Technology in a Nurses World:
Friend or Foe

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Technology in a Nurses World: *Friend or Foe*

No workplace has escaped the touch of technology including Nursing.

Nursing is a field were technology has made a huge impact on the way nurses do their jobs. While some of the technological advances has made the Nurse's job easier, others have not.

Technological changes have been implemented for regulatory requirements (meaningful use), improvement in efficiency and effectiveness of healthcare, and most importantly to enhance patient safety!

enhancing patient care

Technological & Alarm Delivery Devices to assist in nursing care on a daily basis include:

- EMR
- Bar coding
- Smart IV infusion pumps
- Cardiac monitors
- Monitoring devices that are interfaced with the electronic medical record : medical device integration
- Bed exit alarms
- Wireless communication Devices -phones and Vocera
- Secondary alarm notification- Vocera, remote cardiac panels
- Virtual- video /tele sitter instead of a physical sitter
- Computerized medication dispensing agents
- Telemedicine
- Robotic surgery

Bar Coding Technology

Wireless point of care technology developed to reduce medication administration errors verifying a patient's identity (armband) and validate medications against active orders in EMR.

- Validates the five R's-Right patient, drug, dose, time and route
- Workflows developed to enhance patient safety and Nursing accessibility of devices
- Bar coding went live – MVH 2008
- Obstacles/Barriers: ergonomic issues with computer and bar code scanner location, work a rounds, workflow issues, equipment malfunction, compatibility with other devices, upgrades, wireless access
- At first Nursing didn't understand the importance and safety features of bar coding which lead to poor compliance> re education to obtain 90% compliance
- Need for correct override reasons
- Monthly BCMA report sand BOE reports & policies developed of expectations
- Support t from IT dept if scanner not working and pharmacy for med not scanning to increase compliance

BCMA Report
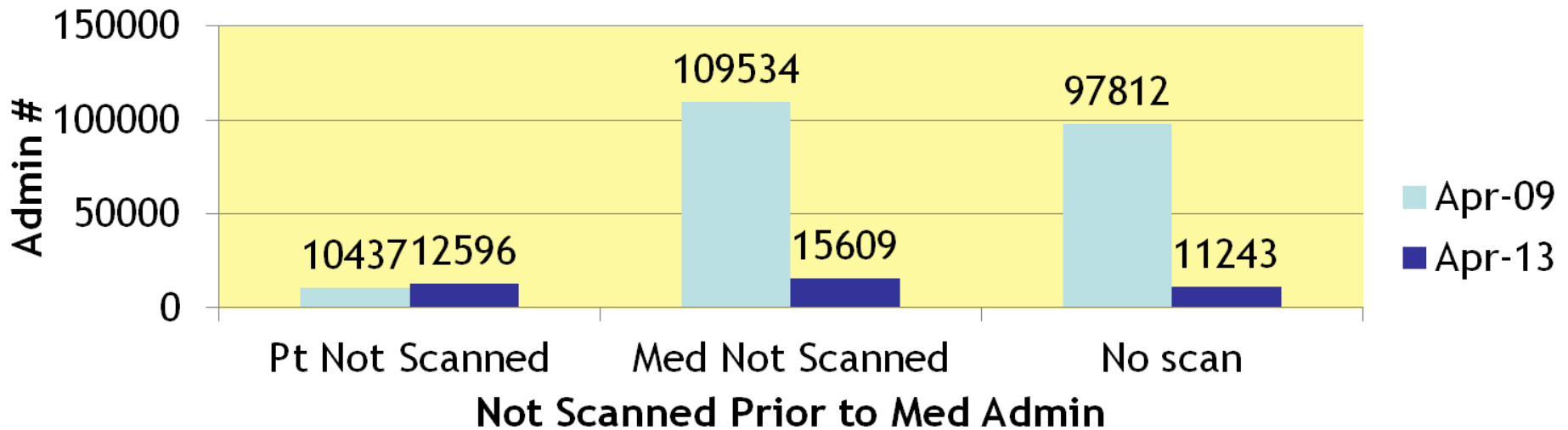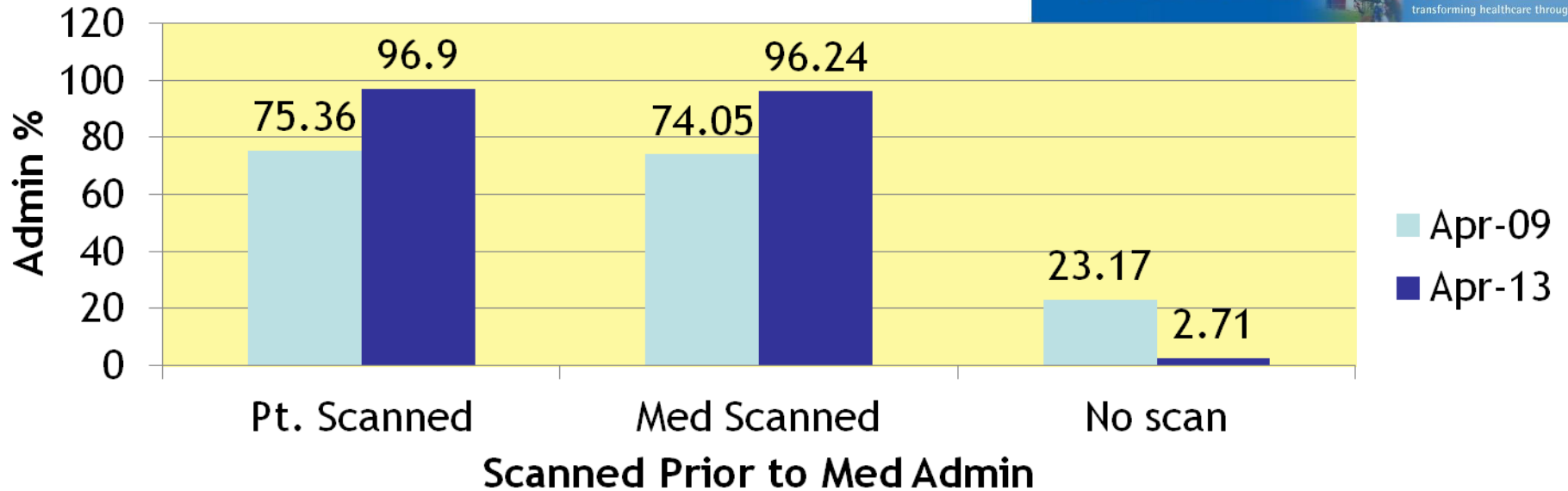
Smart Pump Technology (Alaris)

- Technology to help reduce IV medication errors

- Patient safety improved with Guardrails® safety software-in 8/2007

- Soft and hard stops warning for above or below the drug library's ranges

- Incorrect entered values causes 'locked out' and the infusion is prevented for certain medications.

