sup>rd</sup>**  
largest nonprofit

**Honeydew**  
CONSULTING



Atrium Health



Aurora Health Care



Wake Forest University  
School of Medicine

Now part of  **ADVOCATEHEALTH**



# Advocate Clinical Laboratories Size and Scope



## Geography

ACL reach spans six states:

- Alabama
- Georgia
- Illinois
- North Carolina
- South Carolina
- Wisconsin



## Outreach

ACL has a robust and profitable inreach/outreach business.



## Strategy and Growth

ACL has strategic plans through a series of goals that include expanding inreach/outreach, conversion to value-based care, precision medicine, academic/research (AI), partnerships, workforce development, digital pathology, and direct to consumer.

## ACL KEY NUMBERS

**5100**  
Teammates

**60 Million**  
Tests Annually

**205**  
Pathologists  
with multiple  
subspecialties

**ONE**  
Academic Core  
Wake Forest Baptist

**72**  
Rapid Response  
Laboratories

**THREE**  
Core Laboratories  
Charlotte • Chicago • Milwaukee

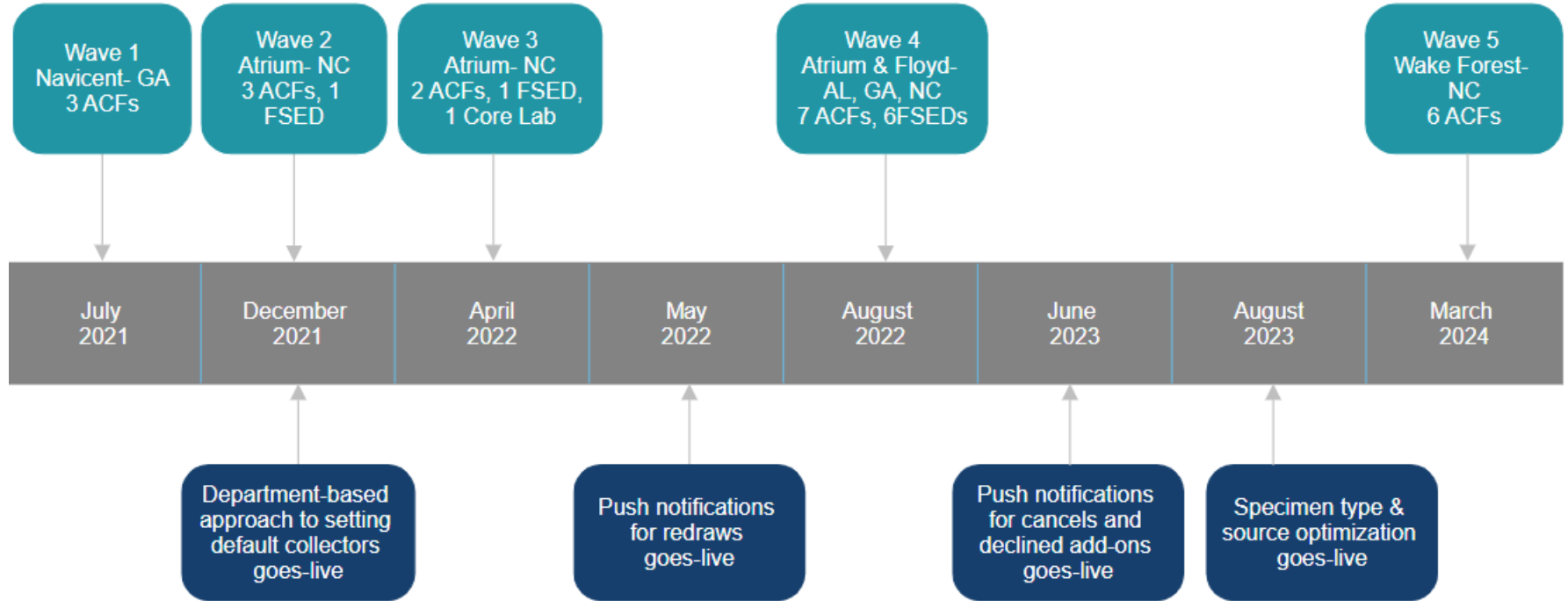
**122**  
Patient Service  
Centers

**1300**  
External Clients



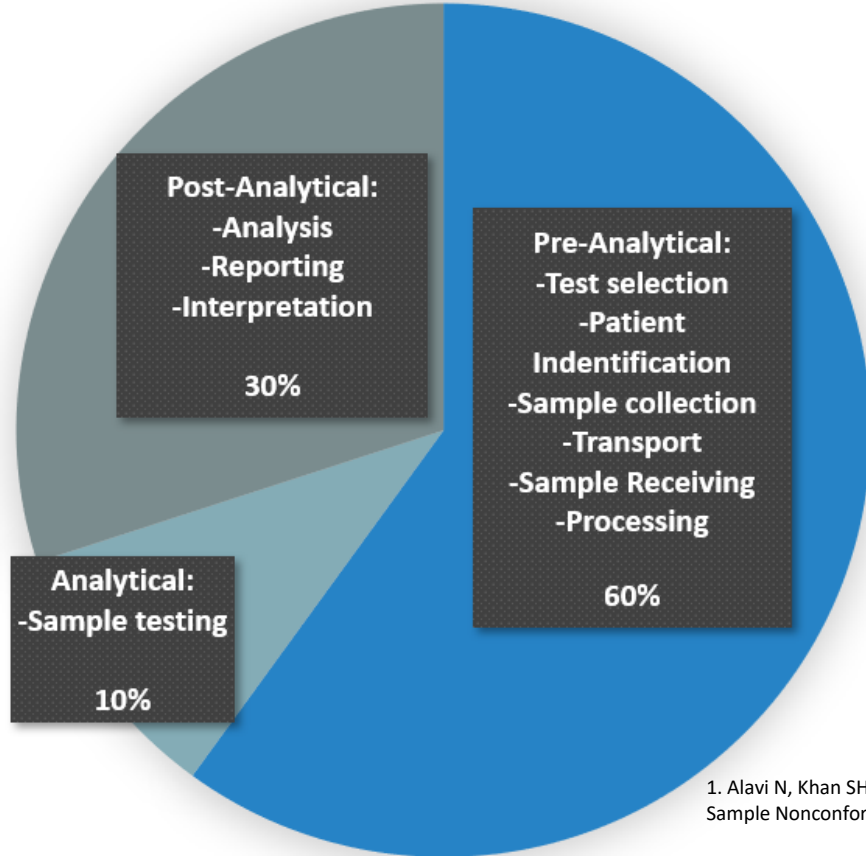
# Project Overview

# Epic Implementation Timeline



# Why the Pre-Analytical Phase?

## Phases of Clinical Testing



46 to 68.2% of diagnostic testing errors are due to gaps in the preanalytical phase.<sup>1</sup>

1. Alavi N, Khan SH, Saadia A, Naeem T. Challenges in Preanalytical Phase of Laboratory Medicine: Rate of Blood Sample Nonconformity in a Tertiary Care Hospital. EJIFCC. 2020;31(1):21-27. Published 2020 Mar 20.

