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Conference & Exhibition | March 5–9, 2018

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Real ROI: Using RTLS to Improve IV Pump Utilization & Save \$1M

Session # 82, March 6, 2018

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COMMITMENT

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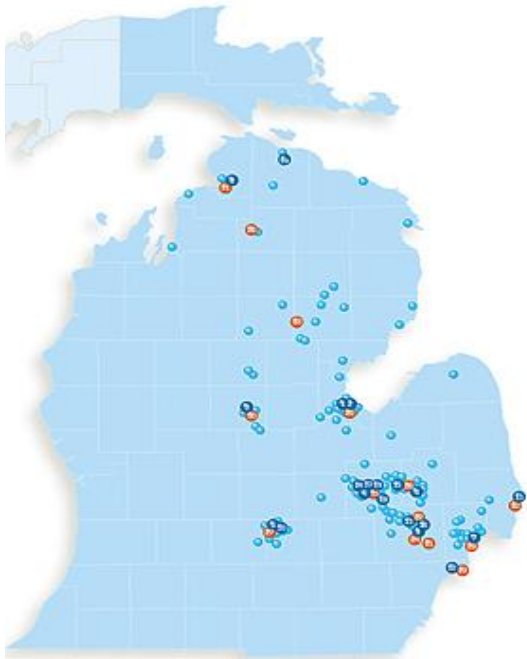
Conflict of Interest

Dave Dickey, MS, FACHE, CHC, CCE, CHTM

No conflict of interest to report

About McLaren Clinical Engineering

■ McLaren Service Area



- Corporate office in Grand Blanc Michigan
- 13 hospitals, 3,000+ beds
- Current Clinical Engineering staff of 77 FTEs, supporting all clinical technology
- >75,000 devices
- This project is at our Flint location

Agenda

- RTLS (real time location system)
- Project background
- McLaren opportunities and ideas
- Data examples
- Features being tested
- Final thoughts

Learning Objectives

- Assess the return on investment a real-time locating system can provide on new capital purchases.
- Discuss methods to gain buy-in from clinical staff when reducing the number of IV pumps in a hospital's fleet.
- Describe how PAR-levels are managed with RTLS, including the strengths and weaknesses of current methodology.

Typical Applications for RTLS

- Tracking patients and staff
- Tracking movable assets. Common sales pitch:
 - “you will be able to find the device when a PM is due”
 - “*you will be able to reduce your rental expense*”
 - “*you will be able to reduce theft*”
 - “*your cost will go down by increased staff productivity*”

RTLS is still a maturing technology

- Battery life getting better (average 1 year).
- Tags getting smaller.
- More use cases being defined when tagging both patients and staff.
- More interfaces to other systems, such as nurse call and patient engagement (TV), leading to 'smart room' designs.
- I envision that, some day in the future, all powered devices will have RTLS integrated directly into the device power supply.
- Also, RTLS will incorporate pressure transducers to be able to report that a wheelchair, bed or other device has a patient on it!

Project Background

Initially looked into RTLS (RFID) systems back in 2009

- No real ROI to cost justify the project. Nothing approved.
- No takers on my offer to give vendors 100% of actual cost savings, if they fund the project.
- Questions on location accuracy. Use of existing access points and triangulation not good enough.
- No good way to identify that the device is in use. And no, the nurse is not going to flip a switch on the tag...get real!
- IV pumps the most common movable device that nurses have issues locating.
- Yet, we all know...pumps get hoarded (keep them in patient rooms, and elsewhere).
- But, someday, we will look again!

Still an issue. This sound familiar?