- Access to infusion database to run reports and identify key areas of focus for education or improvement

- All people are fallible, **even the best people can make the worst mistakes**.

- Studies have found people make an error in the range of 1 time every 100 tries to 1 time every 1,000 tries when using a keypad to enter numbers.

- Error rates vary within each individual, they're influenced by factors such as tempo of activity, interruptions, alertness, noise,
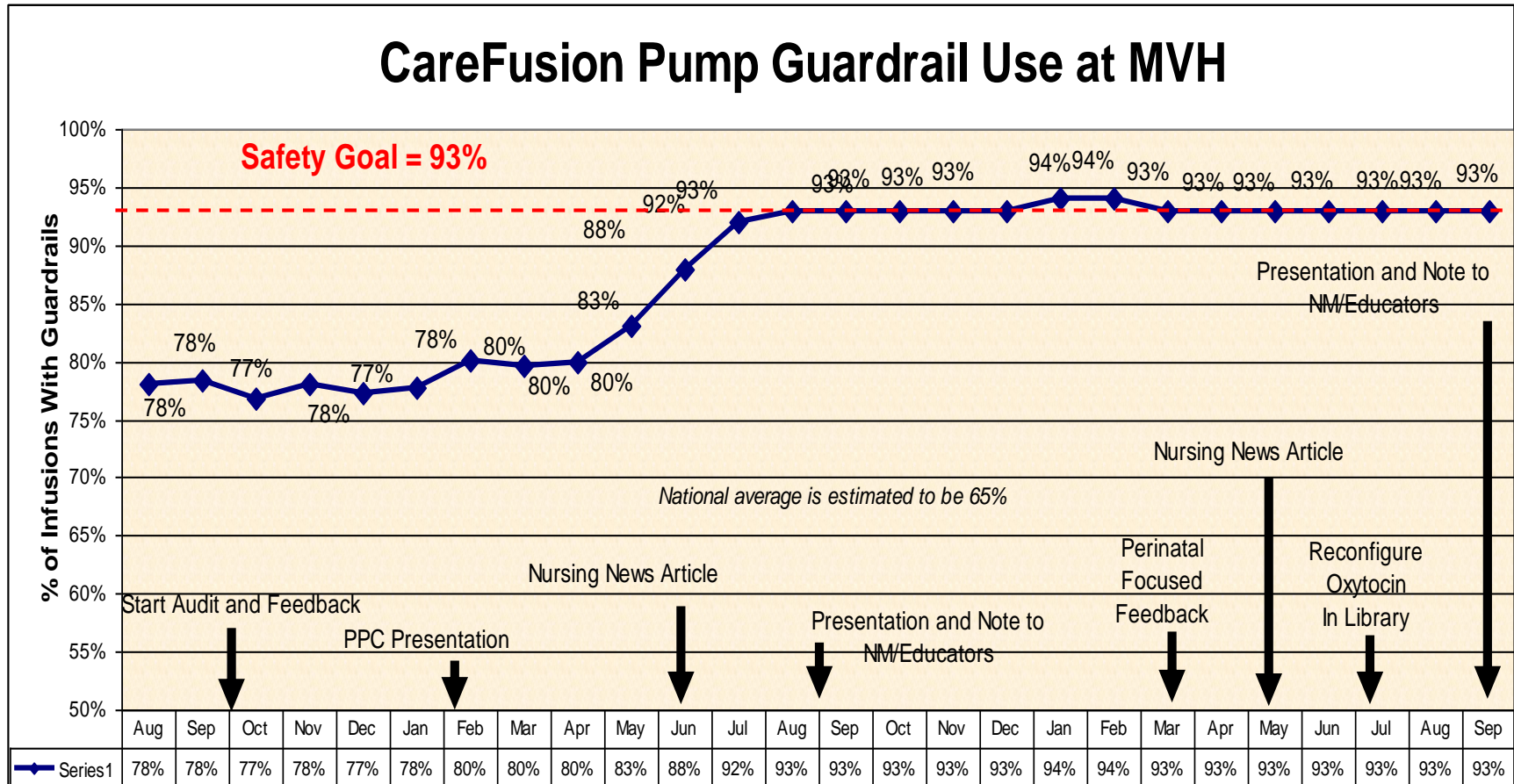
- time of day, etc.

Examples of "Good Catches" by Guardrails.
Example of insulin dosing errors the Guardrails® software has caught and prevented at MVH. In each of these cases, the pump warned the clinician and the clinician reprogrammed the pump with the correct dose.

Example Decimal Dosing Errors for Insulin

Log Time	Above/Below	Dose	Unit	
01/21/2008 18:33	Above Maximum	605	unit/h	Initial Dose
01/21/2008 18:33		6.5	unit/h	Final Dose
02/15/2008 0:05	Above Maximum	142	unit/h	Initial Dose
02/15/2008 0:06		14.2	unit/h	Final Dose
02/07/2008 5:55	Above Maximum	405	unit/h	Initial Dose
02/07/2008 5:56		4.5	unit/h	Final Dose
01/09/2008 14:26	Above Maximum	205	unit/h	Initial Dose
01/09/2008 14:26	Above Maximum	205	unit/h	Final Dose
01/09/2008 14:27		2.5	unit/h	Final Dose
02/20/2008 3:00	Above Maximum	108	unit/h	Initial Dose
02/20/2008 3:00		1.8	unit/h	Final Dose
02/07/2008 22:13	Above Maximum	402	unit/h	Initial Dose
02/07/2008 22:14		4.2	unit/h	Final Dose
02/10/2008 11:59	Above Maximum	405	unit/h	Initial Dose
02/10/2008 11:59		4.5	unit/h	Final Dose
01/14/2008 14:14	Above Maximum	408	unit/h	Initial Dose
01/14/2008 14:14		4.8	unit/h	Final Dose

- # Guardrails use remains at target of 93% use

CareFusion Pump Guardrail Use at MVH

Safety Goal = 93%

National average is estimated to be 65%

% of Infusions With Guardrails

Start Audit and Feedback

PPC Presentation

Nursing News Article

Presentation and Note to NM/Educators

Nursing News Article

Perinatal Focused Feedback

Reconfigure Oxytocin In Library

Presentation and Note to NM/Educators

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Series1	78%	78%	77%	78%	77%	78%	80%	80%	80%	83%	88%	92%	93%	93%	93%	93%	93%	94%	94%	93%	93%	93%	93%	93%	93%	93%