# Setting Default Blood Collectors

# Background

## Problem

- After Wave 1 go-live, high volume of Unit vs Lab Collect Order Transmittal (OTX) tickets

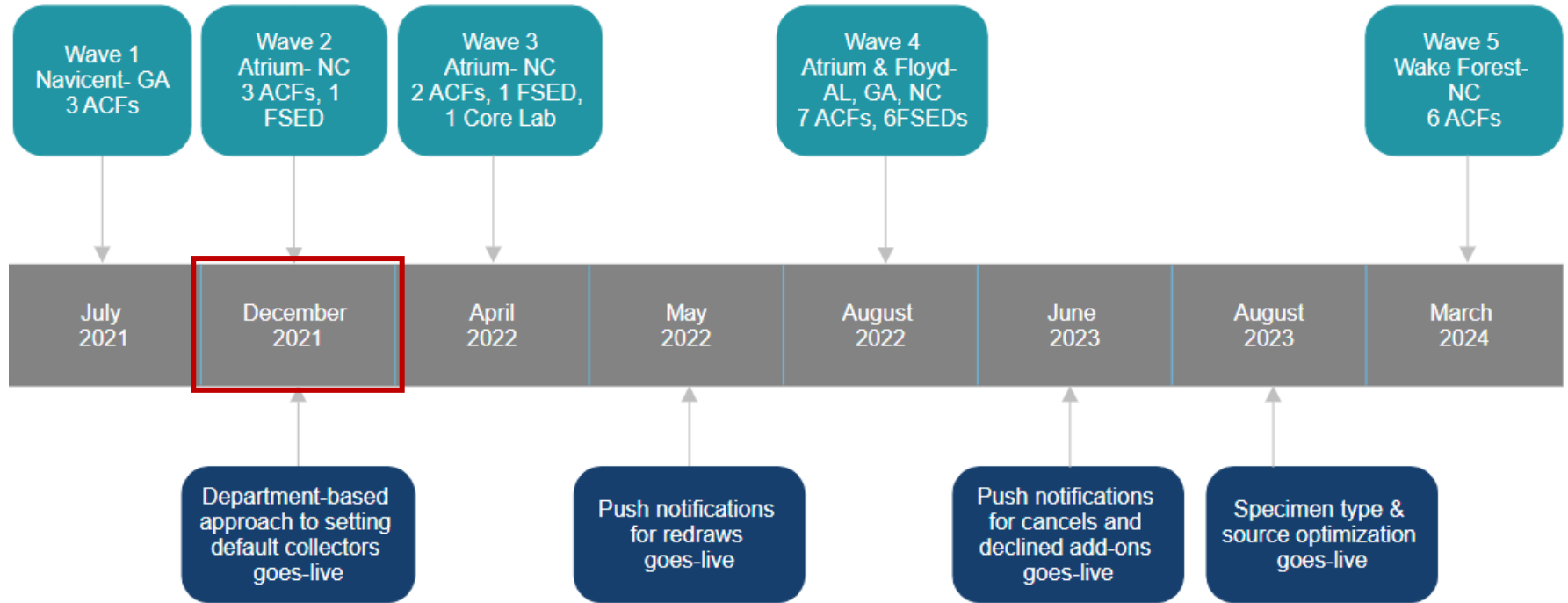
## Starting State

- Extensive build in OTX, requires specialized build knowledge, risky to update on-the-fly

## Opportunity

- Can we more easily set default blood collectors (Unit or Lab) by department?

# Implementation Timeline



# Functionality

- 1) Blood specimens for patients in IP/ED departments have one of the following default settings
  - a. **Unit Collect Always – Ignore Flowsheet**
  - b. **Lab Collect Always – Ignore Flowsheet**
  - c. **Unit Collect Default – Respect Flowsheet**
  - d. **Lab Collect Default – Respect Flowsheet**
  - e. **Both Unit and Lab Collect (Routes to Phlebotomy and Nursing)**
- 2) For patients in “Respect Flowsheet” units, nurse or lab can update the Lab Blood Collection in the Storyboard

Time taken:   + Add Group + Add Row + Add LDA 👤 Responsible + Create Note

**Blood Specimen Collection Status**

Blood Specimen Collection

BE

**Betsy Encompass**  
Female, 49 y.o., 3/3/1973  
MRN: 0050501588  
CSN: 6950016711  
Bed: C10133-01  
Cur Location: 4525 Cameron Valley Parkway - Morrocroft II - AMBULATORY  
Code: Not on file (no ACP docs)  
Readmitted?: Y  
Provider First Contact: None  
Primary Team: None