- *Patient in room 11 at approximately 1420, orders were received to start Nitro at 5mcg/hr. Every pump located in ER was being used, 2 central was called and transportation was called for pumps and both stated they had none. I walked through the entire ER several times and looked in each room to locate pumps. I had others looking for me as well.*

Project Background

- In 2015, for our hospital in Flint, Michigan, we identified the need to plan for capital replacement of our entire IV pump fleet due to age, end of life and tubing sets being discontinued. Capital budget submission was for entire fleet replacement, plus integration to EMR!
- IDEA: Perhaps we can purchase a smaller quantity of replacement pumps and use the \$'s saved to implement a RTLS solution...if it can solve the problem of determining actual pump utilization!
- Hey, here's an idea:

What if:

- We can get both our selected RTLS vendor and our IV pump vendor to work together to develop and implement a new, custom interface?
- Since we were already in the process of purchasing and installing a wireless IV pump solution and data server required to interface IV pump to newly planned EMR system ('One McLaren'):
 - *Can the IV pump vendor send HL7 data over to RTLS vendor, assuming the IV pump HL7 data stream includes data that the pump is actually 'pumping?'*
 - *Can our RTLS vendor take advantage of this data, and give us some new tools to actually determine true IV pump utilization? (not based simply on being in a patient room)*
 - **ANSWER TO BOTH QUESTIONS: YES!!!**

THE PROMISE/GOAL

- HL7 message from IV pump server every 5 minutes.
- Two separate message files used, various data fields used to determine if pump is on/off, and/or, 'pumping.'
- Get accurate capture of pump infusion start and stop times.
- Separate data field to show if the pump is plugged into AC (needed for auto-push of drug library updates).

McLaren opportunity and ideas:

- This would allow us to not only determine physical location of all pumps, but also to identify which pumps are actually ‘in use.’
- Make it easy to see (on the real time floor map display) which pumps are actually in-use (i.e., pumping), by changing the icon color.
- We can now start tracking true pump usage by the hour, by the day, by the week, by the month, and look for patterns, trends and various relationships, for example, to patient census, OR schedule, ER admissions, etc.
- If we can get this to work, can this new data be used to someday develop predictive algorithms which could be used to automatically adjust the par level setting for each clinical unit, perhaps 3 times a day?

IV pump status

- **The HAVE/HAD:** Combination of 711 dual and single pumping channels.
- **The HISTORICAL PROBLEM** defined as ‘can’t find a pump when we need it.’
- **The WANT:** Nursing recommending that 1,000 new pumps should be purchased.
- **The NEED:** After two pump ‘in use’ studies, we came to the conclusion that we really probably only need to purchase 600 new pumps, assuming we can find them, **and**, if we could develop a way to always have the pumps on the floor when needed.
- **The CHALLENGE:** Can we sell the concept of ‘par level’ number of IV pumps always to be on the floor, to nursing? Time will tell!

With RTLS, we can now find the pumps. Big deal, then what?

- Identify baseline 'par level' number of total pumps to be kept in each clinical area, based upon their historical patient IV pump use/needs.
- Use vendor software to show number of pumps in each clinical department as compared to the par level.
- Trigger an e-mail when a defined par level is low, or high.
- Initial plan: Every evening, have a dedicated FTE on transportation team 'round,' in every clinical area (where pumps are shown). Find and move un-used pumps back to clinical areas that have low par levels.

Enterprise View

File Filters Tabs Locate Login Help

IV Pump

IV Pump IV Pump Par Asset - All G_C G_S 1_C 2_C 2_N

BT	Badge #	ID	BloMed #	Curr Location	Status Du...
IP	100426	I400162	55877	10S Rm 1001	3:35
IP	101352	I394611	56060	10S Rm 1001	3:35
IP	100343	I402694	55665	10S Rm 1002	
IP	100531	I373654	55576	10S Rm 1002	
IP	100433	I402829	55717	10S Rm 1004	2:40
IP	100519	I400121	56068	10S Rm 1004	2:40
IP	100537	I400254	55898	10S Rm 1006	
IP	101347	I400318	55549	10S Rm 1008	
IP	101294	I400453	55546	10S Rm 1009	
IP	101596	I406683	55725	10S Rm 1009	
IP	102817	I400104	56105	10S Rm 1009	
IP	100471	I400130	55876	10S Rm 1010	
II!	100374	I400190	55602	10S Rm 1011	0:35
IP	101327	I402757	55755	10S Rm 1011	
IP	100499	I400176	56028	10S Rm 1012	
II!	101300	I406665	55752	10S Rm 1012	14:25
IP	100391	I400377	55561	10S Rm 1013	
II!	100342	I400150	55870	10S Rm 1014	
IP	100547	I402803	56008	10S Rm 1014	14:45
IP	101299	I406666	55765	10S Rm 1014	
IP	100449	I400496	56053	10S Rm 1016	
II!	102682	I400145	55656	10S Rm 1016	0:25
IP	100415	I400440	56074	10S Rm 1017	
IP	100316	I406726	55847	10S Rm 1018	
IP	100581	I400106	56092	10S Rm 1019	
IP	100584	I400118	55580	10S Rm 1019	
IP	100501	I400273	56047	10S Rm 1020	0:05