Ratio of Alerts to Infusion Starts and # of Alerts/Month

- ■ AIM: Reduce 'Cry Wolf' alerts

- ■ Work with Pharmacy, evaluate & adjust alert limits

- ■ A lower ratio indicates
    - ■ Fewer 'Cry Wolf alerts
   - ■ less chance of alarm fatigue

Ratio of Alerts to Infusions

Number of Alerts Per Month

Remote Cardiac Panel Technology
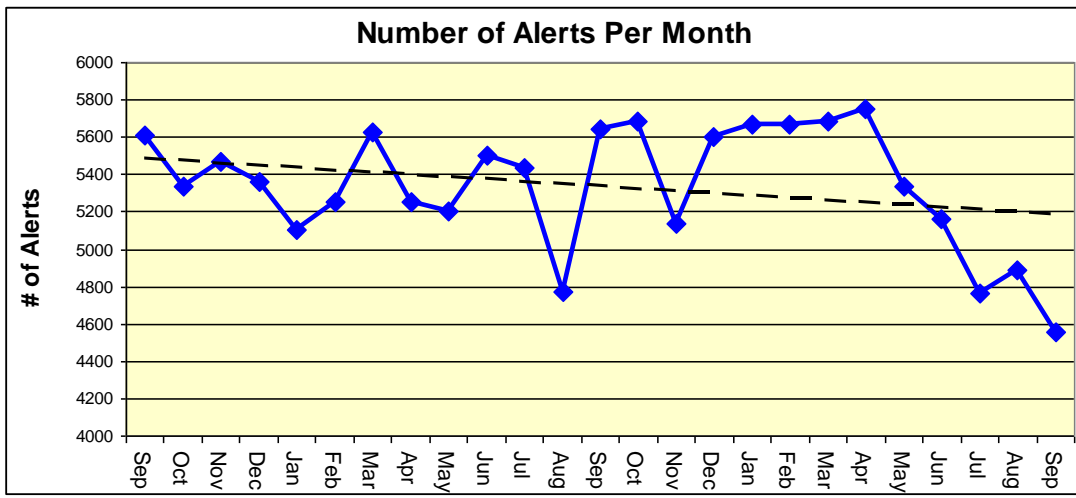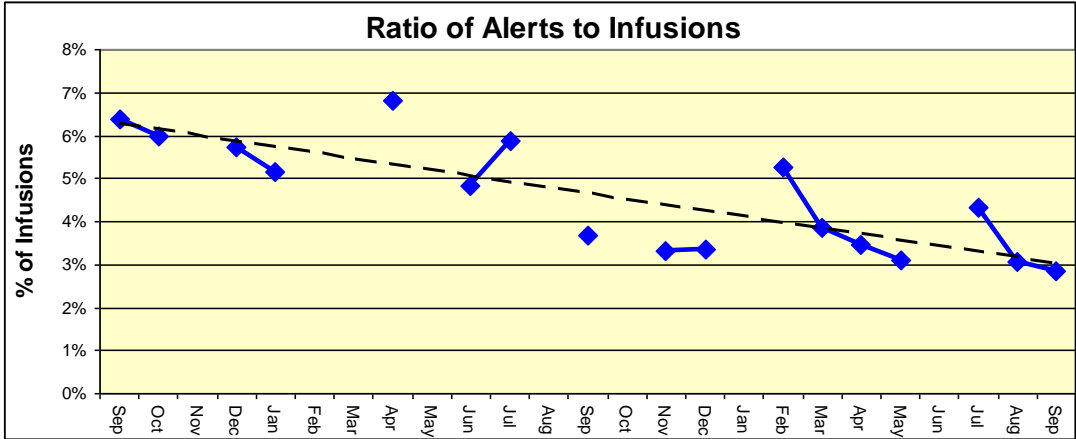
Miami Valley Hospital recognized a need to improve clinical alarm monitoring

- – Staff reports of dissatisfaction with clinical alarm monitoring
    - ▸ Alarm Fatigue
    - ▸ Hard to distinguish 'true' from 'false' alarms
- – Audits of the system use indicated need for improvement > PI study in ICU
- – Panels were strategically placed in patient care hallways and /or medication rooms for direct visualization of patient cardiac monitoring and alarm notification

Benefits:

- ▪ Easier to detect monitoring systems issues
- ▪ Increase awareness of telemetry waveform
- ▪ Reduced nursing mental workload for monitoring alarms
- ▪ Reduced physical workload; reduced the need to walk to the central monitoring station
- ▪ Increase staff satisfaction with alarm monitoring
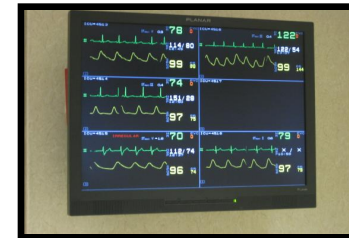
Pilot Study –
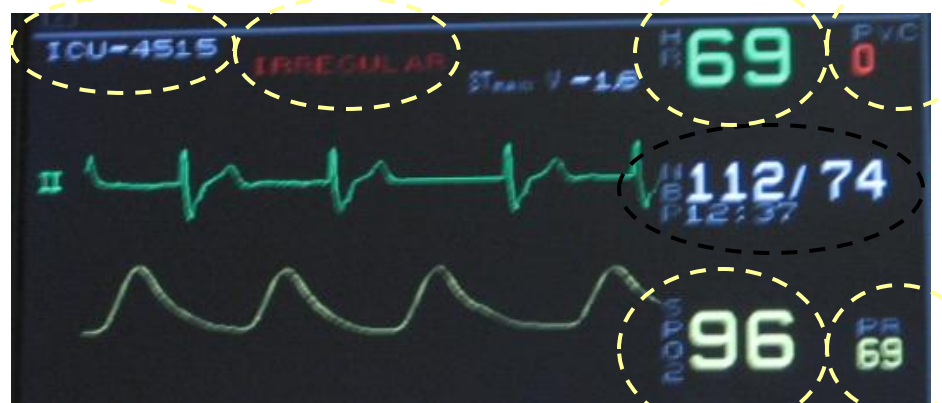## Push Telemetry Information Out Into Staff Work Area
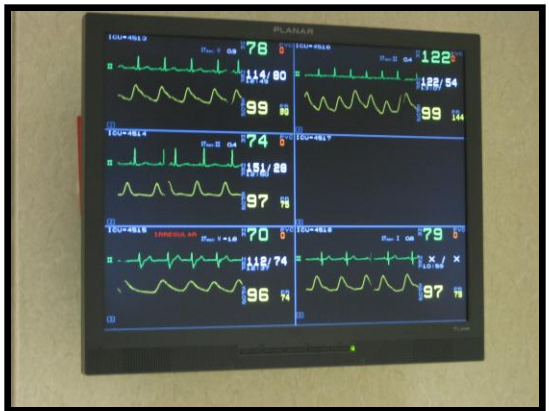
• Install remote panels in ICU