Search

COVID-19 Vaccine: Unknown  
COVID-19: Unknown  
Isolation: None

**Beth Test One Test, MD**  
Attending

Lab Blood Collection: Lab

# Build – Categories and DEP

Setting department's default setting using a DEP grouper item (I DEP 4330)

Record Viewer (Old) | Previous | Next | Refresh | Jump To Item | Compare Record | Build Comparison

INI: DEP | ID: CMC 10T MED/SURG [1000] | Contact: 9 - 7/1/2020

Item range: : | Include blanks

4327-RPT GRP TWENTYEIGHT	Carolinas Physician Network, Inc.
4328-RPT GRP TWENTYNINE	Carolinas Physician Network, Inc.
4330-RPT GRP THIRTYONE C	Lab Collect Default - Respect Flowsheet [103]

List of possible values (DEP 4330 category list)

101	Unit Collect Always - Ignore Flowsheet
102	Unit Collect Default - Respect Flowsheet
103	Lab Collect Default - Respect Flowsheet
106	Both Unit Collect and Lab Collect (Routes to Phlebotomy and Nursing)
107	Lab Collect Always - Ignore Flowsheet

Data gathering project with nursing and lab managers to determine appropriate default setting for every IP/ED department where specimens could be collected – *standard part of new implementations*



# Build – Order Transmittal

Cascade that appropriately sets Order Class for an order based on DEP setting (settings below will override the settings above if criteria is met)

IF specimen\_type

EQUALS Blood

IF specimen\_source

DOES NOT EQUAL Umbilical Artery OR Umbilical Vein

+ IF department\_unit\_collect\_default\_respect\_flowsheet

+ IF department\_lab\_collect\_default\_respect\_flowsheet

+ IF dep\_4330\_blank\_catchall

+ IF patient\_collection\_flowsheet\_lab

+ IF patient\_collection\_flowsheet\_unit

+ IF department\_route\_to\_nursing\_and\_phlebotomy

+ IF department\_unit\_collect\_always

+ IF department\_lab\_collect\_always

+ IF procedure

“Respect Flowsheet” DEPs get set first

Any DEPs that did not get a setting are Unit Collect

Patient header overrides

DEPs with these settings are “immune” to the patient header overrides above

Exceptions

# Build – Order Transmittal 2

Expanded version showing setting for two DEP values

IF specimen\_source

DOES NOT EQUAL Umbilical Artery OR Umbilical Vein

IF department\_unit\_collect\_default\_respect\_flowsheet

EQUALS 1

DIRECTIVES: event equals Sign or Redraw or Declined Add-on; Continue afterwards

SET order\_class TO Unit Collect

DIRECTIVES: if order is standing and event equals Sign or Redraw or Declined Add-on; Continue afterwards

SET order\_class TO Unit Collect

IF department\_lab\_collect\_default\_respect\_flowsheet

EQUALS 1

DIRECTIVES: event equals Sign or Redraw or Declined Add-on; Continue afterwards

SET order\_class TO Lab Collect

DIRECTIVES: if order is standing and event equals Sign or Redraw or Declined Add-on; Continue afterwards

SET order\_class TO Lab Collect

# Build – Order Transmittal 3

Example of rules: “Unit Collect Default – Respect Flowsheet” & Patient Header override

AH Lab Unit Collect Default - Respect Flowsheet

Detail: Lab - Collection Flowsheet is Set to Lab Collect

This rule is used for routing specimen collection to the lab when the patient is marked as a "lab collect" patient via the collection flowsheet activity in the patient header. When the patient header is marked as "lab collect", they will evaluate as "true" for this rule and their labs will be marked as lab collect.

Evaluation logic:

And

Or

Custom:

Show Parameter Values

#	Property	Operator	Value
1	Patient »	Contain Any (Match case)	Lab
2	Last Flowsheet Value (String)		
	Flowsheet Row		

R IP SPECIMEN COLLECTION [3...

# Outcomes

## Outcome #1

- Order of magnitude fewer Order Class-related tickets at subsequent go-lives

## Outcome #2

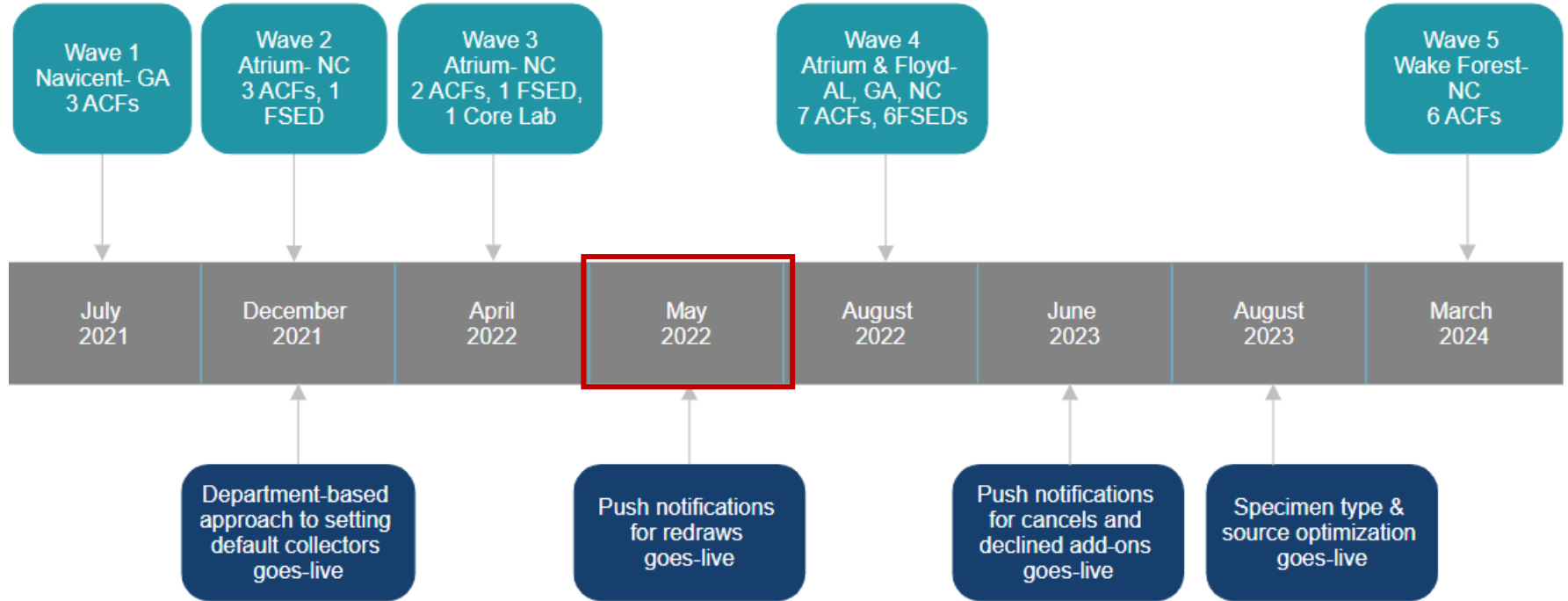
- Changing a default no longer requires OTX change → significantly faster