IV Pump Listing Example, By Floor



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Floor Map Example

IV Pump Drug Library Download Ready

IV Pump - Interface Test		IV Pump - Status		IV Pump	IV Pump Par	IV Pump Par Admin	Asset Loca...
BT	Badge #	ID	BioMed #	Curr Location ▲	Current St...	Status Du...	Download...
IP	100426	I400162	55877	10S Rm 1001	ON	3:40	YES
IP	101352	I394611	56060	10S Rm 1001	ON	3:39	YES
IP	100343	I402694	55665	10S Rm 1002	OFF		YES
IP	100531	I373654	55576	10S Rm 1002	OFF		YES
IP	100433	I402829	55717	10S Rm 1004	ON	2:45	YES
IP	100519	I400121	56068	10S Rm 1004	ON	2:44	YES
IP	100537	I400254	55898	10S Rm 1006	OFF		YES
IP	101347	I400318	55549	10S Rm 1008	OFF		YES
IP	101294	I400453	55546	10S Rm 1009	OFF		NO
IP	101596	I406683	55725	10S Rm 1009	OFF		YES
IP	102817	I400104	56105	10S Rm 1009	OFF		NO
IP	100471	I400130	55876	10S Rm 1010	OFF		YES

Par Level Admin Display

Enterprise View

File Filters Tabs Locate Login Help

IV Pump Par Admin

VERSUS

IV Pump - Interface Test IV Pump - Status IV Pump IV Pump Par IV Pump Par Admin Asset Location Admin Asset - All G_C G_S 1_C 2_SE 2_SW ->

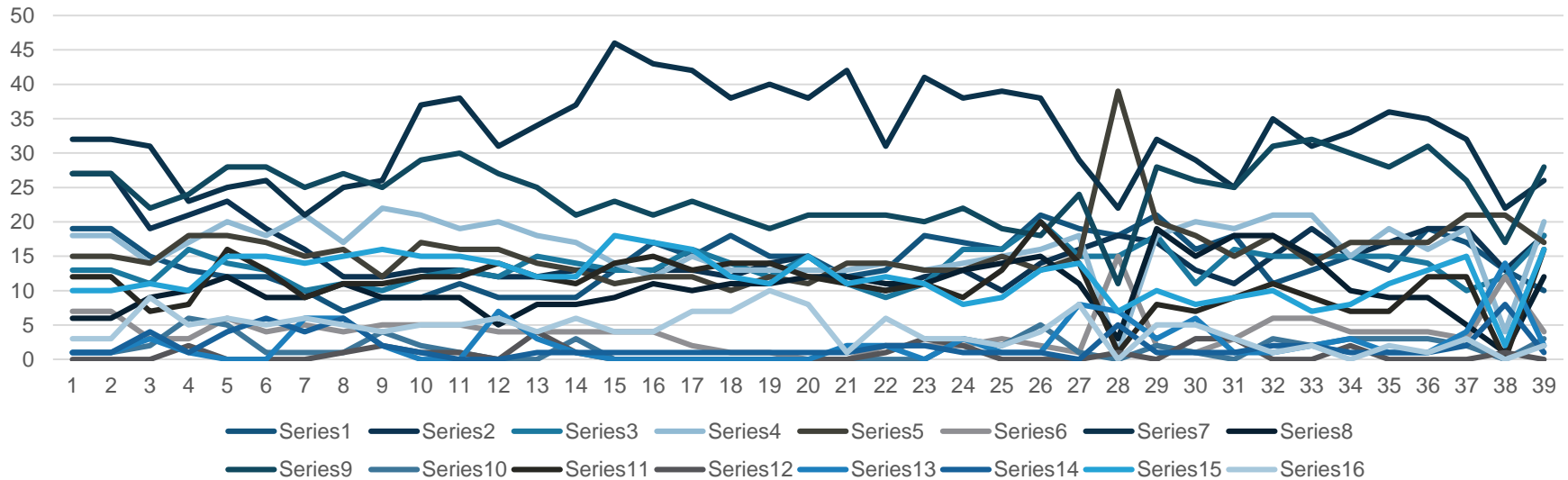
Unit	Infusing Count	Available Count	Critical Low	Par Level	High Warning	Notifications	Reset	Popu...	Email
12S	16	16	12	25	40	YES		mclare...	dave.dick...
11S	13	27	12	25	35	YES		mclare...	
10S	16	19	12	25	35	YES		mclare...	
9S	13	29	15	30	40			mclare...	
8S	16	20	12	25	35			mclare...	
7S	3	6	4	8	15			mclare...	
6S -CCU	39	32	37	75	90	YES		mclare...	
6C	14	12	15	30	40			mclare...	
5S-ICU	17	42	35	70	90	YES		mclare...	
5N	2	5	7	15	20			mclare...	
4C	13	14	15	30	40			mclare...	
3S-PACU	0	12	5	10	18			mclare...	