ICU Central Stations and Remote Viewing Panels
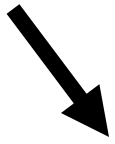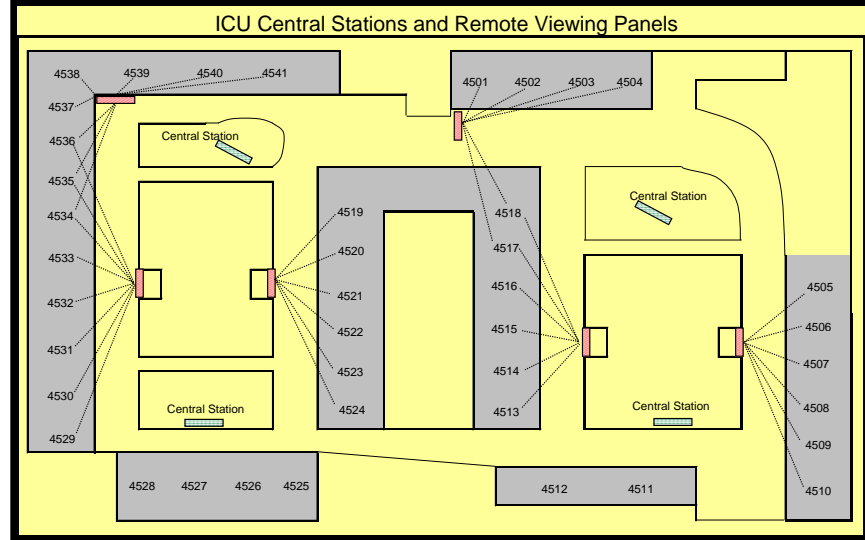
• Room #   • Arrhythmia   • HR   • PVC

• ECG   • BP

                                         • HR
                                         (SPO2)

Pilot Study Results - Remote Panel Impacts

- **Increased Awareness**

- **Increased Staff Satisfaction 61%**

- **Decreased Mental Workload 46%** **(NASA-TLX)**

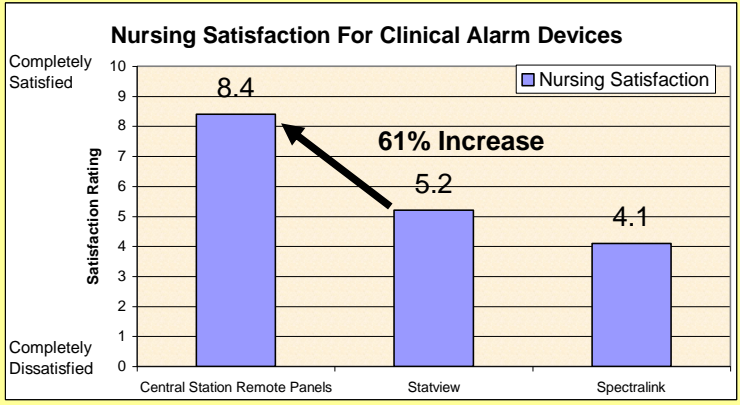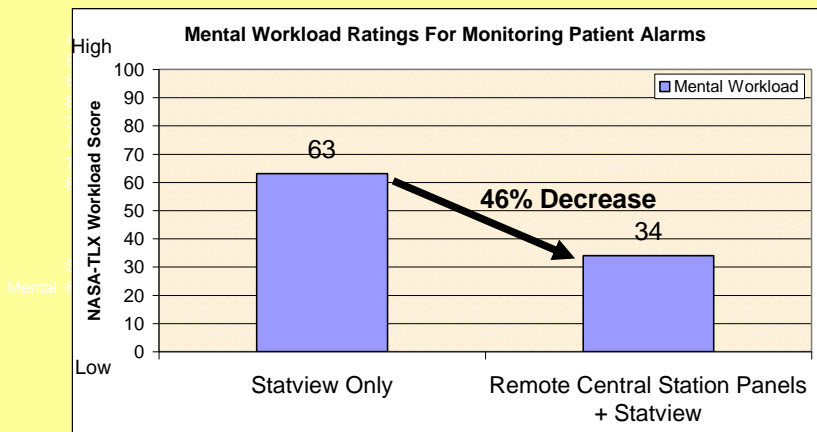| 2) Has your **awareness of patient conditions/status** changed with the remote panels?	Increased Awareness 80%	No Change in Awareness 20%	Decreased Awareness

4) On a scale of 1 to 10 with 1 = completely dissatisfied and 10 = completely satisfied, **how satisfied are you with the new central station remote panels**?

Nursing Satisfaction For Clinical Alarm Devices

- Nursing Satisfaction
- Central Station Remote Panels: 8.4
- **61% Increase**
- Statview: 5.2
- Spectralink: 4.1
- Y-axis: Satisfaction Rating (0–10), Completely Satisfied at 10, Completely Dissatisfied at 0

7) Use NASA-TLX to rate the effort for:

Monitoring a patient's condition using only Statview and the bedside monitors.

**Monitoring a patient's condition using Statview, the bedside monitors AND the new central station remote panels.**

Mental Workload Ratings For Monitoring Patient Alarms

- Mental Workload
- Statview Only: 63
- **46% Decrease**
- Remote Central Station Panels + Statview: 34
- Y-axis: NASA-TLX Workload Score (0–100), High at top, Low at bottom

Patient Monitoring Alarm Notification Technology- VOCERA

- Needed new technology for secondary alarm notification device for our bedside Nurses on units with cardiac monitors: statview was becoming obsolete

- Vocera was used at one of our other facilities(Atrium Medical Center) with much success>Decision was made to incorporate Vocera® into our daily operations to increase ability to locate their team members quickly and receive prompt alarm notification directly to badge

- Primary system alerts >secondary alarm notification system - to enhance patient safety and bedside caregivers awareness

- Development of each unit's functional design-develop the alarm configuration including cardiac monitor, ventilator, bed, pulse oximetry, ICP, and Hill Rom nurse call alarms directly to the wireless badges for the direct care nurses.

