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- Currently Manager of Clinical Engineering at Cedars-Sinai in Los Angeles
- Current Secretary of ACCE (American College of Clinical Engineering)
- 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 (Italy) and a M.S. in Biomedical Engineering from the University of Connecticut
- Certified Clinical Engineer

Jaspinder Ratth

- Currently a Clinical Engineer II at Cedars-Sinai in Los Angeles

- Worked as a site lead and Clinical Engineer for Northwell Health (New York).

- Completed a joint BS/MS in Biomedical Engineering at Binghamton University, State University of New York.

Agenda

- **Session Summary**
- **Cedars-Sinai & Clinical Engineering Team**
- **Our RTLS journey, including Lessons Learned**
- **Results**
- **ROI Considerations**
- **Looking Ahead**

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Session Summary

After a successful pilot program, an RTLS solution encompassing **14,000 assets** has been recently implemented at Cedars-Sinai. With the leadership from clinical engineering, device integration and nursing, the project team formed a steering committee with a diverse group of stakeholders to ensure successful **planning, deployment and post-implementation**. The speakers will share challenges and setbacks experienced along the way, while providing **honest feedback** on the system's functionalities and possible ROI. The speakers will also point out **specific use cases** beyond asset tracking that can increase the utility of such a solution.

Cedars-Sinai Medical Center

Located in Los Angeles, CA
Licensed for 889 beds
Over 15,000 employees
Over 90,000 patients seen in the ED/year
Over 6,000 births/year
Over 500 solid organ transplants/year

Clinical Engineering:
30 team members strong
Over 30,000 assets managed
Reports to IT / Enterprise Information Services

Recognized eight years in a row on the "Best Hospitals" Honor Roll by *U.S. News & World Report*

Need for RTLS?

