



Lessons Learned from our 5000+ Infusion Pump Replacement

Michele Manzoli, MS CCE & Gianna Vanchieri, MS
Cedars-Sinai Medical Center





Michele Manzoli

- Manager of Clinical Engineering at *Cedars-Sinai* in Los Angeles
 - Current Secretary of *ACCE* (American College of Clinical Engineering)
 - Certified Clinical Engineer
 - Worked in Medical Device Regulatory Affairs in Italy, Quality Management Systems in the UK, Clinical Engineering at *Yale-New Haven Hospital* in CT, and Device Integration at *Cedars-Sinai*
 - Holds a M.S. in Clinical Engineering from the *University of Trieste* and a M.S. in Biomedical Engineering from the *University of Connecticut*
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Gianna Vanchieri

- Currently a Clinical Engineer at *Cedars-Sinai* in Los Angeles
- Holds an M.S. in Biomedical Engineering from *University of Southern California*



Cedars-Sinai Medical Center

- Located in Los Angeles, CA
- Licensed for 915 beds

Clinical Engineering:


- 30 team members
- Manage over 30,000 assets



Cedars-Sinai Health System: Includes Huntington Health, Torrance Memorial, Marina del Rey Hospital, and a Medical Delivery Network

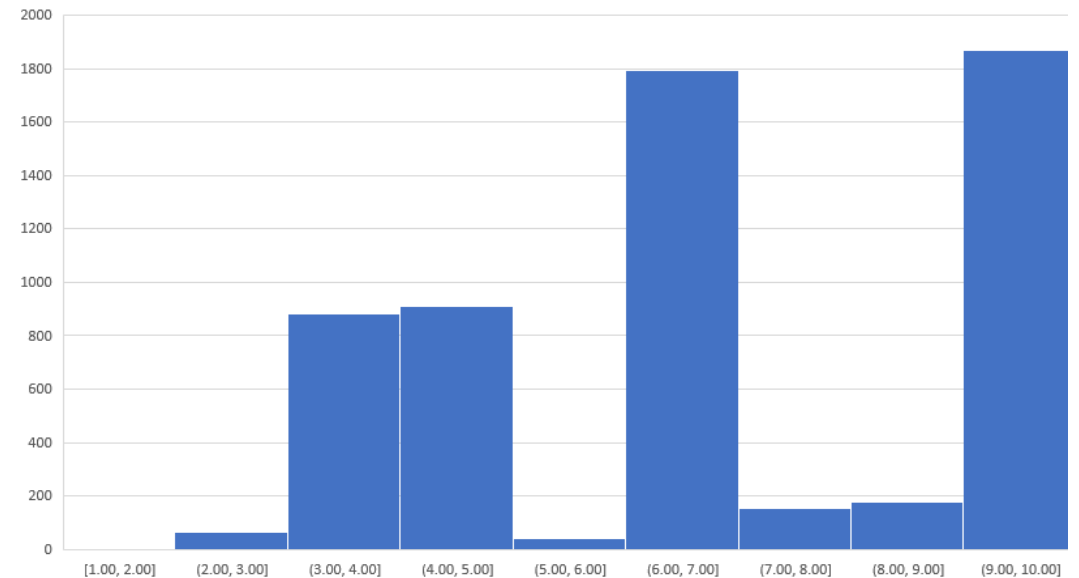


Agenda

- Background and Project Overview
 - Vendor Selection
 - Planning
 - Device Preparation and Training
 - Deployment
 - Equipment Return and Post Deployment
 - Lessons Learned
 - Q&A
- 

Need for New Infusion Pumps

- Aging Fleet
 - Infusion devices were nearing or at the end of life
- Safety Concerns
 - Safety concerns and recalls on equipment had been identified by the FDA and the manufacturer



Pre-Project Challenges

- Inconsistent cleaning protocols
 - No standard process
 - Lacked training and proper supplies
- Hoarding
 - Units stockpiled pumps due to fear of shortages and imbalances across department
- Mishandling of Equipment
 - Pumps mishandled or stored improperly causing broken equipment



Project Overview

- Goal: To replace all BD Alaris infusion pumps and establish a common standard throughout the Health System
- Timeframe: From April 2023 to November 2024
- At the Medical Center: Replacement of over 5600 devices



