

Streamlining Patient Flow by Leveraging Real-Time Location Data via Direct Integration with Epic EHR

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What is a Real Time Location System?

RTLS is a technological solution for tracking in *real time* the *location and status* of assets and people within a healthcare facility.

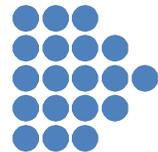


How Real Time Location Systems Work?

RTLS collects location information **automatically** (no manual data entry) and **continuously** (always on)



Tags (badges) are attached to items (assets, supplies, instruments) and worn by people (patients, nurses, technicians, transporters)



Readers (locators) collect location data and transmit them through middleware to software applications



Software applications visualize data (map views, dashboards) and provide actionable information (notifications, reports)

It Takes a Village

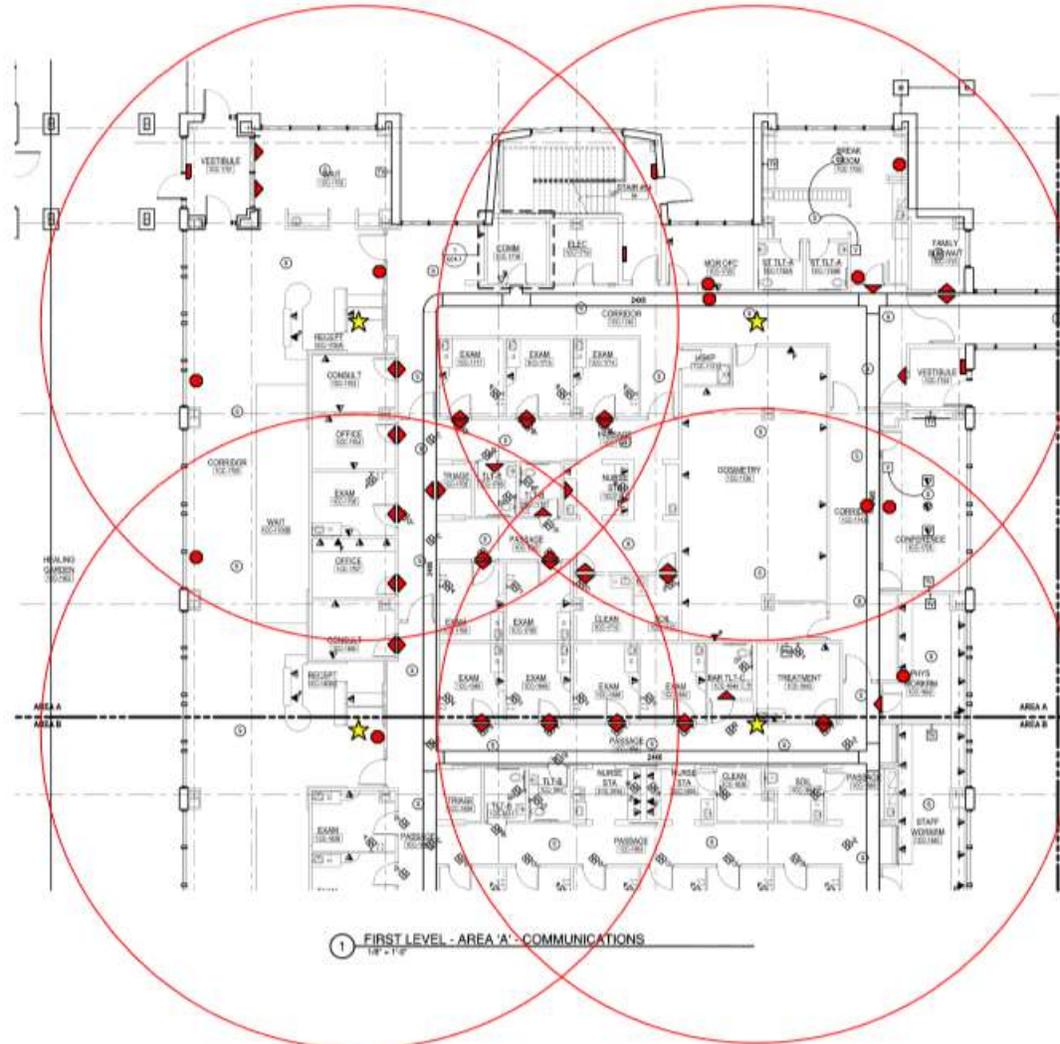
Internal Partners

- IS/IT
- Operations
- Finance
- Clinical staff & providers

External Partners

- Centrak – hardware provider
- Infinite Leap – OR work, Cancer Center installers and system first line support
- Cetani – software developer; asset management, workflow, alert notification, reporting