1. **Reduce time spent searching for equipment**

2. **Reduce staff frustration and improve morale**

3. **Improve workflows & productivity**

Infrastructure

Due to pre-existing Nurse Call workflow automation and environmental monitoring systems, most of the Infrared, Low Frequency and Ultra High Frequency emitters / receivers were **already in place** in inpatient spaces.
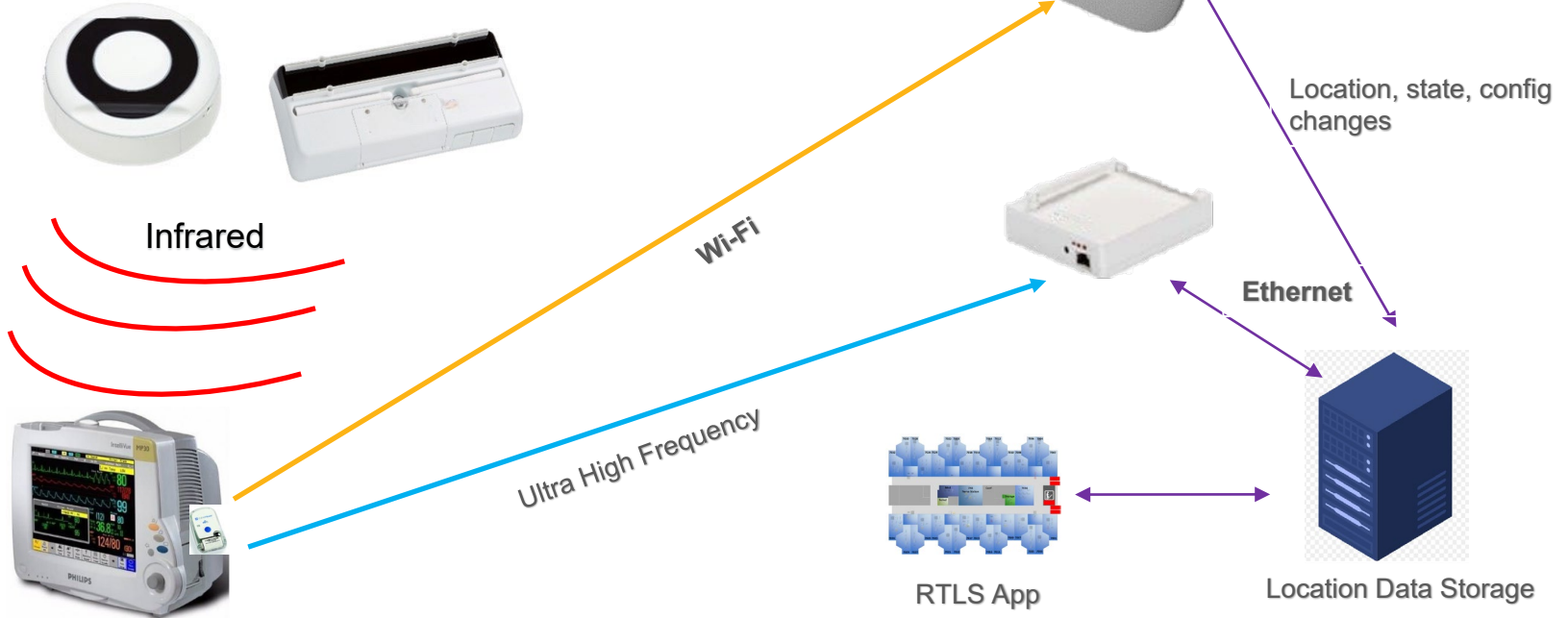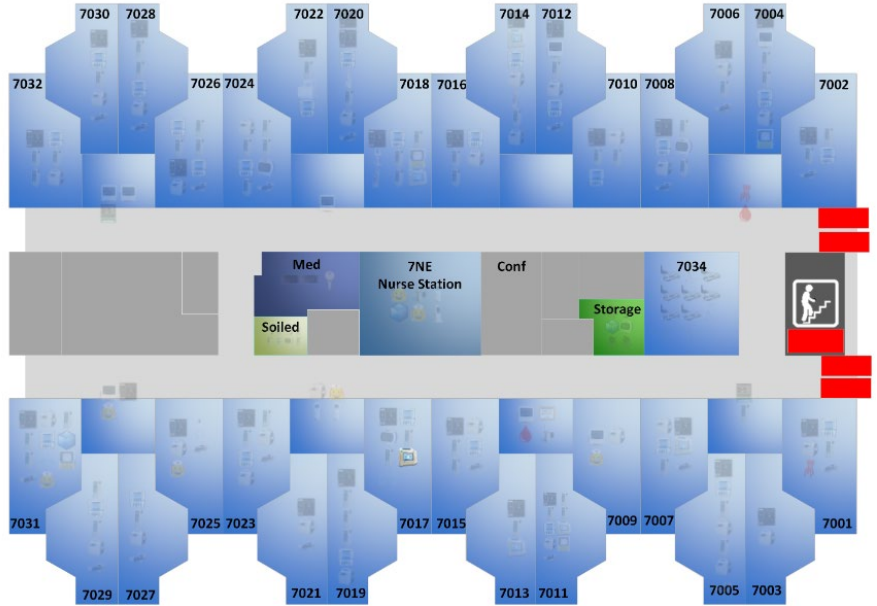
Infrared

LF (125kHz)

UHF (900MHz)