Key Stakeholders

Clinical
Engineering

Nursing

Pharmacy

Supply Chain

Epidemiology

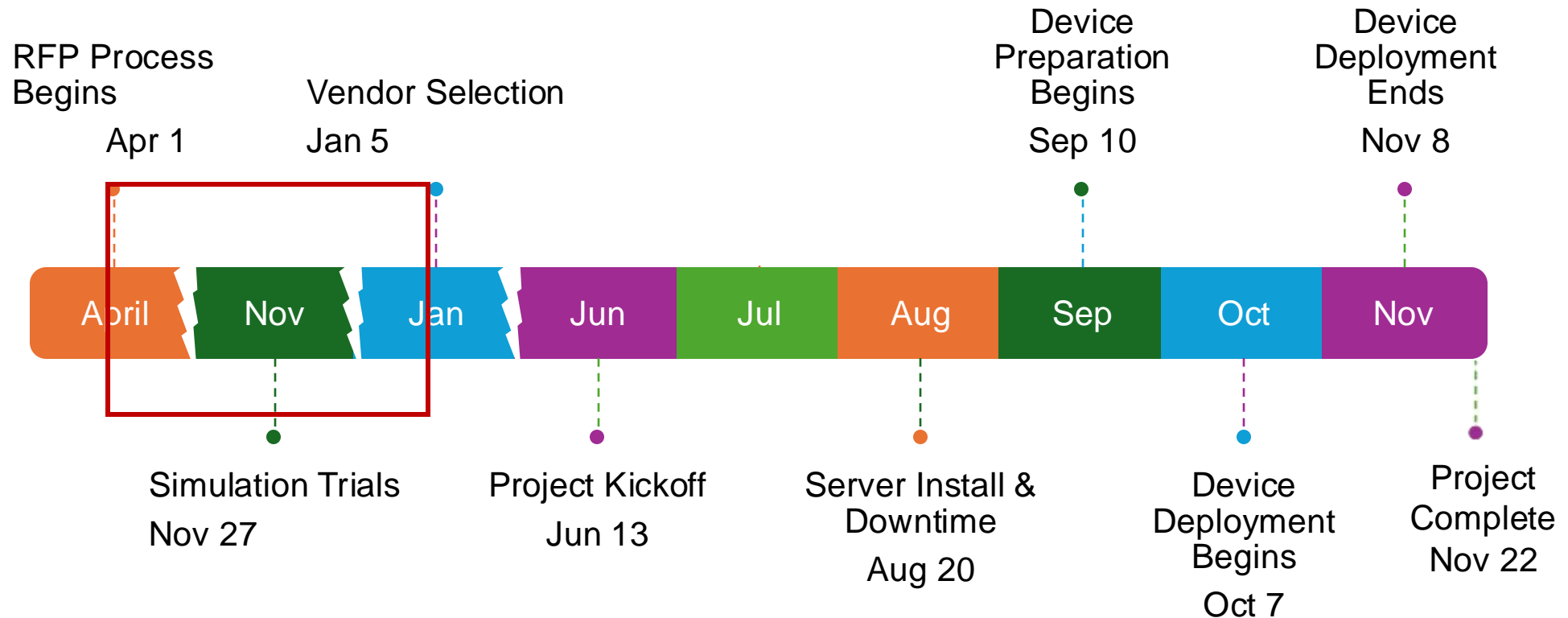
Environmental
Svc

Off-Site
Locations
Leaders

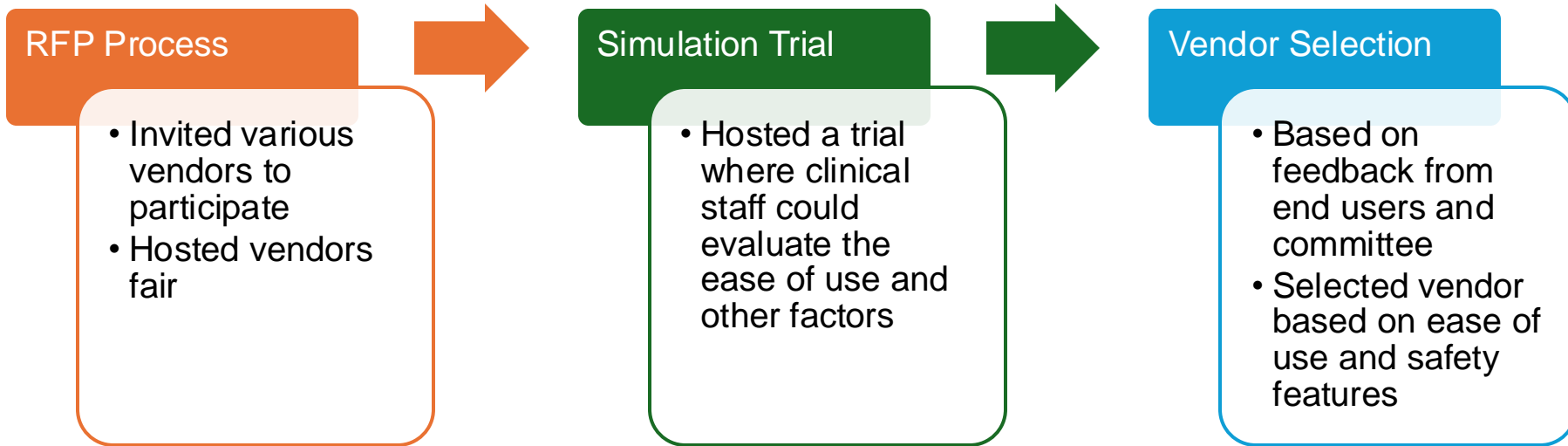
Vendor Project
Leads

IT

Vendor Selection: Apr 2023 - Jan 2024



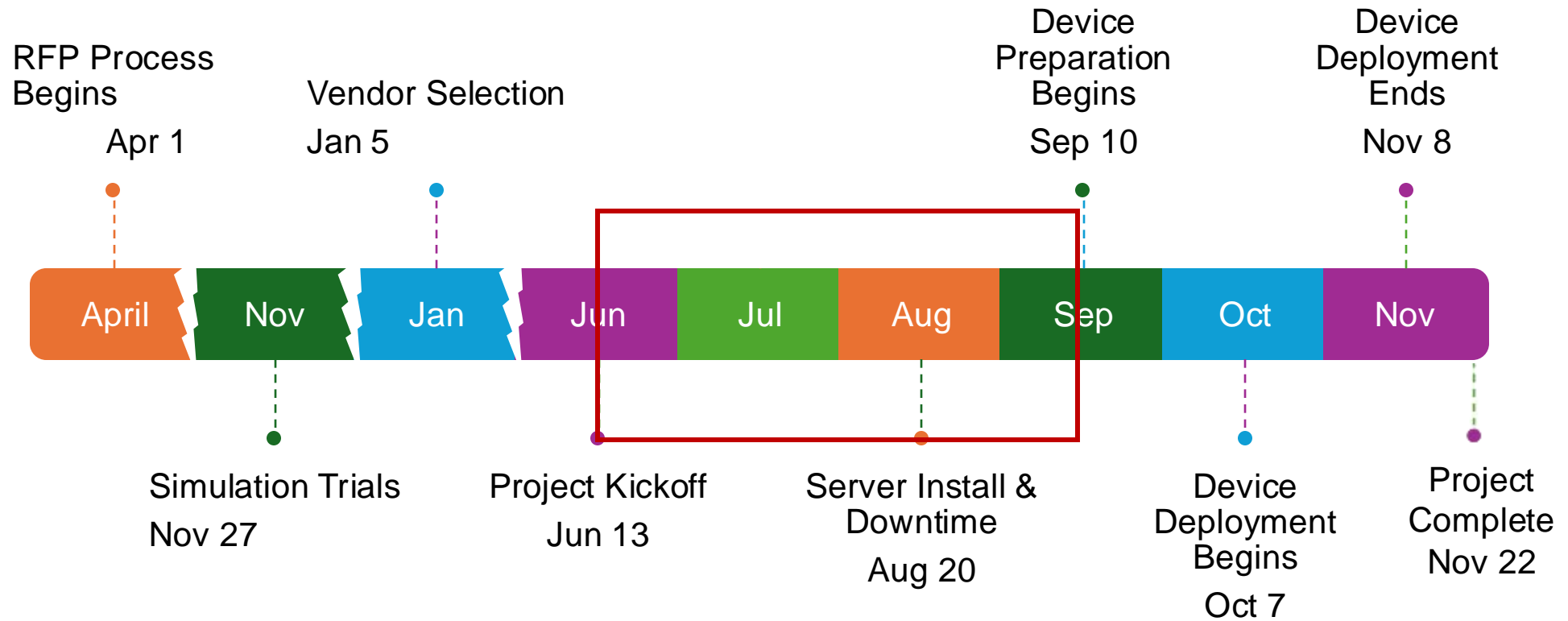
Vendor Selection Process



LARGE VOLUME PUMPS | This table shows that end-users prefer **Vendor B** for its ease of use and overall safety features and **Vendor A** for its small size/transportability.

Vendor	Ease of Use Average	Safety Average	Transportability Average
Vendor A	3.96	4.39	4.35
Vendor B	4.57	4.65	3.48
Vendor C	3.84	4.44	3

Planning Phase: Jun - Sep 2024



Server Build and Integration

IT

- Built and installed application on new servers (prod, training and test)
- Validated wireless connectivity
- Managed production Cutover
- Created device records in EMR

Pharmacy

- Updated drug library and concentration limits
- Guardrails
- Minimal changes from current version