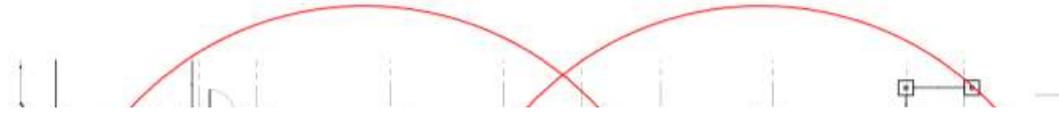
RTLS System Design



Design Considerations

1. Patient & Staff Workflow
 - Waiting Rooms
 - Exam Rooms
 - Nurse Stations
 - Med Rooms
 - Entry/Exit
2. Asset Management
 - Soiled Rooms
 - Clean Rooms
 - Corridors
 - Alcoves
3. Staff Duress
 - Hallways
 - Patient Rooms
 - Public Areas

RTLS System Design



STOP!



It Is NOT just Technology

- Technology – you need to deploy technologies to support operational excellence
- Process – you need to apply operational data to drive continuous process improvements
- People – you need to nurture a culture of change

RTLS Solution Design Process



EHR + RTLS = EHR²

EHR	EHR+RTLS
Status updates are entered ad hoc, typically between appointments (fragmented, non-factual data)	Status updates are entered continuously (full and actual view of patients' status and interactions)
System relies on manual data entry (error-prone)	System is updated without a human intervention (accurate data)
System does not provide contextual information (with whom patient was interacting, for how long, where, what type of medical equipment was used during patient care)	System delivers context and resource awareness (through tracking staff-patient interactions)
System takes away time from a direct interaction with the patient (low patient satisfaction scores)	System gives back time to providers and allows providers to be present "in-the-moment" with a patient (increased patient satisfaction)
System focuses on clinical outcomes as a top priority. Patient satisfaction is not taken into an account	System enables real-time notifications and alerting for improved patient safety and patient experience
System provides a limited data set for process improvement	System offers rich historical data for process improvement

- Wayfinding/Routing

1. Wayfinding / Routing

- Wayfinding/Routing
- Asset Locating and Par Level Management

2. Asset Locating and Par Level Management

- Wayfinding/Routing
- Asset Locating and Par Level Management
- Asset Loss

3. Asset Loss

- Wayfinding/Routing
- Asset Locating and Par Level Management
- Asset Loss
- Patient Wait Time Management

4. Patient Wait Time Management



5. Patient Flow Phases of Care

7 VMC Identified RTLS Use Cases

- Wayfinding/Routing
- Asset Locating and Par Level Management
- Asset Loss
- Patient Wait Time Management
- Patient Flow Phases of Care



7 VMC Identified RTLS Use Cases

- Wayfinding/Routing
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- Patient Flow Phases of Care
- Staff Safety/Duress

6. Staff Safety/Duress

7 VMC Identified RTLS Use Cases

- Wayfinding/Routing
- Asset Locating and Par Level Management
- Asset Loss
- Patient Wait Time Management
- Patient Flow Phases of Care
- Staff Safety/Duress
- Time Studies for Process Improvement

7. Time Studies for Process Improvement

Evolution of RTLS at Vidant Medical Center

- First used as a passive “finding” system
 - Pull up location via map or list view of facility when you need something and can’t find it
 - Use cases 2 & 3
- Next, heads up display of location
 - Epic OpTime leverage system to show where patient is physically located (assumes location defines the workflow)
 - Still cases 2 & 3, but on people now

Evolution of RTLS at Vidant Medical Center (cont.)