Operational Features being tested

- Review of Par level (every evening)
 - Initial plan was to have par leveling done once per day, third shift.
- Notification, e-mail, to be sent to one person or a group, when par level is low or high for each clinical area.
 - What is the expectation of outcome? Transportation department brings each unit up to par level, but TBD, how often?

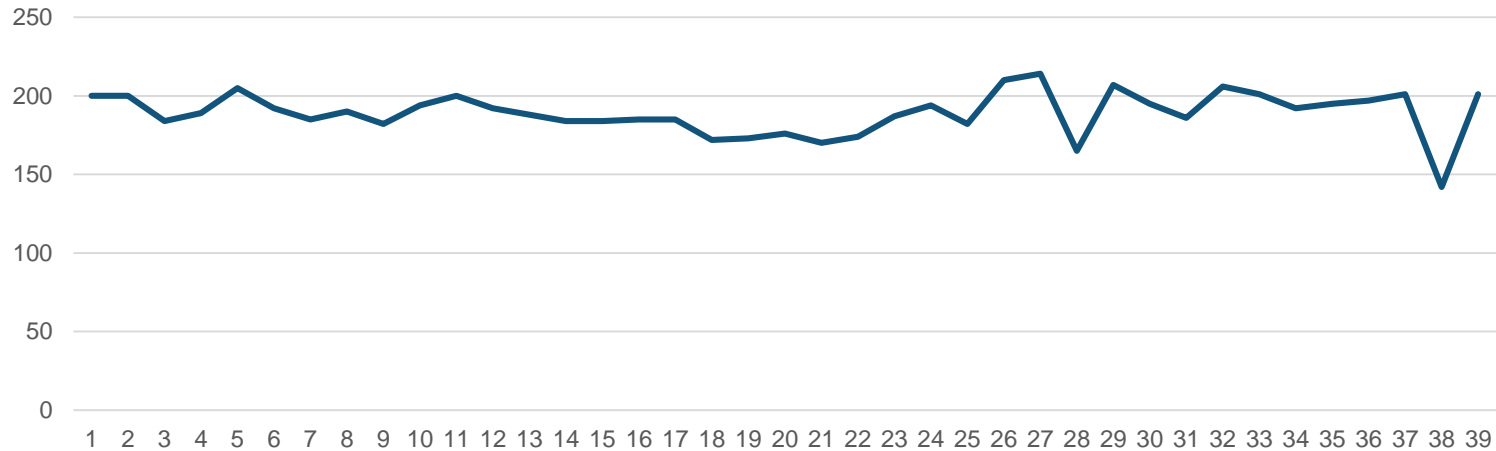
Initial data...yikes!