Exchange Times


Med-Surg & ICU

- 6 AM
 - Based on lowest usage of infusions throughout the day

Procedural Areas

- 5 AM
 - Prior to surgical start time

Off-Site Locations

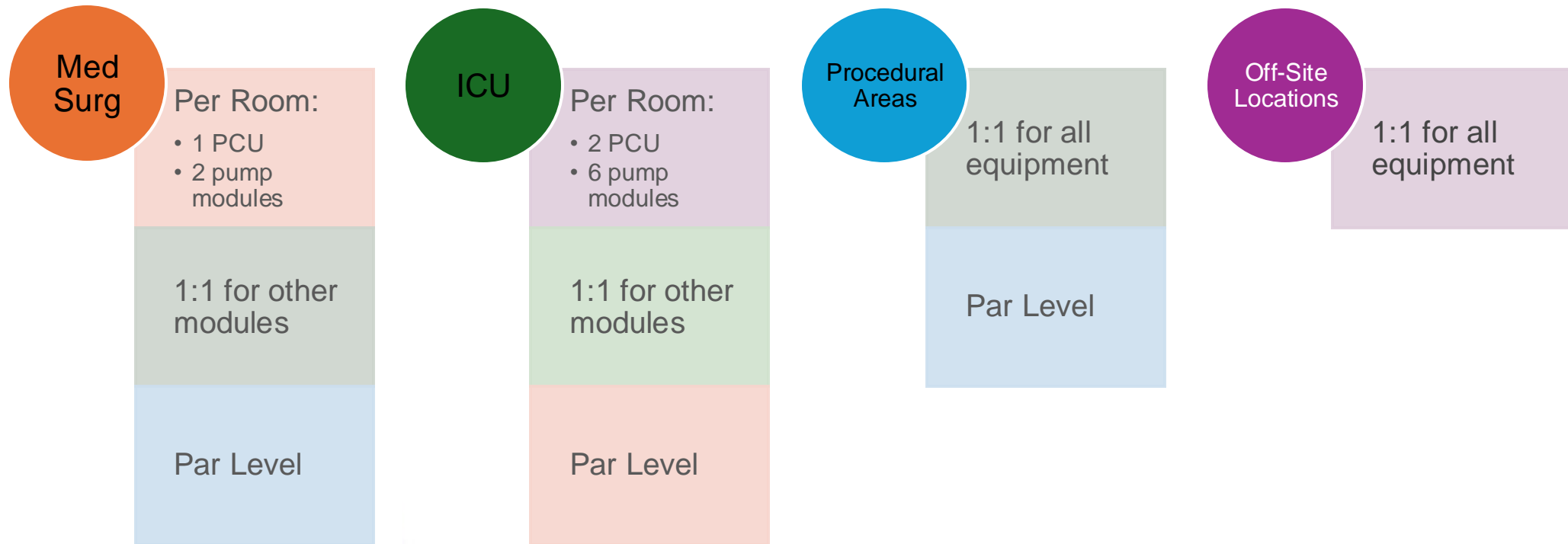
- 5 PM
 - After closing of clinic
- 

Par Level

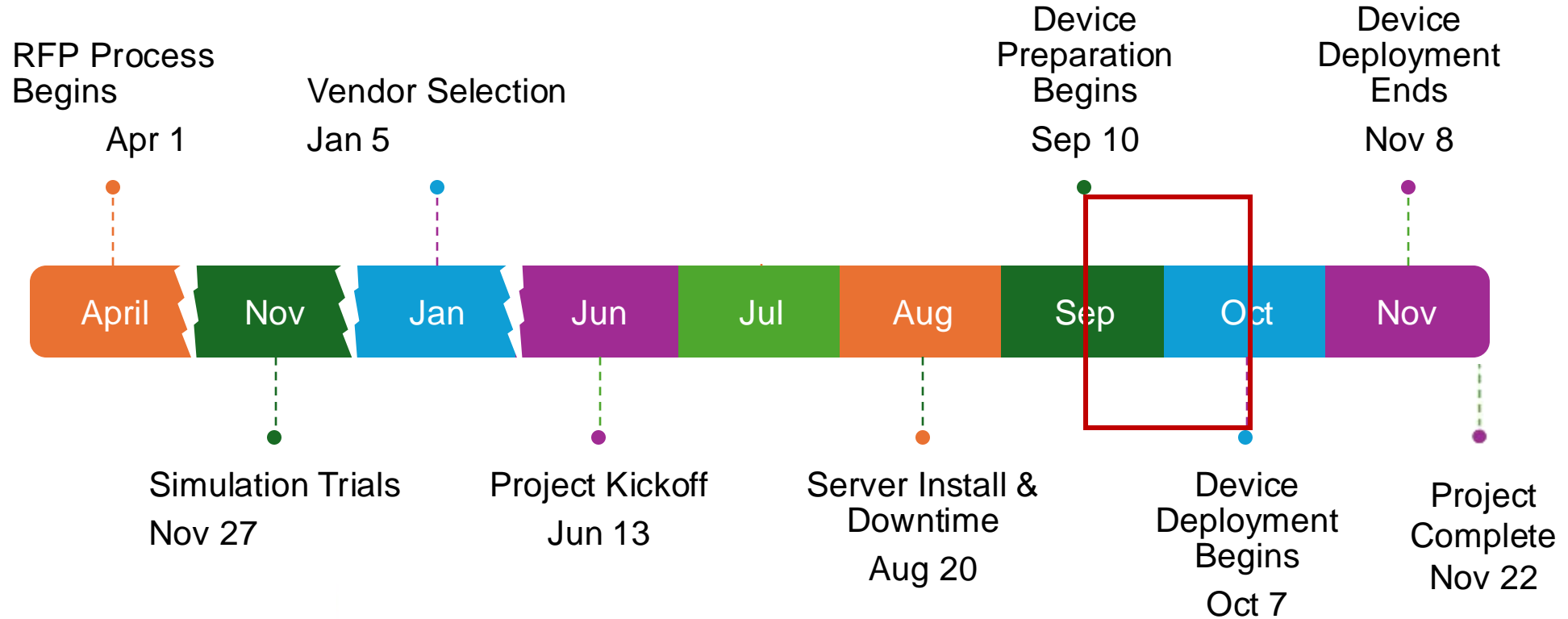
- Worked with Nursing leadership to determine the number of devices each area would need on hand based on daily discharges
 - Dependent also on space in clean utility rooms
- Essential in having the nursing staff trust the new cleaning process and prevent hoarding.



Pump Quantities



Device Preparation: Sep - Oct 2024



Equipment Logistics

- 55 Pallets of equipment shipped to the warehouse
 - No record of what was shipped out on each pallet
- Scheduled shipment from warehouse to Medical Center based on deployment quantities
- 1 to 2 deliveries per week



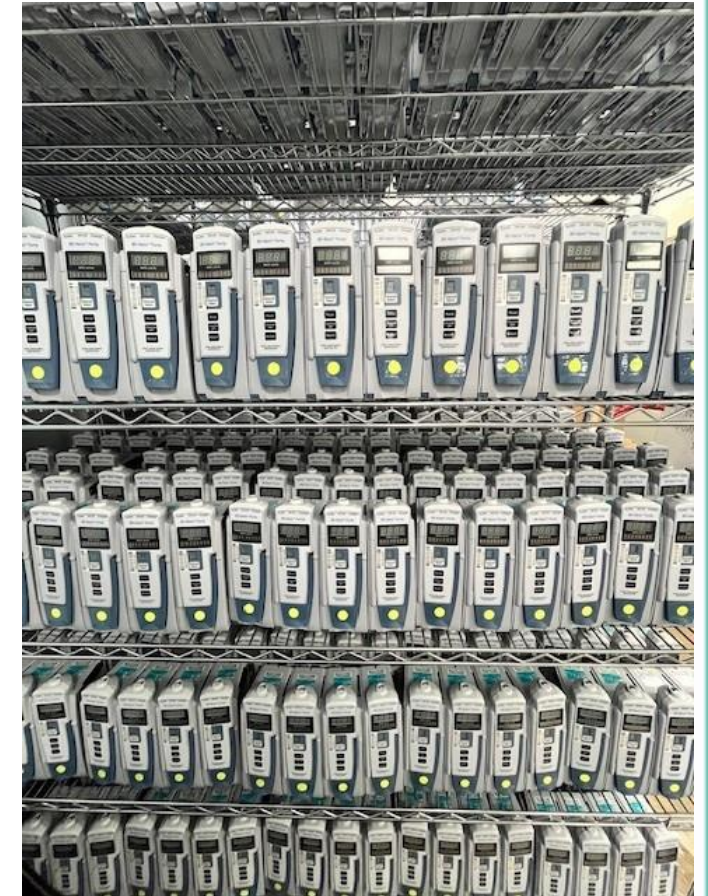
BD Check-In Process

- Created Roles and Responsibilities form for BD Team
 - Detailed check-in tasks
 - Placement of asset stickers, PM stickers, barcode stickers and yellow dot stickers
 - Disable PM Reminder Date on PCU



BD Check-In Process

- BD Team completed nearly 200 devices per day
 - Organized wire racks based on deployment locations



Training for Nursing Staff



Old PCA, Syringe pumps and EtCO₂ modules would not be compatible with new equipment

Compatibility

Alarm text change from "no breath" to "no CO₂"

Scrolling message change: Drive Head Error

Visual Changes

Cleaning

Epidemiology

- Reviewed and standardized cleaning protocols
- Developed area-specific guidelines and a cheat sheet for reference