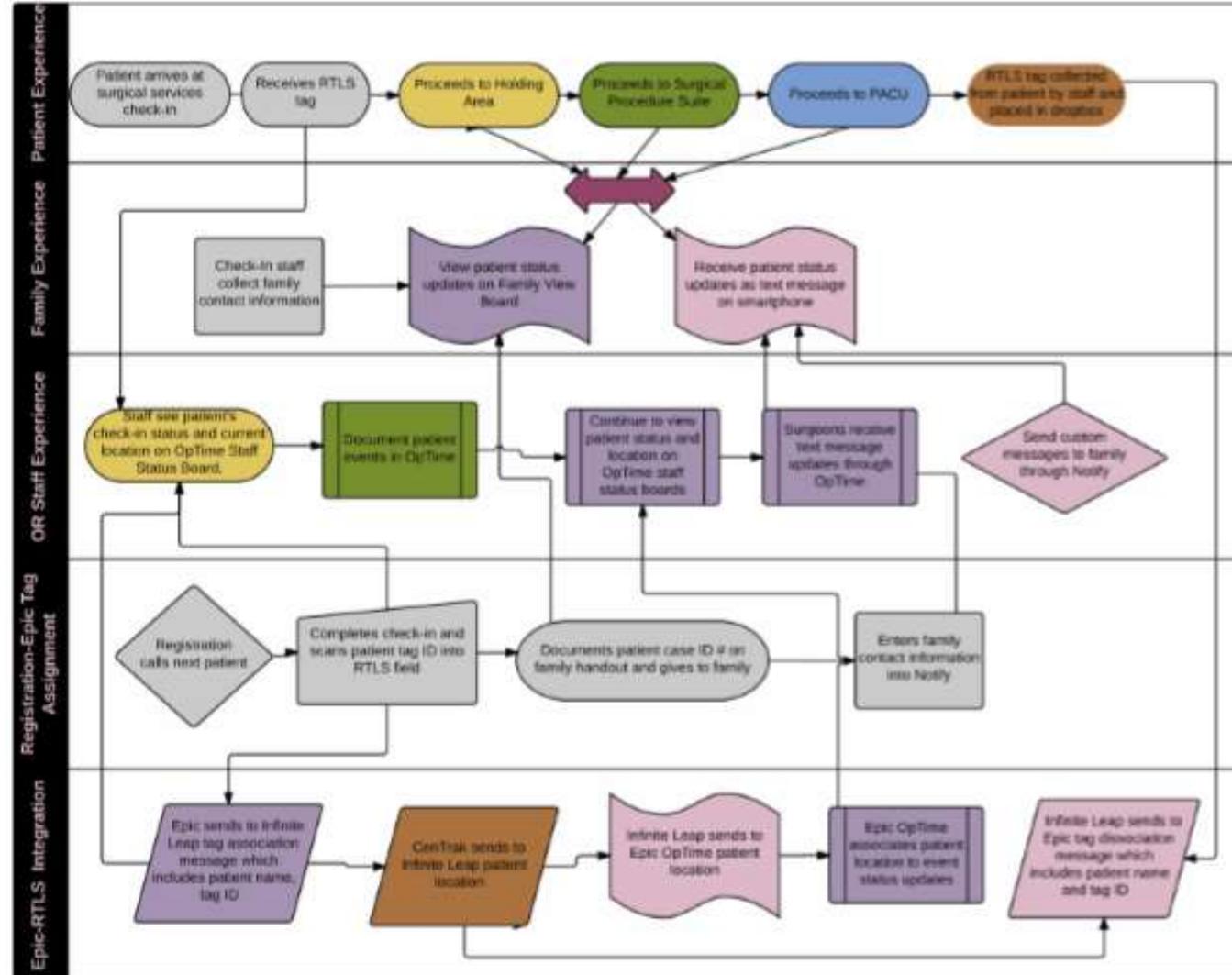
- Finally, active patient management system
 - Heads up display gives staff visibility into real and current process times for patients
 - System can notify when care times not being met
 - Notifies valet when the patient visit is over and vehicle is needed
 - Allows daily, weekly, monthly reporting of process times by clinic type, provider, etc.
 - Use cases 1, 4, 5 and 7 above