RTLS Maps
Room-Level Accuracy

- Maps drawn up by RTLS vendor using Visio

- Room–Level accuracy thanks to Infrared emitters in every room

RTLS Maps
Area-Level Accuracy

- Hospital floor plans provided to vendor

- Integrated with our Wi–Fi Network location services platform

- Less accurate
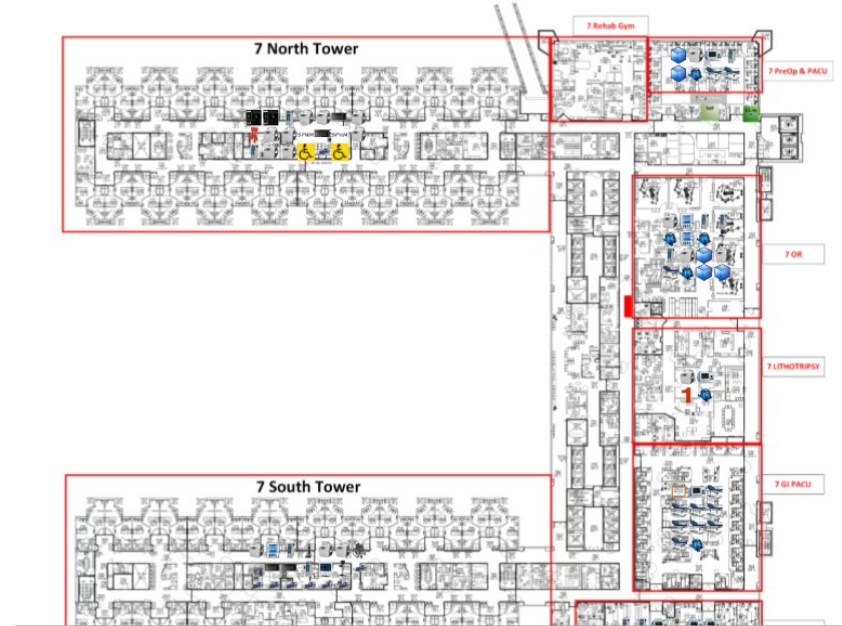
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Pilot – 2021

Survey,
Installation,
Configuration,
Certification

Asset Tagging,
Map creation &
configuration

Training,
Application
Validation

| 3/15 | 3/22 | 3/29 | 4/12 | 4/19 | 4/26 |

Asset Tagging,

Map creation

Training

Go-Live

Pilot Equipment (~700 tags)

- Infusion Pumps
- SCDs
- Spot check Monitors
- PCA pump keys
- PCEA pump keys
- Scales
- Cardiac Chairs
- Wheelchairs
- Glucometers

- Bladder Scanners
- Dopplers
- Tele boxes
- Transport Monitors
- Vein Finders
- Interpreter svc iPads

Lessons Learned from Pilot

- Hardware and firmware compatibility/updates

- Detached tags, correct placement of tags (not covering asset or PM stickers)

- LF Exciters to be installed in locations to minimize false positives

- Tags with out-of-the-box failure or low battery level (quality checks!)

- Need for spare parts (cradles, adhesives)

From Pilot to Full Rollout

- Need for governing multidisciplinary committee

- Ensure appropriate resources for solid battery management and application and back-end support

- Develop appropriate training and ensure inclusion in on-boarding for new employees

- Involve all hospital stakeholders, as non-conventional use cases may arise

- Establish clear criteria for inclusion in the Program

- Provide clear directions on how to ask for support, depending on issue

Recommendations from consultants

- Host a Staff Awareness Campaign for the RTLS Program (signs, screensavers)
- Create standardized asset naming schema
- Establish formal tagging request intake process
- Appoint Division Champions and Nursing Unit Representatives
- Set Rules to notify of assets leaving the floor and for abandoned assets
- Set up automated alerts for equipment types susceptible of theft or unintentional loss
- PAR Level monitoring in clean utility rooms
- Tag stretchers and beds
- Integration with CMMS

RTLS Workflow Committee

For a successful program governance and system implementation, we formed a Workflow Committee:

1. Representatives from each area are **engaged participants** in recurring meetings
2. The Committee is empowered to make decisions and **enact changes**
3. The Committee is **accountable** for staff adherence to the workflows
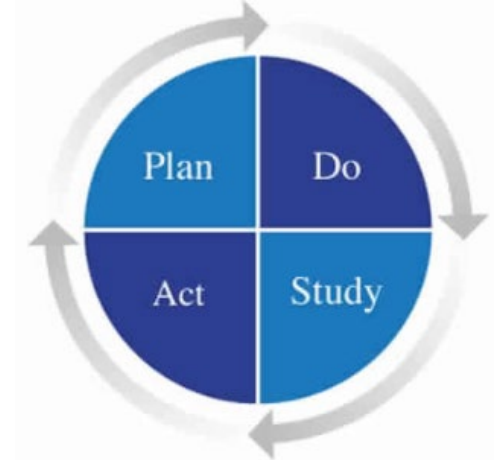
Workflow Committee Charter