- Levels of escalation- (3 levels) according to the alarm, the design were established to go to appropriate role and the call would escalate to the next designated caregiver to add layers of safety

- Hands-free communications between staff and anyone at the end of a telephone or another person wearing a Vocera badge
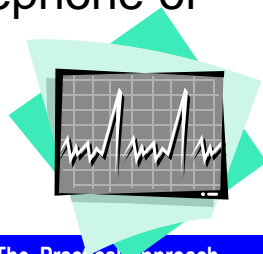
Alarms- Too Much Noise

Concerns with too many alarms=" alarm fatigue ", need to reduce false alarms that have no clinical significance, concerns with Information overload

- Cueing up our system>delay in alarms
- Wireless connectivity issues

Through Shared Leadership & our Monitoring collaborative committee, PI projects, Pilot unit, workgroups- development of new alarm strategies (right recipe)

- Changed patient status alarms so the right alarm goes to the right person at the right time
- Adjusted alarm levels – crisis, warning, advisory, message
- Set default alarm volumes on cardiac monitors
- Developed Tip sheets, re education on units
- Gave bedside Nurses wireless phones
- Changed workflows for patient call lights
- Emergin report data- started collecting data-shared with Directors, Managers, top 5 units- broken down to top 5 caregivers with the highest amount of alerts/alarms sent to vocera badge
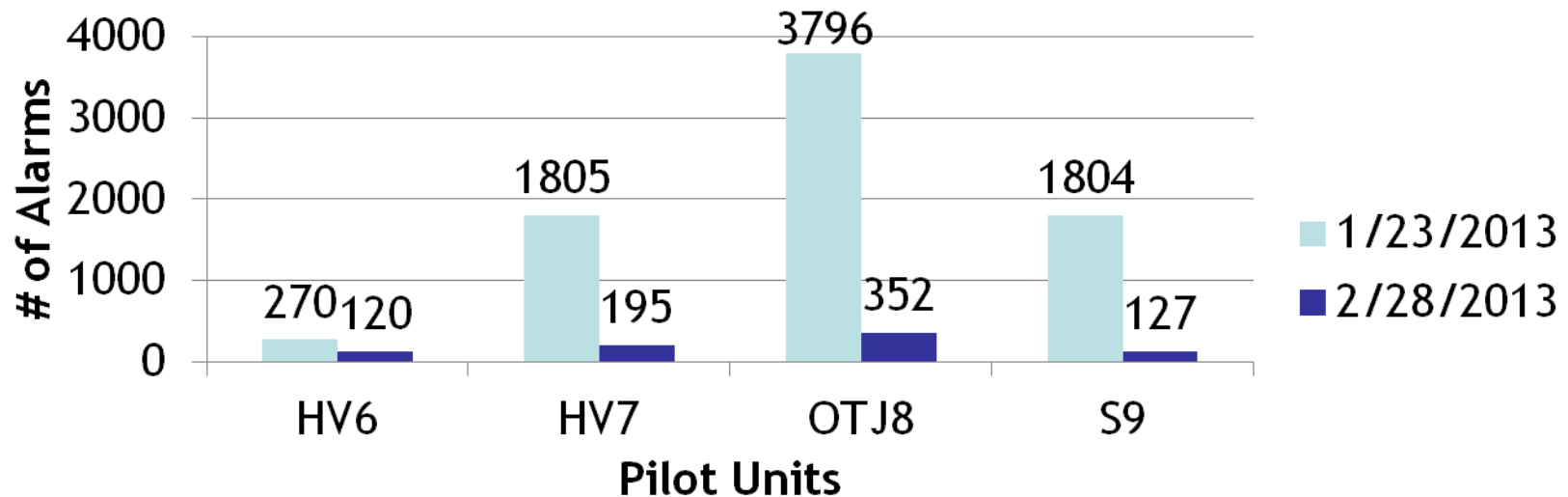
Alarms

- **<u>Cardiac Monitor</u>**-Asystole, Vtach, Vfib, High HR, Low HR, Brady, Tachy, Low battery, leads fail, low pressure vent, SP and ICP-(designate areas)

- **<u>Nurse call</u>** -Normal calls, bath, shower, bed exit, staff emergency, Code Blue, Equipment

- **Changes needed to be made:- right alarm>right person>right time**

- Nurse call system
  - Patient normal nurse calls >PCT only ,and front desk- HUC

- Cardiac monitoring System
  - leads fail biggest culprit
  - Changes: leads fails, no telem, Lf no telem> Nurses only
  - All alarms always go to primary system

Alarm notification strategy

- **Pilot unit:**
- New alarm strategy was implemented on several units at MVH- Pilot Units: HV6,HV7,OTJ8 and S9 on 2/11/13 as our pilot units and made a **89% reduction in alarms in these areas**.

New alarm management strategy for **leads fail, No telem and LF No Telem alarm to go to the Nurse only** was implemented for all other units using Vocera 4/9/13
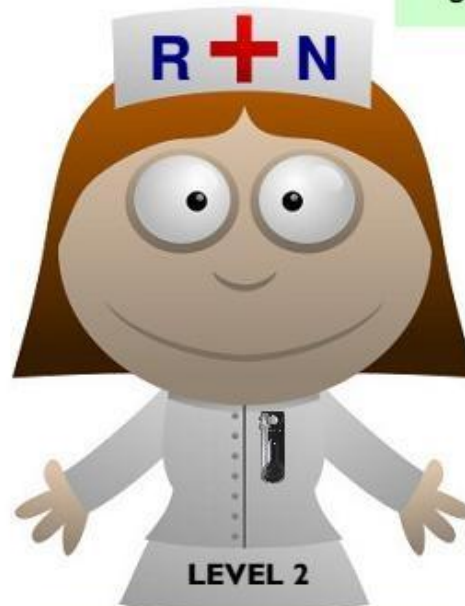
VOCERA ALARM NOTIFICATION

Advisory Alarms
- Pause
- VT>2 (but <6)
- V Brady
- ST Elevation

PCT

LEVEL 1

R + N

LEVEL 2

R + N

LEVEL 3

Basic Alarms
- Low Battery
- Bath
- Shower
- Normal calls
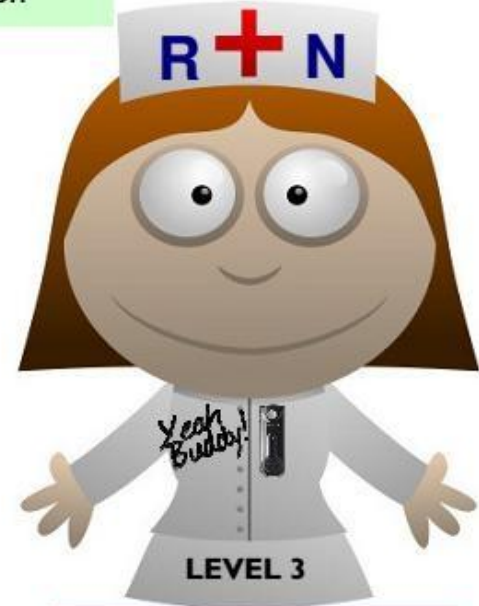
Warning Alarms
- Hi HR
- Low HR
- SpO2