RTLS in the ORs

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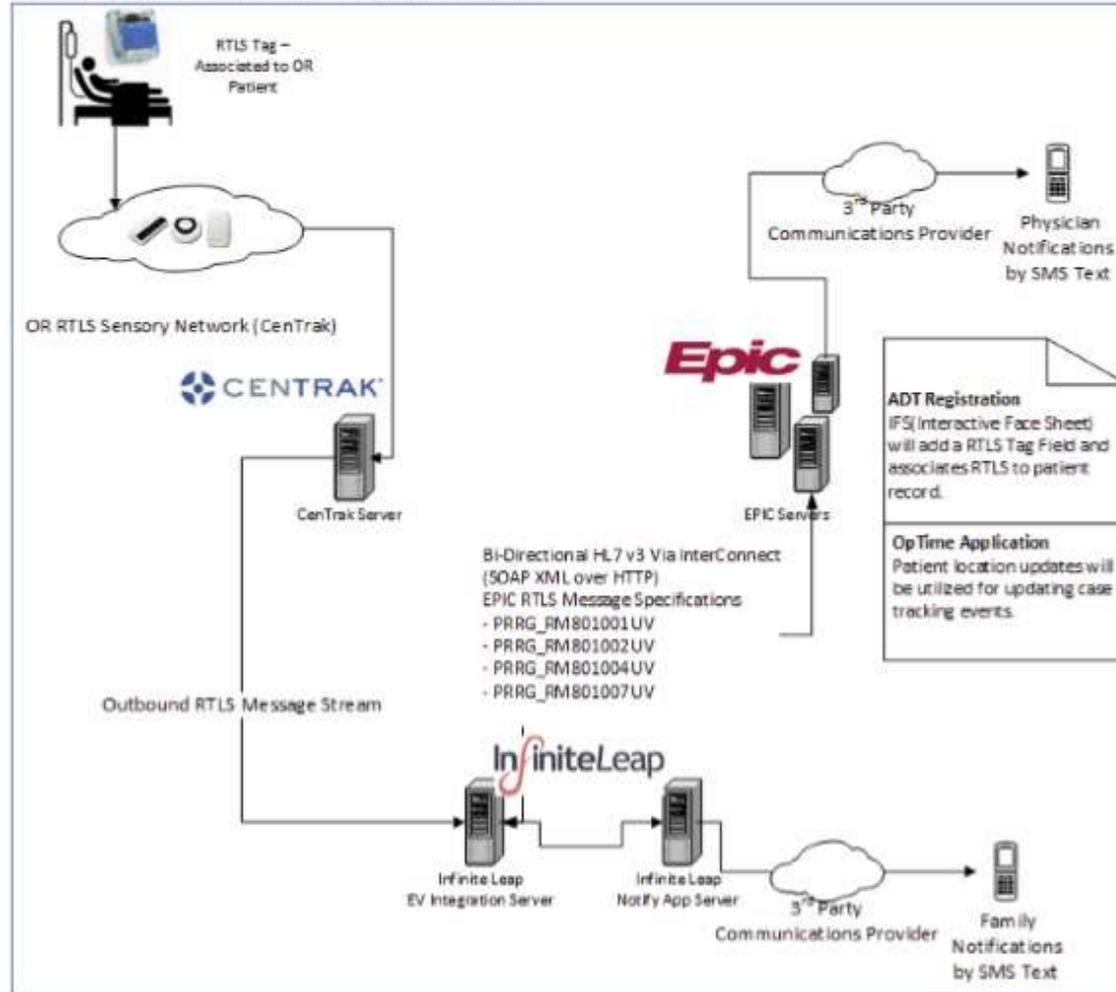
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RTLS-Enabled Patient Flow



System Architecture - EHR Integration

System Architecture – Future State



Transition to Epic OpTime

The primary project objective was to smoothly transition OR documentation and patient status updates directly into Epic OpTime, while ensuring data accuracy and simplicity for staff.