## Outcome #3

- “Send to Nursing and Phlebotomy” → useful for smaller hospitals (staffing)

# Push Notifications: Cancels, Redraws, Declined Add-Ons

# Implementation Timeline



# Background - Redraw

## Problem

- Nurses were not notified of redraws, causing collection delays

## Starting State

- No notification to nursing
- Relying on nurses seeing redraws on the Brain

## Opportunity

- Leverage existing communication pathways (created for closed loop criticals) to alert redraws

# Functionality

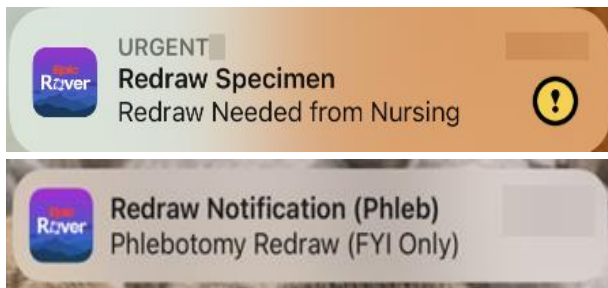
**Affected Users:** Inpatient and ED RNs, LPNs, Charge Nurses, Technicians, Paramedics **actively on patient's treatment team**

Real-time communication consisting of

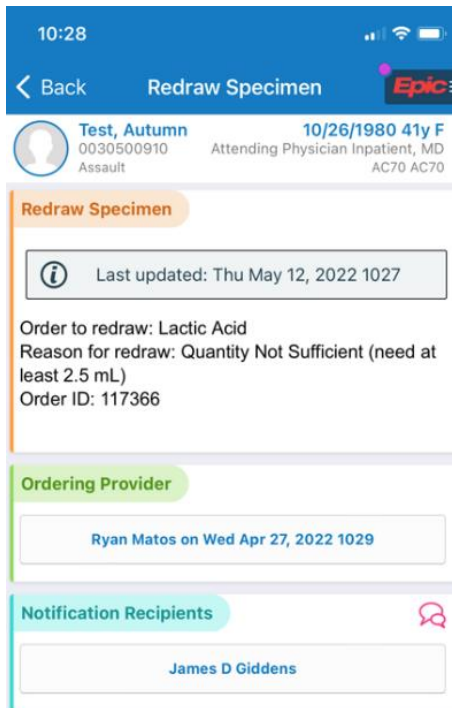
- “**Important**” Rover push notifications for redraws for **unit collect** orders (**action needed** from nursing)
- “**Informational**” Rover push notifications for redraws for **lab collect** orders (**no action needed** from nursing)



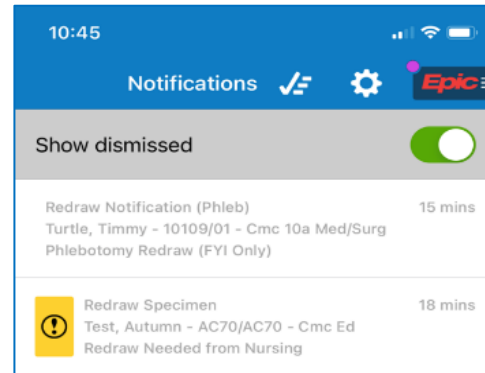
# Functionality - screenshots



*Push Notifications on Rover lock screen*



*Push notification details for Redraw (Unit Collect)*



*Appearance in Rover notification center*

# Technical – Extension

Epic extension (LPP) code template for OTX push notifications:

UC ORDER TRANSMITTAL PUSH NOTIFICATION EXTENSION [341462]

## Configuration Options:

- Priority
- Insecure Text (*notification overview on lock screen before authentication*)
- Secure Text (*notification overview after user authenticates*)
- SmartText ID (*body of message*)
- Recipient parameters

Name	Value
Order ID	ORDId
Notification Type	Lab Order Cancel Notification
Notification Priority	Normal
Insecure Text	Order Canceled by Lab
Secure Text	Order Canceled by Lab
SmartText ID	AH LAB NURSING CANCEL NOTIFICATION [30014]
Report	
Users	
Groups	
Teams	