Crisis Alarms
- Asystole
- Vfib / Vtach

- Equipment alarms
- Leads Fail / No Telem

- All Unsatisfied alarms
- Equipment alarms
- Unassigned beds

BED EXIT ALARMS
STAFF EMERGENCY/CODE BLUE

# Human Factors Reference Points for Alarm Processing

- Process Control Industry Data
  - Chemical and Oil Refinery control board operators
- 120 alerts/hour 'hard to cope with'
  - response times had significant decrease
- 14-30 alarms/hour is a normal rate

- Total messages/alarms 24 hour period
- Data for all areas using Vocera at MVH and MVS went from **186,629** alarms on 1/22/13 to **121,664** alarms on 4/18/13

Emergin Messages/Clinician/Hour
April 18 2013
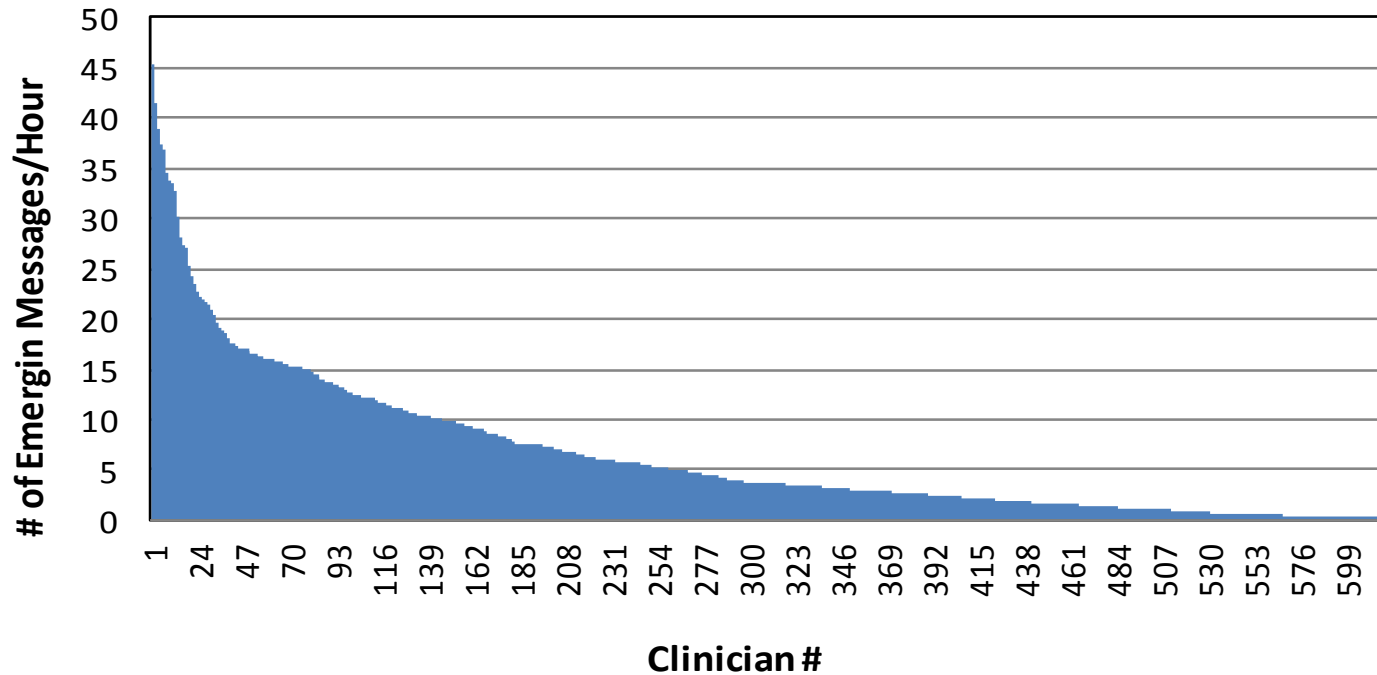
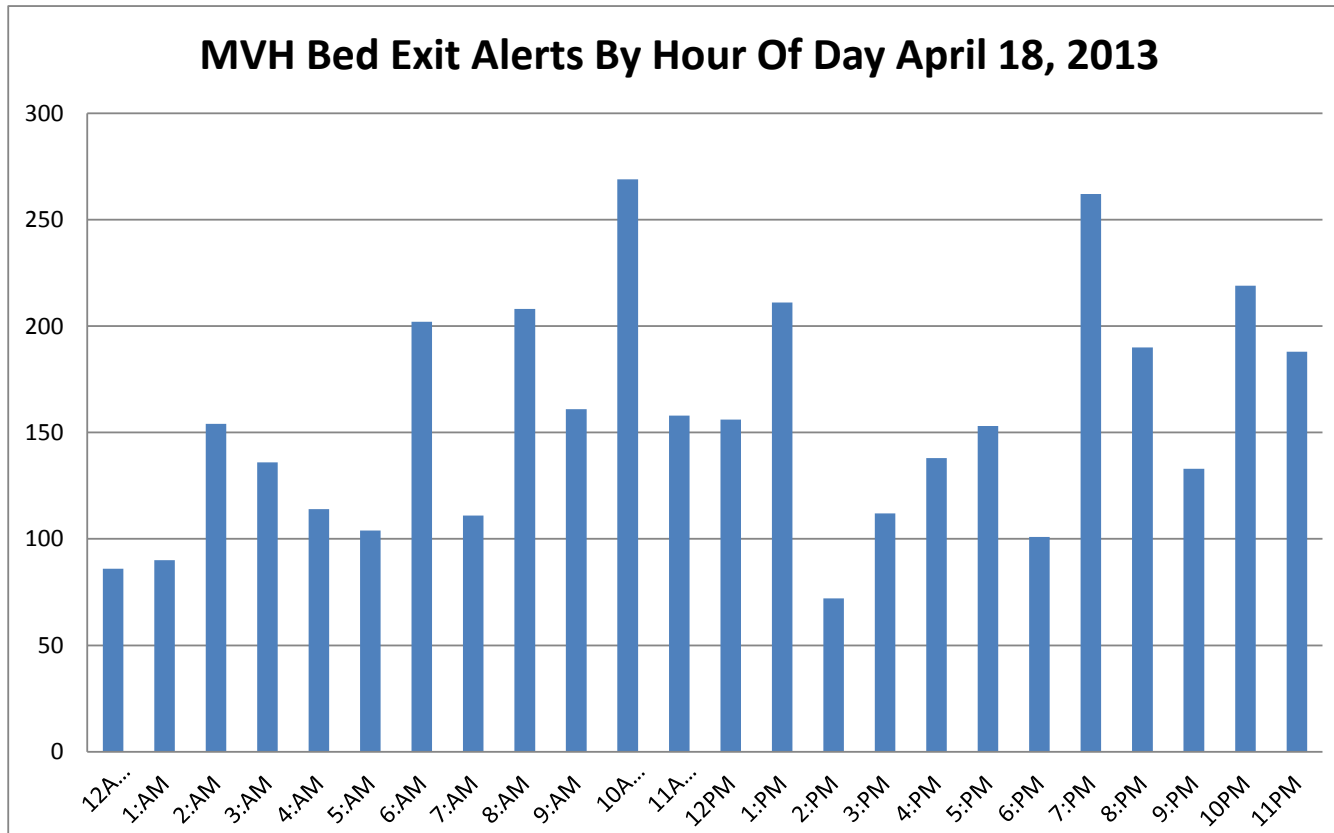| | Average | 6.5 |
	Median	3.7
	Max	45.4
	Min	0.1