Variations of pumping pumps

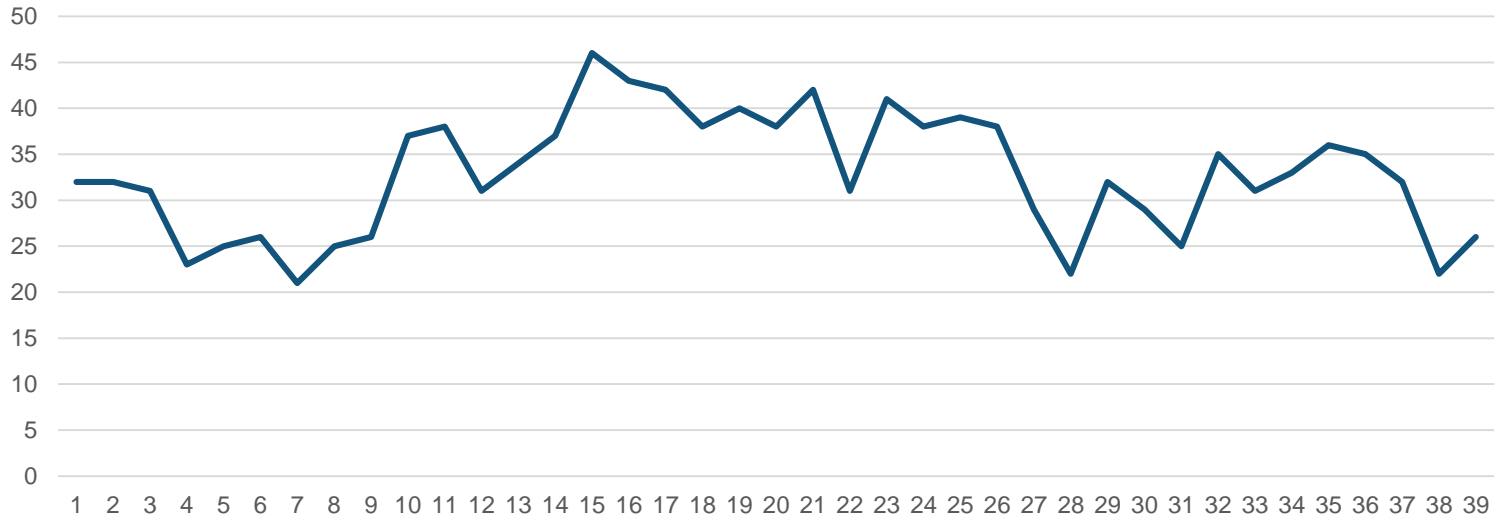


Total Pumping Data Sample

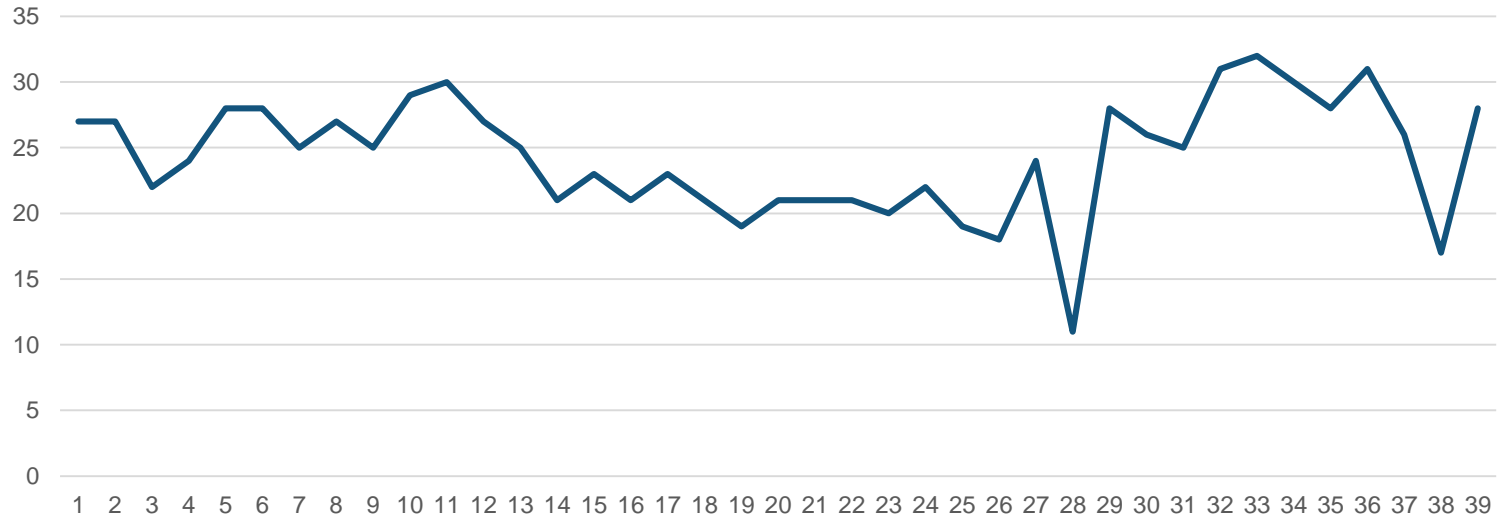
Hourly Pumping Sample over 9 days



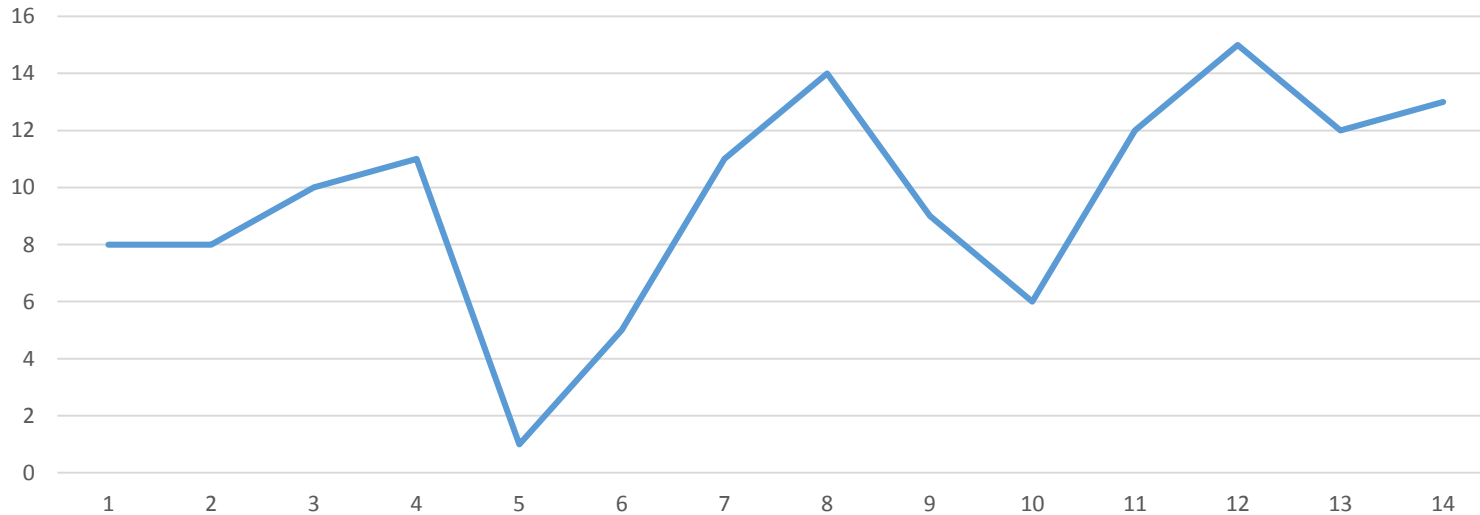
CCU



ICU



Cardiac Cath Lab over 3 day period



Two Weeks Highest Pumping Data

UNIT	HIGHEST	PAR		HIGHEST	PAR
		Sugg			Sugg
12S Card tele	22	22	4C Dialy/SCU	20	18
11S Oncology	27	31	3S PACU	5	5
10S Med/Surg Tele	20	18	3S OR	14	8
9S Med/Sur Progr tel	28	25	3S PREOP	12	7
8S Orthn/Neuro tele	38	21	2C high acqu ED overfl	20	21
7S LDRP	13	8	2S ER	13	12
6S CCU	46	53	2NHV	23	18
6C PCU transition	13	15	1	1	1
6S ICU	42	35	G	1	1
5N Joint exp	6	7	4N rehab	2	2
			TOTAL	204	235