Treatment Team Roles

Registered Nurse  Technician  Paramedic  Licensed Practical Nurse  Charge Nurse

Include Attending?  No

Included Referred To?  No

Order Team Question

Order Group Question

Use Chat Forwarding?  Yes

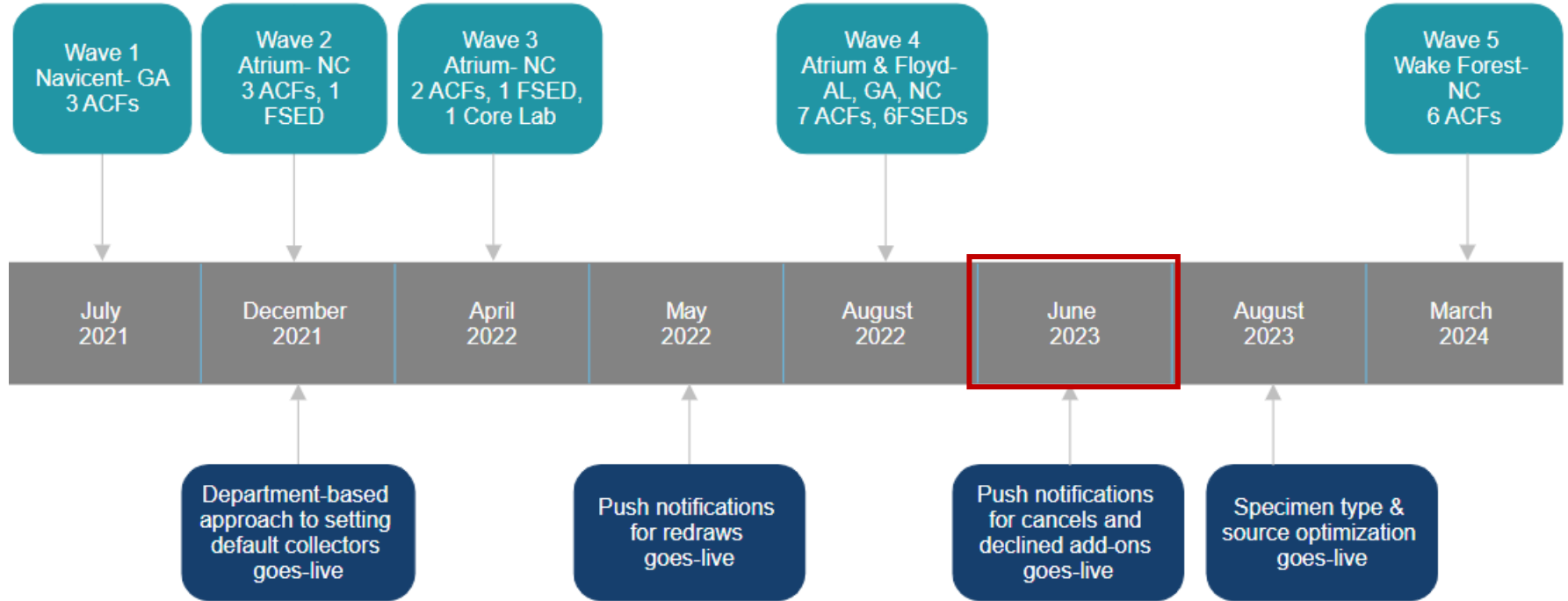
# Technical – OTX

Simple OTX build for sending push notifications

Redraws and Declined Add-Ons

```
IF order_class
  EQUALS Unit Collect
    DIRECTIVES: event equals Redraw; Continue afterwards
    DO THE ACTION AH Lab IP Redraw Push Notification (Unit Collect)
    DIRECTIVES: event equals Declined Add-on; Continue afterwards
    DO THE ACTION AH Lab IP Lab Declined Add-On Push Notification (Unit Collect)
  EQUALS Lab Collect
    DIRECTIVES: event equals Redraw; Continue afterwards
    DO THE ACTION AH Lab IP Redraw Push Notification (Lab Collect)
    DIRECTIVES: event equals Declined Add-on; Continue afterwards
    DO THE ACTION AH Lab IP Lab Declined Add-On Push Notification (Lab Collect)
```

# Implementation Timeline



# Background - Cancels and Declined Add-Ons

## Problem

- Communication was not in real time
- Communication was not to the right audience

## Starting State

- Inbox messages to ordering provider
- No notification to active care team

## Opportunity

- Leverage existing communication pathways through push notifications

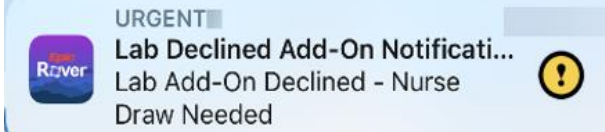
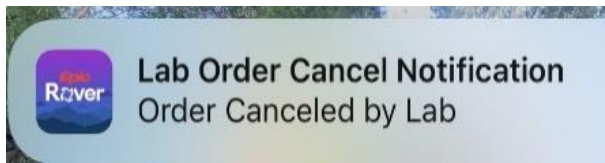
# Functionality

**Affected Users:** Inpatient and ED RNs, LPNs, Charge Nurses, Technicians, Paramedics **actively on patient's treatment team**