Bed Exit alarms

MVH Bed Exit Alerts By Hour Of Day April 18, 2013
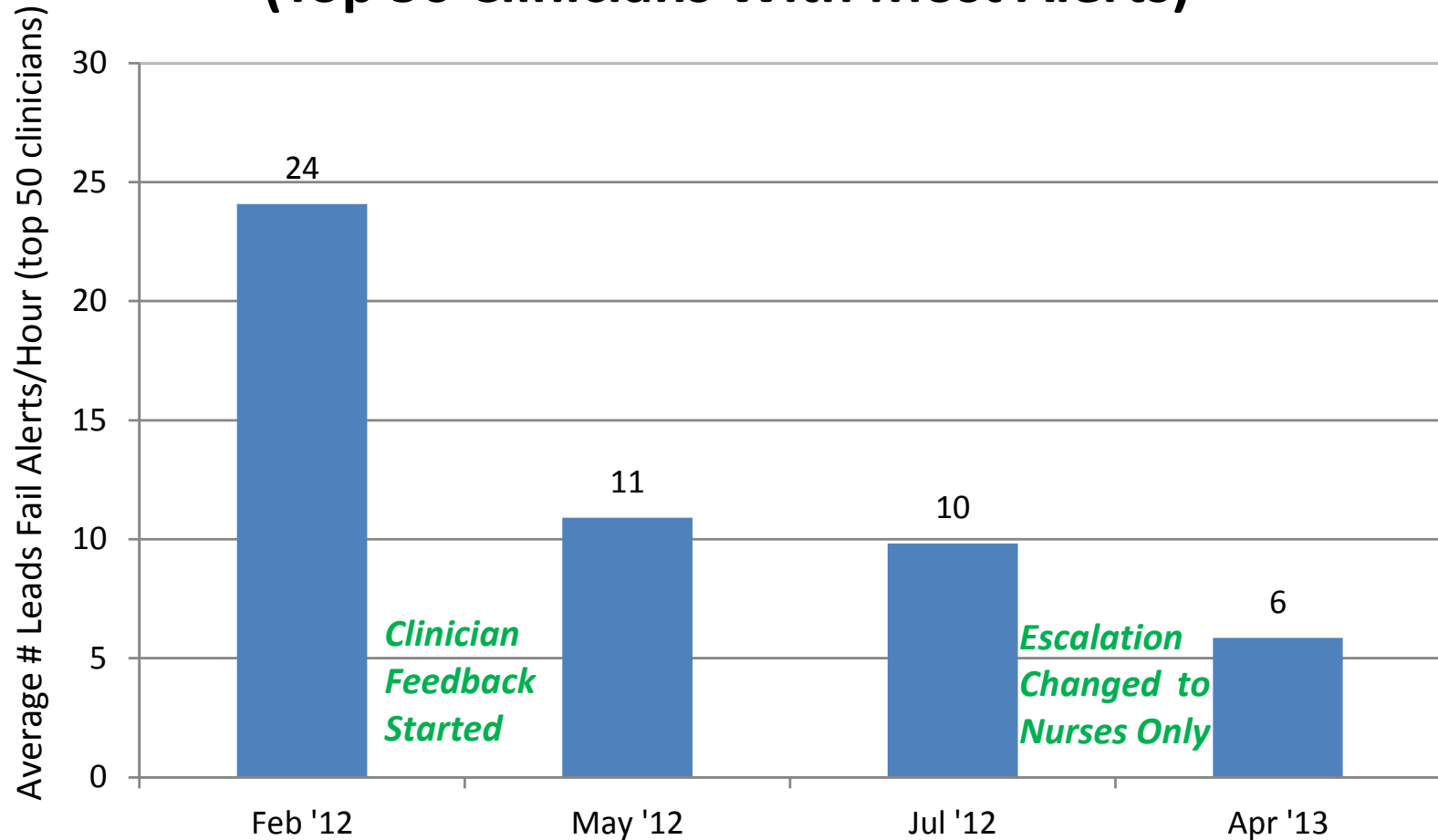
- Use the data to find patterns and improve patient care
  - Plan for increased rounding at 10am, 7pm, 2am

As demonstrated in the graph below, Vocera® has also proven to decrease noise levels on the nursing units by eliminating overhead paging, elevating safety by increasing awareness of patient status and changes in patient condition, and lastly, increase in direct care nurse's satisfaction for streamlining technology in one device.