Two Months, Daily Sampling

- Max # of total pumps ‘pumping,’ if all at the same time: 382
- Max # of pumps ‘pumping’ based on hourly sampling: 224
- Minimum # of pumps ‘pumping’ during random sampling: 149
- Average # of pumps (not pumping) on the units: 344
- Average # of pumps ‘pumping’ per patient census: 716
- Top care units with pumps ‘pumping’ at any one time:
 - CCU 46 (18 b) -Ortho/Neuro 38 (37 b)
 - ICE 42 (18 b) -Med/Surg 28 (37 b)

Dec 14, 2017 4:30 pm

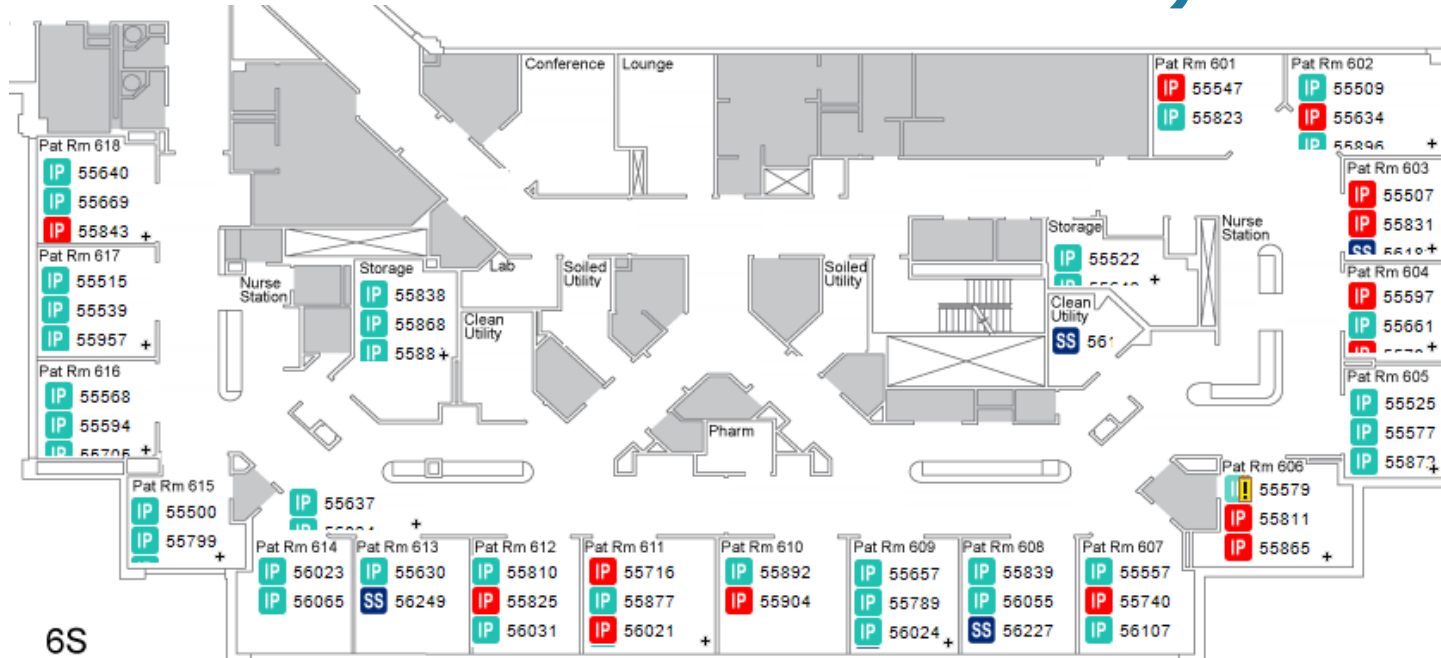
Location Information

Status	Location Name	Phone	Number
	6S Rm 609		4067

Type	Badge	Name	Time Entered
SS	100203		12/10/2017 1:09:22 PM
IP	100233	55789	12/11/2017 6:09:57 AM
IP	100558	56024	12/10/2017 1:06:58 PM
IP	102702	55657	12/10/2017 1:08:49 PM

View As:

Dec 14, 2017 4:30 pm (look at all the pumps stashed in these rooms!)