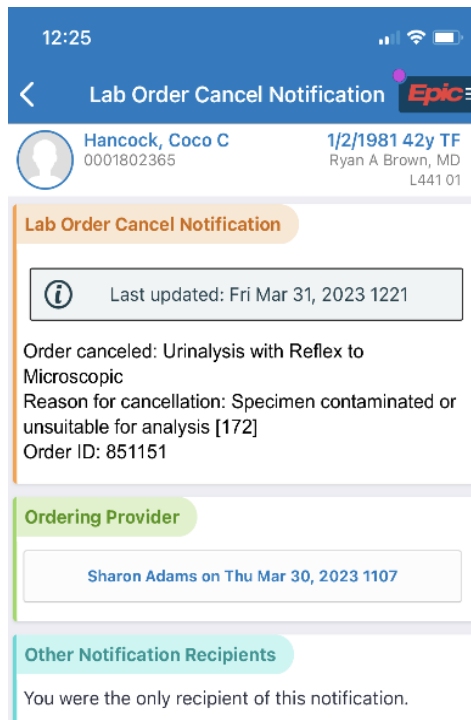
Real-time communication consisting of

- **"Important"** Rover push notifications for redraws or declined add-ons for **unit collect** orders (**action needed** from nursing)
- **"Informational"** Rover push notifications for **all** canceled orders (**no action needed** from nursing)
- **"Informational"** Rover push notifications for redraws or declined add-ons for **lab collect** orders (**no action needed** from nursing)

# Functionality - screenshots



*Display on Rover lock screen*



*Cancel push notification details*

# Technical – OTX for Cancel

Cancel OTX slightly more complex – only notify for select cancel reasons

Cancel reasons available to lab – limited by lab profile (LPR)

AH LAB CANCEL REASONS FOR PUSH NOTIFICATION

Determines if this order was canceled with one of the reasons that would elicit a cancel notification.  
Reasons from LPR AH LAB DEPT [900900] item 8276 that were excluded (all other reasons included):  
Other [0]

Evaluation logic:

Show Parameter Values

#	Property
1	Order » ↗
	Cancel Reason

```
IF lab_notify_cancel_reason
  EQUALS 1
    DIRECTIVES: event equals Cancel;
    DO THE ACTION AH Lab IP Lab Cancel Push Notification
  EQUALS 0
    DIRECTIVES: event equals Cancel;
    STOP ORDER TRANSMITTAL
```

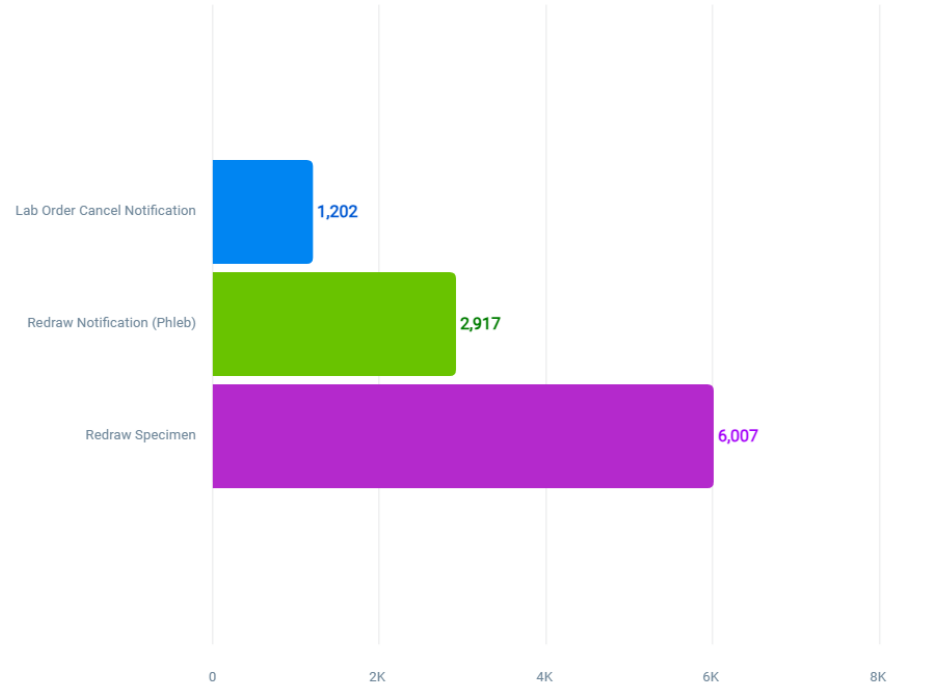


# Outcome

Average month of push notifications broken down by notification type.

- 10% Cancel/Decline notices to the Care Team
- 30% Redraw by Phlebotomy
- 60% Redraw by Nursing