Nursing Informatics

- Created Job aids to support nursing staff

Central Issues

- Developed training videos to help standardize cleaning procedures
- Hired additional personnel to support increased workload

Clinical Engineering

- Served as the main point of contact between BD and hospital departments for cleaning procedure changes
- Distributed cleaning kits to areas responsible for their own equipment cleaning

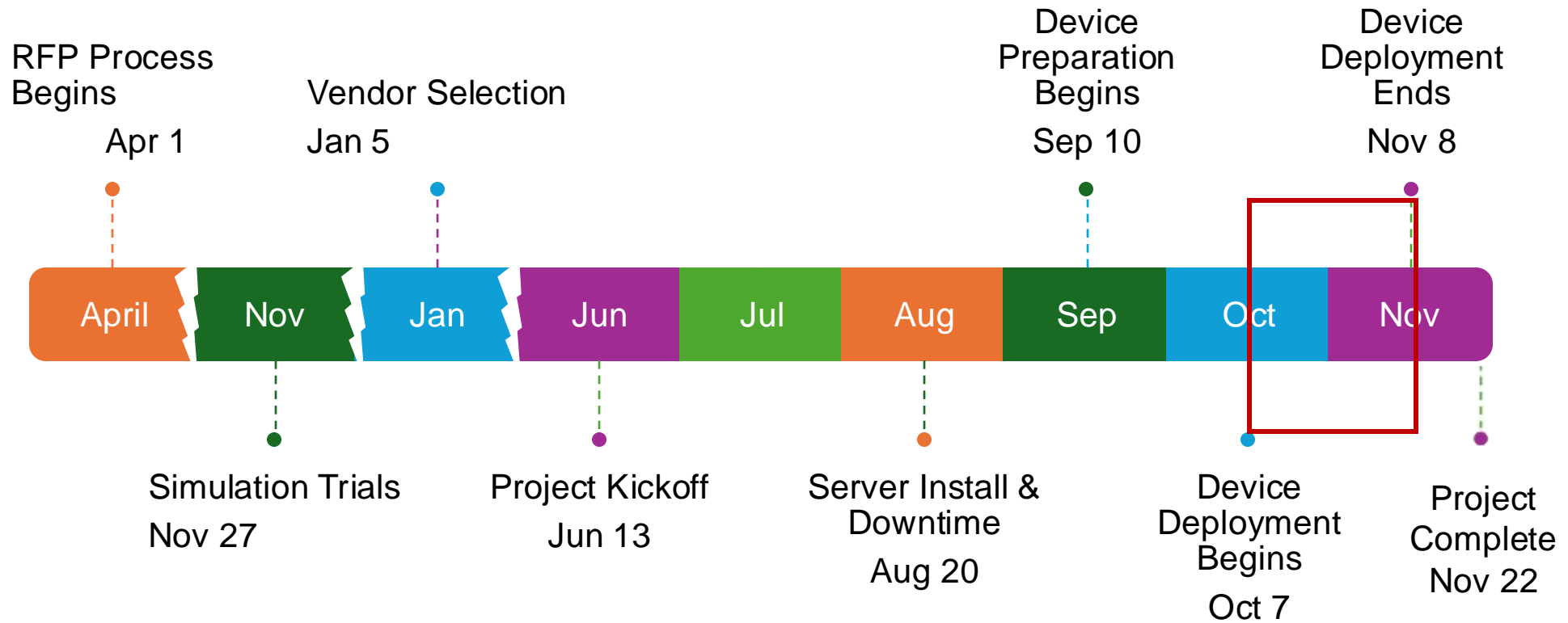
BD

- Collaborated with hospital leadership to address modifications to the cleaning requirements (DI water, IUI covers, approved cleaning agents)

Cleaning Guidance

Location	Personnel	Cleaning Frequency	Disinfecting Frequency
Inpatient Units	Central Issues	After each patient use	After each patient use
Procedural Areas	Environmental Services	After each patient use	Annually with preventative maintenance (PM) or as needed
Off-Site Locations	Clinical Staff	After each patient use	Annually with preventative maintenance (PM) or as needed