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Asset Movement History

Main Menu

Asset Information

Displays time spent in an asset's most visited locations, with optional detail on all movements.

Modify Report Criteria

Date Range: Custom
 Starting: 12/09/2017 12:00 AM
 Ending: 12/14/2017 11:59 PM
 Shift: 24x7

Locations: All
 Badges: 100558 - 56024

Location	Entered	Exited	Duration
9S Rm 901	12/9/2017 12:00AM	12/10/2017 1:03PM	37:03
9S Hall Conf	12/10/2017 1:03PM	12/10/2017 1:04PM	0:01
9S Hall Elev 2	12/10/2017 1:04PM	12/10/2017 1:05PM	0:02
6S Hall Elev 2	12/10/2017 1:05PM	12/10/2017 1:06PM	0:00
6S Hall West Stairs	12/10/2017 1:06PM	12/10/2017 1:06PM	0:00
6S Hall Rm 618	12/10/2017 1:06PM	12/10/2017 1:06PM	0:00
6S Hall Rm 614	12/10/2017 1:06PM	12/10/2017 1:06PM	0:00
6S Hall Rm 612	12/10/2017 1:06PM	12/10/2017 1:06PM	0:00
6S Hall Rm 610	12/10/2017 1:06PM	12/10/2017 1:07PM	0:01
6S Rm 609	12/10/2017 1:07PM	12/14/2017 4:18PM	99:11

Location	Duration	
6S Rm 609	99:11	72.77%
9S Rm 901	37:03	27.18%
9S Hall Elev 2	0:02	0.02%
9S Hall Conf	0:01	0.01%
6S Hall Rm 610	0:01	0.01%
6S Hall Rm 618	0:00	0.00%
6S Hall Elev 2	0:00	0.00%
Total:	136:17	

**Drill down..
 Where have
 you been?**

Final thoughts

- Being able to locate movable assets is great.
- However, without knowing if the asset is actually being used... how was the ROI on the purchase of the RTLS system determined?
- What do you do when you find the asset connected to a patient?
- Lesson learned...just because an asset is in a patient room, do not assume it was being 'utilized.' NOTE: RTLS utilization reports are 'location tracking' reports!
- Nurses are smart... if they want to have the device available at a moment's notice, they will keep it in a patient room.
- This is all about changing behavior, trust in the new model, cooperation between multiple departments, etc.

Lessons learned and status

- Nursing still a bit reluctant to give up pumps and are still hoarding them in patient rooms.
- However, we recognize that a pump may be used intermittently on a patient, so keeping it in the room may be advantageous.
- Collecting ‘pumping’ data hourly is/was a manual process, printing a screen shot, then populate into a spreadsheet.
- RTLS vendor is currently working on automating the collection of pumping and available pumps (not pumping) every hour 24 x 7 x 365!
- Realized that we need a new column of data, showing the number of pumps available in utility/equipment rooms on each floor, since currently, the ‘available’ count includes all pumps not ‘pumping.’

Initial Project Costs

- Need to cover 500,000 sq. ft., 342 patient rooms
- Base RTLS (assets only, 1000 tags, most for large volume, single channel IV pumps and multichannel housings) \$500,000
 - Sensors (IR and RF, approximately. 600) and related hardware
 - Software and reporting package, licensing and implementation
- Wiring
 - \$300,500
- Total project cost: \$800,500
- Capital cost avoidance of 400 IV pumps not purchased: \$1,791,544
- Annual maintenance cost avoidance on 400 pumps:\$35,000
- Net project savings: \$1,026,544

Challenges

- Technology, by itself, is not always the answer.
- Realized that pumps are remaining in patient room until discharge, then cleaned by housekeeping.
- Lost our third shift transporter who was moving pumps around to maintain par levels.
- A better plan may be to have housekeeping staff move (and clean) un-used pumps out of the room when they are no longer needed.
- But, how will they verify if and when it is going to be needed? Will nursing 'buy-in?'
- Who then moves them into holding rooms?

Questions

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