TEAM

Executive Sponsors
Executive Nursing Director
Chief Technology Officer

Committee Leads
Clinical Engineering Manager
Nursing Manager

Key Team Members
Nursing
Clinical Engineering
Device Integration
Materials Management
Transportation
EVS
Imaging
Periop Svc
Respiratory Therapy
Pharmacy
Lab

PROBLEM STATEMENT

Proper governance is necessary for a Real Time Location System implementation to be successful.

SCOPE

Predominantly inpatient areas. ED, L&D, Hospitality, Imaging, Central Issues, Periop Svc also included.

GOALS

Reduce time spent searching for equipment
Improve workflows and productivity
Decrease over procurement and rental expenses

TIMELINE

Phase 1

Goal: Share the challenges related to finding equipment when needed or losing equipment.

Phase 2

Goal: Education, communication, issues resolution as the implementation progresses.

Phase 3

Goal: develop structure and process to evaluate and improve asset tracking. Review usage, success stories, challenges.

Budget for ongoing support resources

- **1-2 FTEs for on-site support**
  - Battery management
  - Tag management

- **1 FTE for system/application support**
  - Application, server ownership
  - Back-end support
  - Requests for expansions (new asset types or locations)
  - Alerts and reports creation/customization

Criteria for Tagging

- **Asset must be valued at least $500**

- **The asset should also satisfy at least one of the following criteria:**
    - Improving clinical workflow (asset shared on a floor)
    - Preventing accidental loss (small devices)
    - Facilitating maintenance workflow
    - Facilitating patient transport workflow
    - Increasing operational efficiency

- **Device should have a flat surface for tagging**

Naming Conventions

Asset Names

If the asset belongs to a floor/unit:

UU NAME N

UU is the Unit name, e.g.: 7N, ED, IMG, LAB, EVS, CTS, OR
NAME is an agreed upon name for the asset, e.g.: Vital Signs, Scale, Bladder Scanner
N is a sequential number, based on identifiers used by end users
EXAMPLE: 8S Glucometer 3

Asset Groups

UU NAME

UU is the Unit name, e.g.: 7N, ED, IMG, LAB, EVS, CTS, OR, CI
NAME is an agreed upon name for the group, e.g.: Vital Signs, Scales, Bladder Scanners
EXAMPLE: 8S Glucometers

Tagging Requests

- **User sends a request using the ServiceNow portal**

Nursing Division Leads and Unit Champions

Critical Care

Unit	Unit Champion
3 Sap	
4 Sap	
5 Sap	
6 Sap	
7 Sap	
8 Sap	
6 North	
Respiratory	

Nursing Medical

Unit	Unit Champion
3 South	
4 South	
5 South	
6 South	
7 South	
4 North	
5 North	

Nursing Surgical

Unit	Unit Champion
7 North	
8 North	
8 South	
ACU/ IV Team	
Dialysis	
SPHM	

Women and Children's

Unit	Unit Champion
Peds	
NICU	
PICU	
L&D	
3 North	

Loss Prevention

Alerts

ACTIVE

Nurse Call   5/26, 10:05 AM

TIME SENSITIVE! test notification was detected in 7S AGVS 7940 / Please retrieve ASAP test notification. Area Restriction occurred on 7 South West for (2657300) test notification at 5/26/2022 10:05:43 AM. Tag ID- 2657300 Serial Number (). From Rule AGVS Egress

ACCEPT

Phone notification to
Charge nurse
Unit Secretary

Requires immediate attention

RTLS Phased Rollout

- **Phase 1** (Devices tagged: ~11,000)
  - Part 1 – January 2022 (delayed by 2 months)
  - Part 2 – March 2022