To support this goal, HL7 standards for Patient Administration, also known as ADT - Admit, Discharge, and Transfer, were utilized.

There are three HL7v3 message types being leveraged, as they relate to an RTLS tag interface during a patient encounter:

- Associate Patient Tag
- Broadcast Patient Location Changes
- Disassociate Patient Tag

These messages allow for automatically documenting case tracking events within Epic EHR

The New Process in Practice

- When the patient registers, the staff uses a scanner to read the barcode on the side of the patient badge, which associates the RTLS ID, and thereby the patient themselves to the Patient Record in Epic HER (this new process eliminated errors and increased efficiency for staff, who previously relied on manual keyboard entry)
- As a patient moves through the surgical workflow, the RTLS system broadcasts location updates and publishes patient location changes on Staff Status Board within Epic OpTime. Staff appreciate this ease of visibility into the overall flow as well as at the individual patient level. These patient status updates are also delivered in HIPAA compliant and family-friendly ways via a Family View Board.
- After the patient has received care and is ready to depart, the badge is placed into a location-enabled drop box, which sends the message that the badge is no longer with the patient. This outbound “Disassociate Patient Tag” message, updates the last location to a status of “Completed,” closing patient encounter. Placing badges in a drop box also allows for faster redistribution, reducing the number of patient badges that need to be purchased to support patient volume.

RTLS in the Cancer Center

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Vidant Cancer Care at Greenville



Vidant Cancer Care at Greenville

- New 430,000 sq. ft. cancer center opened March 26th that co-located:
 - 4 oncology clinics encompassing 60 outpatient exam and treatment rooms
 - 1 infusion center that has 48 infusion chairs and 12 private infusion rooms
 - 1 radiation oncology joint venture that includes a Cyberknife, 2 Trubeam linear accelerators, 1 Varian Edge and a Gamma knife
 - 2 inpatient floors that house 96 oncology beds
 - 2nd floor – Surgical Oncology
 - 4th floor – Medical Oncology
 - Retail pharmacy

Vidant Cancer Care at Greenville

- Cancer Clinics are multi-functional areas and swing from one clinic type to another depending on day of week
- Encompass Surgical Oncology, Medical Oncology, Sickle Cell, Gynecologic Oncology clinics with multiple disease types seen in each clinic
 - Maximizes utilization of space but creates enormous complexity for RTLS because location usually drives function

Logistics in the New Cancer Center

- Increased space and co-location of oncology services creates many positive benefits and some negative ones:
 - Positive:
 - One stop shop for patients
 - Less travel between modalities in a given day
 - Enhanced partnership between providers
 - Negative:
 - Greater likelihood for waiting if flow isn't carefully managed
 - Poorer communication within departments due to expanded geography

Pivot in RTLS (cont.)

- Most recent evolution is to drive workflow automatically
 - Through Cadence (scheduling) interface know why the patient is here
 - Through ADT interface and RTLS know who is here today and where they are
 - Through interaction of ADT, Cadence and RTLS information we can know where the patient is, where they need to be for efficient care times, how long they spent in each step and how much time was delivered by each type of care giver
 - Process times are a mix of time spent in a location (when location determine care step) and interaction times when the location is used by multiple care givers (clinics)
 - Drive patient experience through:
 - Automatic notification of increased wait times and time between caregivers
 - Notification to Valet of patient's impending need for vehicle by using tag removal to send valet ticket #