Number of Push Notifications by Notification Type

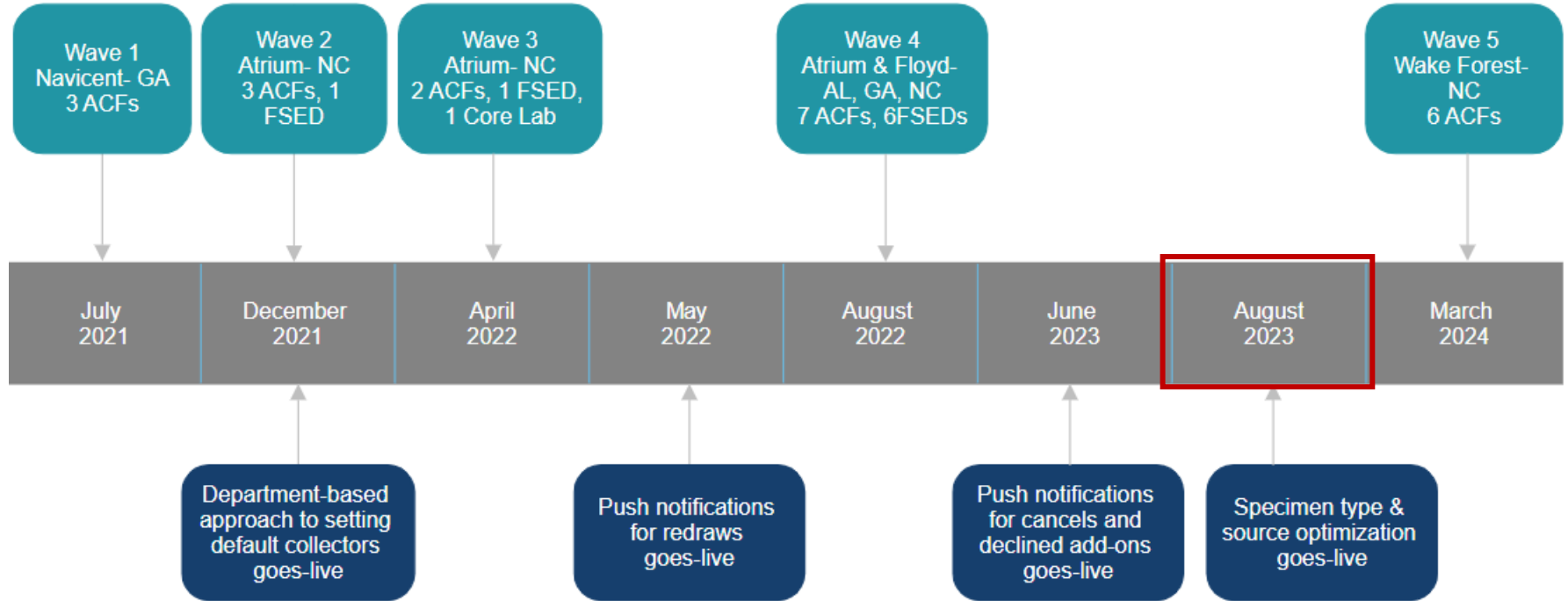


# Optimization Opportunities

	Epic Functionality	Clinician Workflows	Laboratory Workflows
Current Barrier	No notification is sent if there are no appropriate clinicians actively on the treatment team	Clinical users frequently dismiss push notifications or leave them as unread	Add On workflow is variable across laboratory spaces
Development Opportunity	<ul style="list-style-type: none"> <li>• QA Note filed with Epic to improve tracking</li> <li>• Work on education and workflows on the clinician level</li> </ul>	<ul style="list-style-type: none"> <li>• Seek to understand users' reasoning and workflows</li> <li>• Follow-up and training for repeat offenders</li> </ul>	<ul style="list-style-type: none"> <li>• Seek to understand workflow gaps around add on testing</li> <li>• Standardize when to utilize "Send for New Collection" from Add-On In Basket</li> </ul>

# Optimization of Specimen Type and Source

# Implementation Timeline



# Background - Definitions

## Type

- Physical type of specimen being collected
- Answers the question "*What is the specimen?*"
- Examples:
  - Urine
  - Tissue
  - CSF

## Source

- Anatomical site/source of the specimen
- Answers the question "*from where on patient is the specimen?*"
- Examples:
  - Leg, Left
  - Jackson-Pratt Drain, Right
  - Colon, Splenic Flexure

# Background - Clinical Need

## Problem

- Type and source lists had drifted from the clinical definitions; vague, confusing, and redundant

## Starting State

- Providers added order comments for clarity
- Orders often required clarifications before testing

## Opportunity

- Refine our Type and Source lists to streamline and refocus on clinical accuracy

# Build Process - Starting Point

Combined Type and Source lists for all markets → **unmanageable**

- Starting # Types = **433**
- Starting # Sources = **1097**

Assembled enterprise task force

- Chemistry, Microbiology, Molecular/Cytogenetics, Cytology, Histology
- Specific pathologists specializing in anatomical areas
- Included procedural areas

# Build Process – List Cleanup

Defined goals and used them to drive list cleanup

The task force had the following objectives:

- Clarify naming (with compliance feedback) to support accuracy of specimen data in the chart.
  - Specimen **types** should answer the question “physically, what is this specimen?”
  - Specimen **sources** should answer “from where on the patient is this specimen?”
- Mitigate redundant values using synonyms.
- Deactivate values with little or no utilization.
- Deactivate vague “other” or “NOS” values in favor of specificity.
- Add laterality where needed.
- Facilitate ordering for clinicians and increase lab efficiency by reducing manual intervention.



# Build Process – In Epic

Systematic review and replacement – Excel and imports

- **Container Types (OVM)** – *allowed types*
- **AP Specimen Protocols (OVT)** – *allowed and default sources*
- **Procedure (EAP)** – *allowed types/sources, default type/source*
- **Navigator Configuration (VCN)** – *source-to-type & type-to-EAP mapping*
- Other records identified by Epic utility –rules (CER), result checking (TRE), lab facility structure (LDF), reports (HRX), and more

Extensive testing in build and testing environments

**Painstaking Change Control to prevent early moves to PRD**

# Preparation and Go-Live

**This big change required significant training and ample advance notice.**

- Encompass Ideas Process, clinical Advisory Councils
- Extensive tip sheets and training
- Appended \* for types sources to be deactivated Aug `23; migrated in June `23

## **Go-Live**

- Aligned go-live with a planned downtime
- Coordination with Epic TS (replacement utility for future/standing orders)
- Detailed data migration plan

## Body Fluid Ordering – Major Updates

### Specimen Type Updates

### Specimen Source Updates

#### Appendix C: New Specimen Types

[return to page 2](#)

#### Appendix D: Deprecated Specimen Sources

[return to page 3](#)

Deprecated Source	Source(s) to use instead	Reason
Abdominal Fluid*	Abdomen, with type Aspirate or Washing	Source should <u>actually be</u> a specimen type
Above Knee Amputation*	Above Knee Amputation, <u>Right</u> Above Knee Amputation, Left	Needs laterality
Abscess*	Use appropriate body source with type of Abscess	Source should <u>actually be</u> a specimen type
Adipose Tissue*	n/a	Source is too general
Alveoli*	no replacement	Little or no utilization
Amniotic Fluid*	use type Amniotic Fluid, source Amniotic Sac	Source should <u>actually be</u> a specimen type
Aneurysm-arterial/ventricular*	use source Aneurysm	Little or no utilization
Antral*	Stomach, Antrum	Duplicative
Anus tag*	no replacement	Little or no utilization

# Maintenance Process

Enterprise clinical review & approval process for any changes!