- **Phase 2** (Devices tagged: ~2,400)
  - September-October 2022

- **Phase 3** (ongoing)
  - May 2023 – Present

Phase 1

- **Room-level accuracy for Med-Surg and ICU floors**

- **Area-level accuracy for other Main Building spaces (support services, imaging, ED, ORs, Cath Labs, GI and other procedure spaces)**

- **Chokepoints along linen and trash paths**

- **Tag ~11,000 assets**

Phase 1 Tagging

Pilot Categories

Vital Signs Monitors
Wheelchairs
Glucometers
PCA and PCEA keys
Ultrasonic Dopplers
Bladder Scanners
Scales
Infusion Pumps
SCDs
Interpreter Svc iPads
Vein Finders

Categories requested via survey

Ortho & Cardiac Chairs
Defibrillators
Transport monitors
Tele Boxes
External Pacemakers
POC US

Other Requests

Feeding Pumps
Syringe Pumps
PC(E)A Pumps
etCO2 modules
Hypothermia units
Blood Analyzers
ED equipment
Imaging equipment
Phlebotomy carts
CTS wheelchairs
EVS equipment
RX exchange carts
Periop equipment
NICU equipment
L&D equipment
RT equipment
PICU-Peds equipment
Urometers

Phase 2

September-October '22

- **Continuation of Phase 1 Equipment**
- **Gurneys (~400)**
- **Multiparameter modules (~600)**
- **Pumps/Patient Warmers (CI equipment) (~650)**

- **Total Tagged : 2400 devices**

Phase 3
May '23 – Present

- **Bed Tagging**
  - 1100 Beds (Currently ~800 tagged)
  - Departmental Handoff at 95% completion

- **Par Level Coverage**
  - Expansion in PACUs and NICU clean/soiled utility rooms

- **Focus on Surgical Equipment**
  - Need based tagging in OR, Cath Lab, and GI spaces (~400 assets)

Ongoing Support
Jas's Weekly Tasks

- Providing Team with Low Battery Reports

- Reviewing RTLS inventory for
    - Improper Name Tagging
    - Missing Data (CE #s, asset groups)
    - Defective tags (active tags that are not communicating)
    - Creating icons and new groups for easier navigation

- Reviewing tagging requests submitted by end users

Ongoing Support
Low Battery Report

- **Generated twice a week**

Tag	Item	Asset ID	Map	Last Known Location	

Results

- **End User Feedback**
- **Reducing Time spent searching for equipment**
- **Loss Prevention**
- **Workflow Improvement**
- **Inventory Optimization**

End User Feedback

From Clinical Engineering and Bed Shop

*It was very helpful in correcting the location and ownership of our Philips module **loaners**.*

*We have used the system, along with clinicians, to locate **missing tele boxes** several times.*

*We have used it to find some equipment **overdue for Preventive Maintenance**. It helps us stay compliant with the TJC standards.*

*Some clinical areas do **daily checks** of their tagged equipment and are happy with the system.*

From Central Transportation Services

*We **save about 1-2 hours a week**. Previously my team would make rounds looking for equipment and bring it down to our storage area. We are still doing rounds, but my team will use RTLS to pinpoint equipment and hit those areas first. The other benefit is we've used the history/report section to track equipment's movement when we've found it in an **unapproved area**. Occasionally we can use this info to identify the individual who left it there*

End User Feedback

From Imaging

*We are very happy to be able to see where our **transport monitors/gurneys** are within the hospital. It is very easy to use and view locations and the duration of placement. It has been a tremendous help finding/locating our monitors the next day when either were used by others and **not returned to our dept.** It has saved us time and effort trying to look for our monitors.*

End User Feedback

From Surgical Floor
- It has helped with time management
- "*It saves time from walking around in the unit looking for equipment*"
- "*We've used RTLS a couple of times to locate **PD machines** that we couldn't find, it's been very useful on those instances*"
- "*It increases productivity, **cuts down on a lot of walking around**".*
- Surprised at how **easy it is to use**