Process Times based upon Location - Infusion



Patient Workflows Current Patients **Live** Edit

VMC-INFUSION SERVICES

VMC-INFUSION SERVICES Workflow

Map (All Maps) Current Step (Any) Future Appointments Active Patients Off On

Time Display Duration + Add Patient

11 Patients

Tag #	Current Area	Time at Current Area	Provider	Waiting	Fast Track	Infusion	Start Time	Total LOS
2030720	CCI Green Flow step 2b - Infusion in 16D	⌚ 5m 16s	DARLA K LILES	32s	6m 16s	⌚ 1h 02m 23s	12:00 PM	⌚ 17m 41s
2034138	CCI Corridor near Provider Workroom 1267	⌚ 54s	Ogugua N Obi	9m 08s	5m 59s	⌚ 2h 53m 02s	9:00 AM	⌚ 3h 17m 41s
			Maria Ramirez Picton			25s	11:00 AM	⌚ 1h 17m 41s
2032538	CCI Green Flow step 2b - Infusion in 14A	⌚ 44m 31s	MUSHARRAF NAVAID	16m 35s	5m 15s	⌚ 44m 57s	11:00 AM	⌚ 1h 17m 41s
			Abdul Naqash	5m 09s	20m 18s	4h 37m 00s	10:00 AM	⌚ 2h 17m 41s
2033855	CCA Exam 48	⌚ 40m 15s					11:30 AM	⌚ 47m 04s
2034193	ARU E-H	⌚ 5m 38s	MAHVISH MUZAFFAR				10:53 AM	⌚ 1h 24m 24s
2030214	CCI Green Flow step 2b - Infusion in 16C	⌚ 1h 44m 10s	Rupert W Jilcott	7m 27s	5m 01s	⌚ 1h 49m 31s	10:00 AM	⌚ 2h 17m 41s
2032291	CCB Checkout in Reception 1400C	⌚ 5m 37s	Teresa A Smith				11:05 AM	⌚ 1h 12m 01s
2031907	CCI Green Flow step 2b - Infusion in 14C	⌚ 1h 20m 00s	MAHVISH MUZAFFAR	19m 13s	5m 16s	⌚ 1h 23m 08s	10:30 AM	⌚ 1h 47m 41s
2034226	CCI Green Flow step 2b - Infusion in 13C	⌚ 1h 21m 01s	1e 13	13m 15s	4m 29s	⌚ 1h 21m 20s	10:00 AM	⌚ 2h 17m 41s