Deployment: Oct – Nov 2024

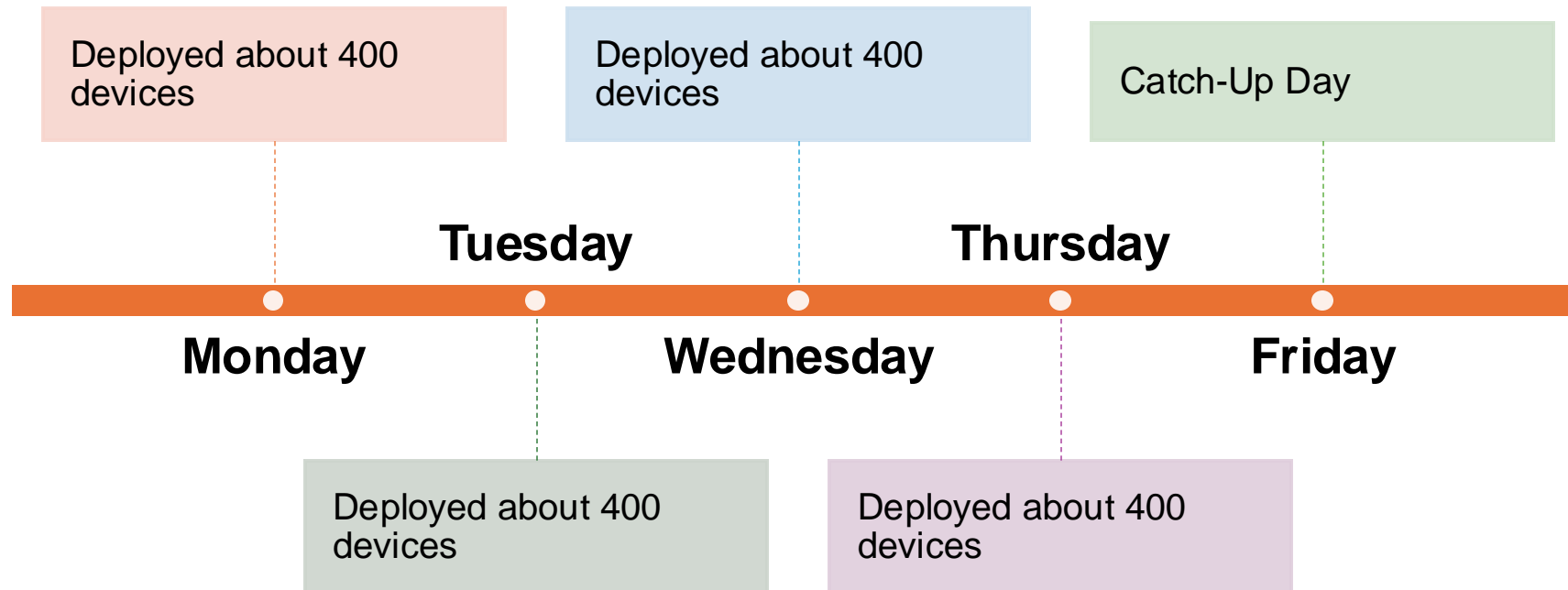


Schedule

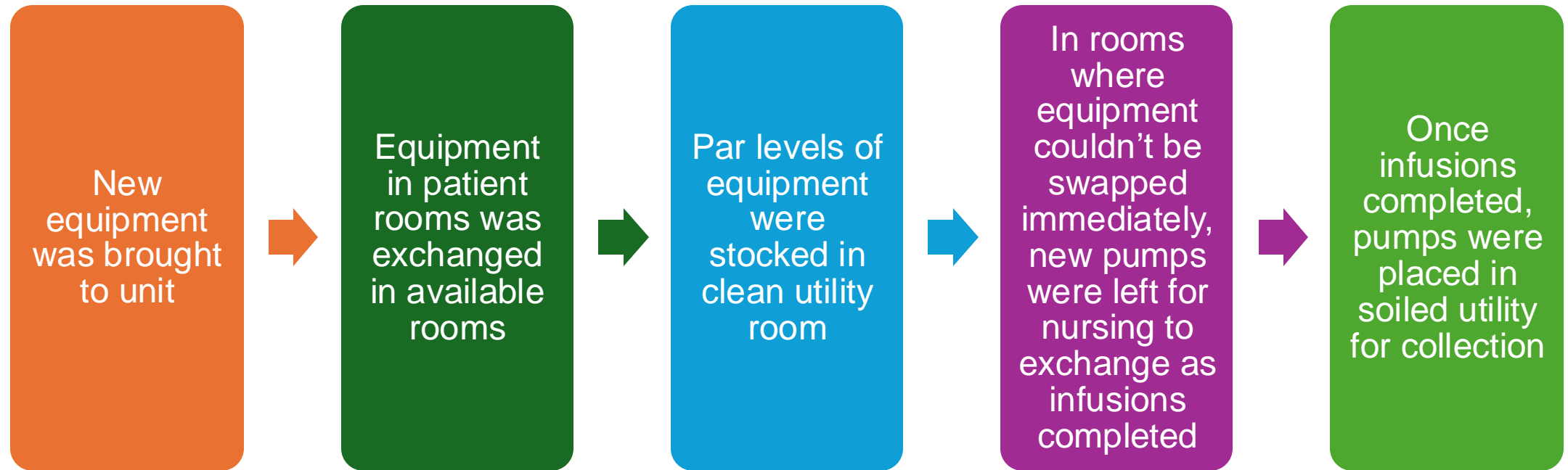
- Originally scheduled for 2 months but condensed to 1 month based on feedback

Date	Area
7-Oct	Cancer Center and CI
8-Oct	8N and 8S
9-Oct	7N and 7S
10-Oct	4N and 4S
14-Oct	3N and LDR
15-Oct	Peds, PICU, NICU
16-Oct	3S and 3ACU and 3SPT
17-Oct	5N and 5S
21-Oct	6N and 6S
22-Oct	3SCCT and 5 SCCT
23-Oct	CICU and 6SCCT
24-Oct	7SCCT and 8 SCCT
28-Oct	ED, Taper, Nurse Education, LL Infusion
29-Oct	Sim Center, 4 AHSP OR, 4 AHSP PACU, 5 AHSP OR, 5 AHSP PACU
30-Oct	5 OR, 5 PACU, NIC, GI, 6 OR, 6 PACU, Cath Lab
31-Oct	7 OR, 7 PACU, Stone Center, GI, 8 OR, 8 PACU, IR
4-Nov	Transplant Center, Davis, SSB, MOT, MGB Pain Center
5-Nov	THO
6-Nov	VOMG
7-Nov	TACRI
8-Nov	10 Congress Pasadena (Cancer)

Weekly Exchange Schedule



Equipment Exchange Process





Daily Communication to Nursing

- Sent to nursing leaders 2 business days in advance
 - Included job aids that detail changes in the infusion pumps and protocol for cleaning