Leveraging synonyms

Defined build steps for :

Detailed Change Control

## We're deactivating a source. What needs to be done?

1. Request that TS run the [networked record search utility](#). Alternatively, you can use your Chronicles searching skills looking for that source in the [item list](#).
2. **OVM:** no changes [needed](#)
3. **EAP:** Based on results from the utility or a Chronicles search, remove that source from any EAP(s), either manually or via import depending on scale.
4. **OVT protocols:** Based on results from the utility or a Chronicles search, remove that source from any OVT(s), either manually or via import depending on scale.
5. **TRE:** Based on results from the utility, remove that source from any TRE(s). It's best to do this manually, and I cannot imagine this affecting more than a handful of records.
6. **VCN:** Based on results from the utility or a Chronicles search, remove that source from any VCNs' source-type mapping. This will best be done manually.
7. **LDF 1:** no changes [needed](#)
8. **FOR OTHER INIs:** Based on results from the utility, remove that source from any networked records. It's best to do this manually, and I cannot imagine this affecting more than a handful of records.
9. Deactivate the source in ORD 325.
10. **Migrate appropriately, with item restrictions.**

# Outcome

## Pre-Optimization

- Types: 433
- Sources: 1097

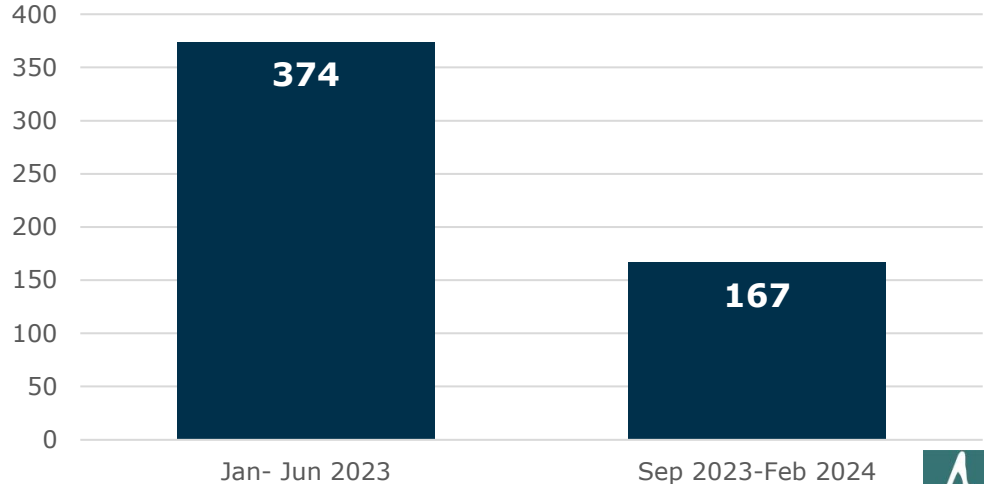
## Post-Optimization

- Types: 83
  - *80% reduction*
- Sources: 657
  - *40% reduction*

# Improvement

Over a 50% reduction in Customer Relationship Management cases related to Type and Source clarifications after go live.

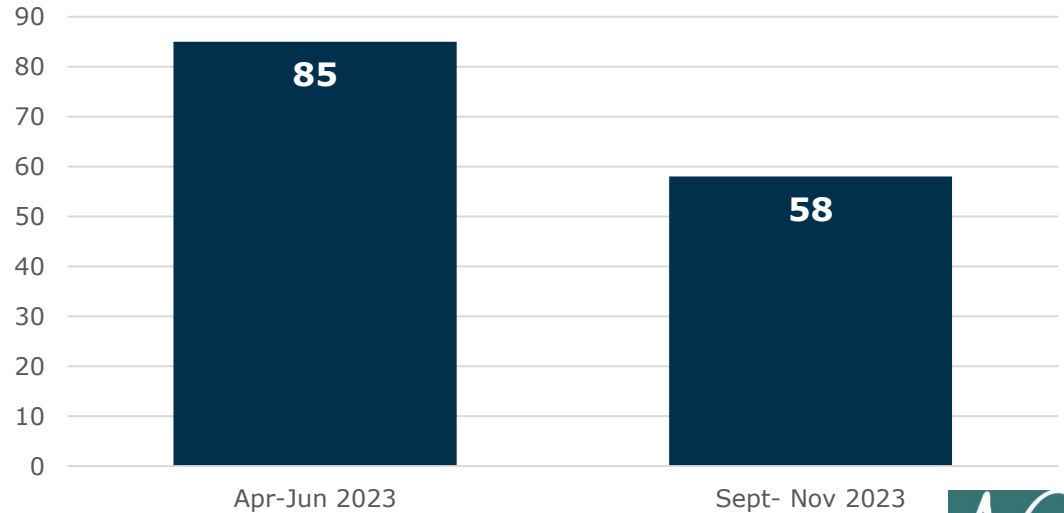
# Customer Relationship Management Cases Relating to Type and Source Clarifications



# Improvement

Over a 30% reduction in cancellations and redraws post go live.

Cancellations Due to Type and Source Order Errors



# Summary and Acknowledgements



# Summary

**Pre-Analytical  
gaps were  
causing pain  
points across  
service lines**



**Leaned into  
leveraging Epic  
build and tools  
to close gaps**



**Optimizing and  
Streamlining :  
Reduced pre-  
analytical errors  
Improved  
patient safety  
and testing  
quality**

# Acknowledgements

- AH IAS Beaker Team
  - Stephanie King, Director
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- AH Nursing Leadership Teams & Nurses
- Atrium's Epic IS & TS



**Honeydew**  
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# Thank You!

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