From Critical Care
- "*The system is great. It has helped improve workflow and productivity*"
- "*I have used it often as Charge RN to help others and myself **find IV channels and brains** because it usually takes a while for these to arrive from central supply*"
- "*When you don't have an IV channel and brain, it can delay treatment. Previously we were texting everyone to check their rooms, but realistically, not everyone was doing so and sometimes the item is hiding in the closets and we do not want to wake patients at night to go searching in their rooms. It is also helpful for locating items like the **bladder scanner and vein finder** which can be difficult to find. It's also been used to locate the **defibrillator***"

More Feedback

- *"We have used it intermittently. Most recently we found out that 3 of our **monitors were missing** and were able to find out where they were via RTLS." – GI Lab Associate Director*

- *"Minimizes the time being used to find equipment and **less delay in care**." – 7SE Nurse*

- *"The workflow changed tremendously. **No more scrambling/worrying**, we know exactly where to look!" – 4 CICU Nursing Tech*

- *"I'm not running around looking for devices such as **glucometers, bladder scanners, or the vein finder.** It helps with improved utilization of time." – 6NW Nurse*

- *Perceived time savings: 20 minutes per day*

Time Savings

Today we have ~70 daily accesses on average.

If we assume that every access saves 20 minutes*, we get ~**8,500 hours saved annually**.

Increasing the usage will determine a higher number of hours becoming available for value-added activities.

*"Nurses Waste 'an Hour a Shift' Finding Equipment." Nursing Times. February 2009

Loss Prevention

In a 12-month period, we reduced wound vac rental unit losses by 80%, with estimated savings greater than $65,000.

Thanks to the chokepoints installed by the linen collection areas, we intend to prevent the involuntary loss of small devices (e.g., tele boxes).

Our UTLs decreased by 18%.

Improved Workflows

- PAR Level Monitoring

- Adverse Events

- Remediations, Recalls

Improved Workflows

Pharmacy Exchange Carts

- Carts tagged and monitored for time in pharmacy area versus on the floors delivering medications.
- Analysis performed to determine the average time the carts were spending in each targeted areas and transitioning areas.

*"The analysis of the **Pharmacy** exchange carts' movements provided valuable insights that helped us take a closer look at workflows and think about how we could improve them going forward. What we have recognized is that there are some significant gaps in our distribution model, so we have stepped back and put forth strategic meetings and retreats that are on-going for significant remodel of our process."*

Improved Workflows
Phlebotomy Carts

- Carts tagged and monitored for time in areas across the hospital.
- Analysis performed to determine the average daily time spent in each area:
  - Average total daily time
  - Average daily time per cart

The Phlebotomy team can now more efficiently address stat requests having real time visibility into staff members' locations. Moreover, the analysis of the carts' movement history highlighted quantitative differences in the time spent in each room, due to different patient populations. This data will be used to optimize the way they dispatch staff (currently based only on the number of orders).

Inventory Optimization

Infusion Pumps

- RTLS can be used to improve asset utilization and reduce the need for extra equipment.
- Historically, our infusion pumps had a 30–35% utilization rate.
- As we remove from service extra equipment, the utilization rate will increase and the operational expenses to maintain the equipment will decrease.

ROI Considerations
One-Time and Recurring Expenses VS Value

- One-Time Expenses: Tags, software and hardware infrastructure, licenses, implementation, project management
- Recurring Expenses: service agreement, batteries, parts, labor

- Value: **inventory optimization and avoided costs during device replacement**, loss prevention, search time savings, workflow improvement (incl. PAR level management), **PM labor and parts savings related to inventory optimization,** improving morale and reducing frustration.

Looking ahead
Some ideas already in the works

- Add rules for automated notifications for "abandoned assets" or assets that leave a certain floor
- Add exciters at certain egress points
- Use Tableau, connecting directly to the database, to create dashboards grouping and presenting data in different ways
- Bi-directional integration with CMMS

Distribution of Devices	Device Type 1	Device Type 2
Inpatient	74%	79%
Outpatient	17%	15%
Clin Eng	1%	1%
CI Soiled	3%	3%
CI Clean	5%	2%

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We value your feedback!

Please scan the QR code to submit a survey for this session.

Thank You!