BD Alaris Pump Replacement

Date: Tuesday 10/8

Time: 6 am

Unit: 8 North and 8 South

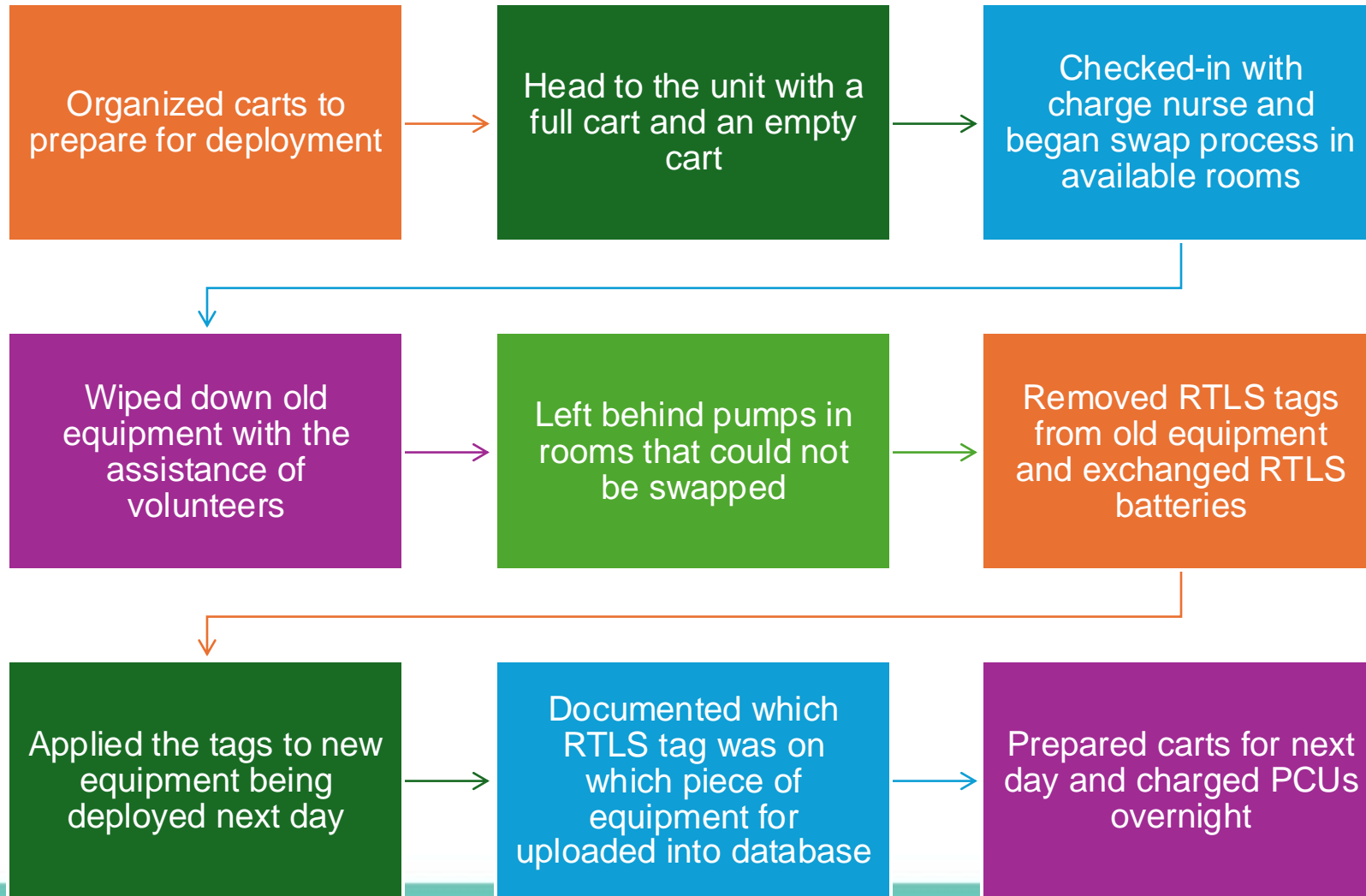
Process Overview:

- Upon arrival, the Clinical Engineering team will check in with the charge nurse regarding patient rooms that should not be entered. Assistance from nursing staff will be required for these rooms.
- **If it is safe, please wait until Clinical Engineering is on the floor before starting any new infusions.**
- While Clinical Engineering is on the unit, notify them when an ongoing infusion ends, so the devices can be swapped.
- If Clinical Engineering is no longer on the unit, place old pumps in the soiled utility room and contact Central Issues specifying that pumps with a yellow dot are needed.

Key Notes:

- **New Pump Availability:** A PAR level of new pumps will be available in the clean utility room.
- **Central Issues:** When requesting additional pumps from Central Issues through the end of the project (11/15), please specify that pumps with a yellow dot are needed.