Process Times based upon Interactions – Medical Oncology

User: **Activate** Change my password Help Admin Logout

Patient Workflows Current Patients Use Edit

VMC-MEDICAL ONCOLOGY CLINIC

VMC-MEDICAL ONCOLOGY CLINIC Workflow

Map Current Step Future Appointments Active Patients

(All Maps) (Any) Off On

Time Display

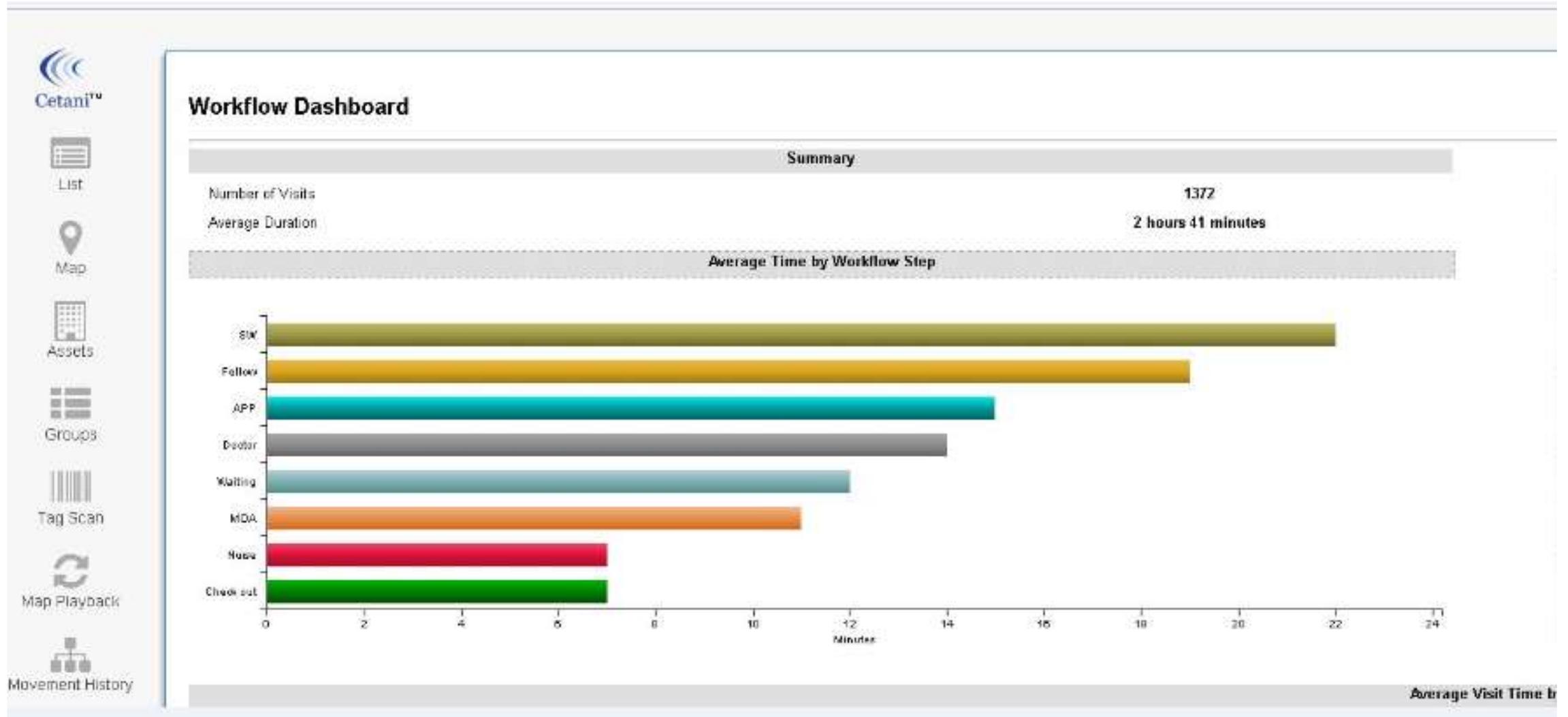
Duration

5 Patients

Tag #	Current Area	Time at Current Area	Provider	Waiting	MOA	SW	Nurse	APP	Fellow	Doctor	Check out	Start Time	Total LOS
1918808	CCD 1800C Waiting	⌚ 17s	Mahvish Muzaffar	⌚ 9m 50s								12:04 PM	⌚ 11m 35s
2031669	CCD Exam 18	⌚ 11m 55s	Elizabeth Ann Gottsch	10m 30s				⌚ 3m 32s				10:00 AM	⌚ 2h 16m 25s
2033665	CCA Exam 48	⌚ 38m 59s	Musharaf Naveed	4m 24s	23m 36s					⌚ 6m 17s		11:20 AM	⌚ 56m 25s
2032291	CCB Checkout in Reception 1400C	⌚ 4m 21s	Andrew Campbell Weil	3m 21s					15m 38s	6m 55s	⌚ 4m 27s	11:00 AM	⌚ 1h 16m 25s
2033645	CCD Exam 6	⌚ 58m 46s	Mahvish Muzaffar	3m 48s	3m 48s							10:15 AM	⌚ 2h 01m 25s



Process Times based on Interactions



Interaction Times by Day – Medical Oncology



Valet Notification

User: **Valet** [Change my password](#) [Help](#) [Logout](#)



Patient Workflows Valet Requests

Patient Valet Requests

0 Requests

Valet #

Improvement Areas Through Leveraging RTLS

- Decreasing patient cycle time
- Converting non-value-added time to value-added time
- Adding more patient visits, improving patient access
- Increasing patient satisfaction
- Increasing resource utilization
- Driving an increase in an annual net revenue – equating to significant changes to the bottom line

Key to Success

- Have a clear vision and execution plan: invest in solution design, engage with an experienced partner
- Gain leadership support: leadership team was wearing badges 3 months before going live to increase awareness about the project and to alleviate any staff concerns
- Listen to patients and staff feedback: if something is inconvenient, it will not get adopted
- Measure results: think in advance what you want to measure and how will you measure it. Collect pre-implementation data points for benchmarking proposes

Q&A

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