Daily Process for Clinical Engineering



RTL5





Volunteer Support


Planning

- Coordinated with volunteer program coordinator on shift times

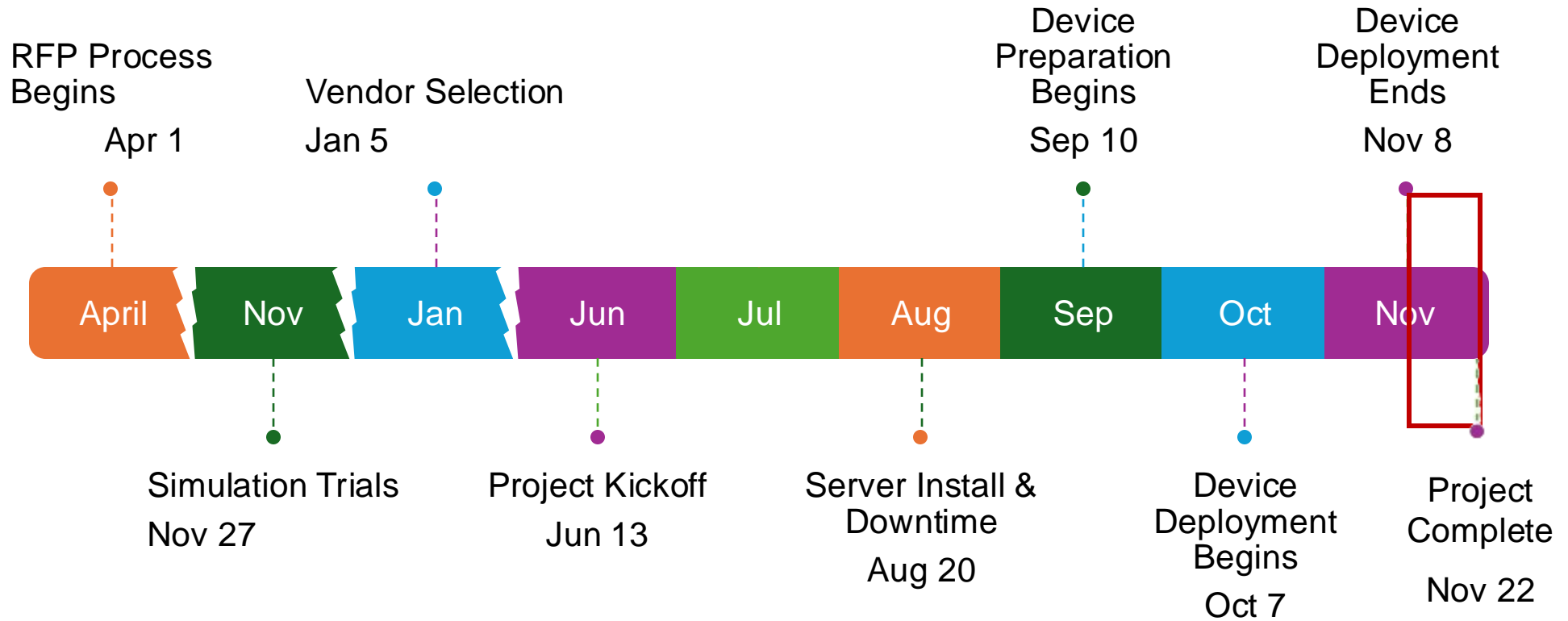
Deployment

- Wiped down equipment as it was removed from patent rooms

RTLS

- Assisted in removing tags from old devices
 - Assisted in placing brackets and tags on new devices
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Post Deployment: Nov 2024







Equipment Transfer to Warehouse

- Due to space constraints, old equipment was shipped back to the warehouse for return
 - BD team picked it up from the warehouse
- Shipped 24 pallets back to the warehouse



Locating Old Equipment

- Utilized RTLS system to find old equipment
- Notated old equipment with different symbol

	Name	Tag Model	Map	Area	In Area For	Last Location Update	Last Tag Communication
	Brain PCU 58617	ITD-761E (Rev E)	Lower Level (Wi-Fi)	LL - IBD and GI motility	5 minutes	5 minutes	5 minutes
	Brain PCU 57893	ITD-761E (Rev E)	Street (Wi-Fi)	Taper Nuc Med	29 minutes	29 minutes	4 minutes
	Brain PCU 58779	ITD-761E (Rev E)	6 Pro (WiFi)	6 South Tower	3 days	57 minutes	6 minutes
	Brain PCU 58473	ITD-761E (Rev E)	6 Pavilion (WiFi)	6 Pav South	5 days	5 days	55 minutes

Par Levels Dashboard

- Updated Par Levels Dashboard based on new numbers
- Updated locations of infrastructure if needed




Par Levels Dashboard

All **2** In Range **0** Out of Range **2** Low **2** High **0**


Location: Area Group:

Location: **Cedars-Sinai Med Ctr**
Facility: **Main Building**
Map: **3 South West**
Area: **3 South 3935A Clean**
Type: **New CI Alaris Brain PCU**



Min/Max: **2 to 5**
Current: **0**

Location: **Cedars-Sinai Med Ctr**
Facility: **Main Building**
Map: **3 South West**
Area: **3 South 3935A Clean**
Type: **New CI Alaris Pump Modules**



Min/Max: **2 to 5**
Current: **0**



Lessons Learned

Associating
New Pumps
in EMR



Include
instructions in
job aid

Scheduling
exchange time



Plan around
shift change for
nursing staff

Space
Constraints



Plan to start
return process
sooner

Ensure proper
configuration (prod vs
training) is loaded



Communicate with BD
team which
configuration is needed
based on location





Engaging Stakeholders Early

Nursing Leaders

- Communicate changes to frontline staff
- Establish par levels early


Epidemiology

- Develop unit-specific cleaning plans
- Ensure compliance with IFU

Central Issues

- Ensure adequate staffing to support new cleaning procedures
- Adjust workflows based on increased quantities of pumps

Environmental Services

- Confirm availability of cleaning equipment and supplies
 - Train staff on updated cleaning protocols
- 

Cleaning Workflow

Date	Central Issues	2SCCT	3 N	3 S	3LDR	3SCCT	4 N	4 S	NICU	4SCCT	5 N	5 S	5SCCT	6 N	6 S	6SCCT	7 N	7 S	7SCCT	8 N	8 S	8SCCT	
1/12/2025	84		6	1	8			2	6	2	2		1		1	5	1	2				2	
1/13/2025	82		11	3	5		1	2	2	1	2	1	2		3	2	6	3	3	1	1		
1/14/2025	92		9		11		2	5	1	1		1	3	1	3	3	4	3	1	4	1		
1/15/2025	118		7	5	4		2	3	3		2		1	3	2	2	6	1	2	2	2		2
1/16/2025	116		8	4	22		4	4	1	1	1	2	2	1	6		2	3	1	5	4		
1/17/2025	112	1	10	4	15	1	3	5	6	7	1	1	1	4	2	2	1	1	1	5	5		
1/18/2025	122		14	1	42		4	3	4	2	2	2	2	5		5	5		3		1		5
1/19/2025	136		10	6	15		1	4	9	1	1			2	1		1	5	3	1			1
1/20/2025	119		4	6	11			2	2	1			1		1	7	1	3	2	2	4		2
1/21/2025	90		4	2	14	2	7	2	1				3		3	3	4	1	2		4		
1/22/2025	104		5	4	38		1	2	2		1		2	3	2	7	5	2	2	2	3		1
1/23/2025	104	1	10	3	23		1	2	3	20				2	1	6	2	5	1		3		2

Gaps in Training



Proper Handling of Equipment



Gaps in Training



Hoarding Equipment

From: "Only Murders in the Building"



Inefficient Use



Gaps in Training



RTLS Tags





Thank you

Any Questions?