Miami Valley Hospital HCAHPS Survey

Additional Technology
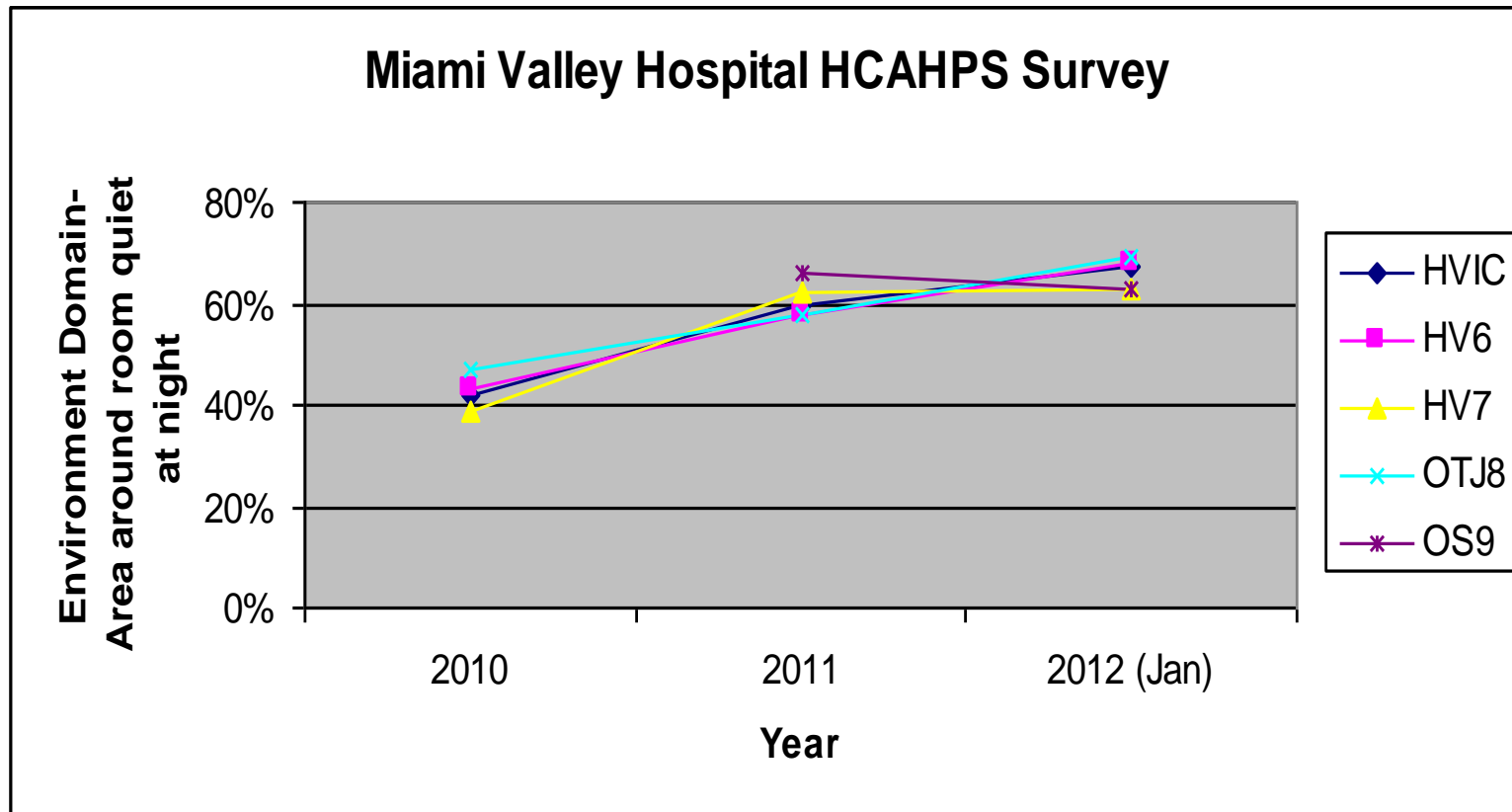
- ## Finger print reader
  - Positive ID required for ordering, dispensing and admin medications
  - Ohio Law- per Ohio board of pharmacy- its who you are and what you know – we choose bio metric reader

- ## MDI- Medical Device Integration
  - Medical device integration syncs device data with electronic records, giving clinicians access to near-real-time patient information.
  - Pulls discrete data from cardiac bed side monitors, CPN (neonatal monitoring) thru data captor , validated by nurse in epic > such as temp, pulse, BP, resp, oxygen saturation and other discrete data vital signs in critical areas, OB, Pacu ,OR and Emergency dept
  - Allows Nurse to spend time caring for patients, not entering data.

REACH- Telemedicine Technology

- Telemedicine robot for stroke patient population

- Telemedicine is the use of telecommunication and information technologies in order to provide clinical health care at a distance includes a variety of applications and services.

- Some benefits of telemedicine are: Physicians have immediate access to patients; improving/maintaining patient satisfaction; hospitals expanding their reach and developing relationships; and cost efficiencies.

- Improve patient outcome to increase timely administration of medication.

- Go live in ER and ICU at PH AMC & GSH- rolling out soon in MVH, MVS and UVMC

Alarm system improvements at Miami Valley Hospital has:

- – Increased staff awareness of patient conditions
- – Lowered staffs' mental workload
- – Increased staff satisfaction
- – Increase Patient satisfaction
- – Reduced risk by addressing system failure modes
- – Improved consistency through policy and procedure updates
- – Ensured staff are using the system correctly through auditing

- The end result is increased patient safety

Avasys - Video/Tele sitter Technology
Camera/voice technology to improve patient safety and resource utilization (sitter utilization)

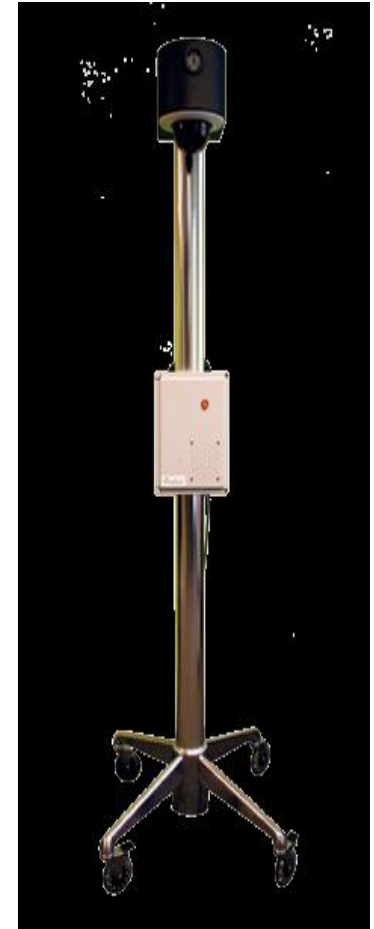

Improve Safety & Decrease Falls

- Allows a single observer to monitor multiple patients via video feed and intervene through built-in, two-way audio channels in time to prevent falls or other events before they happen

- Video sitter identify and interact with patient immediately to calm, direct, or summon help by notifying floor caregivers if patient getting out of bed- by using phone or vocera

Reduce Costs

- Predict a 70% reduction in sitter FTE's and 50% reduction in Injury Falls

- Centralizes oversight to a one-to-many model

- Allows certain sitter positions to be re-purposed

- Every fall-event that can be averted saves our organization countless dollars in lost time, legal, and compensatory expenses.

Better Staff Utilization

- Caregivers are not pulled from direct patient care to sit with a patient

- Nurse calls reduced, Patient needs prioritized

Tele Sitter Technology

Institutional Benefits

- Improved Safety Scores
- Improved Patient Satisfaction Scores
- Improved Nurse Satisfaction

Needed a solution to decrease sitter utilization and decrease falls and increase patient safety

- Go live at MVH- and AMC 1/2013
- MVH- 9 carts   AMC- 3 carts
- **AVASYS Project Plan**
- Calculate Potential ROI for Fall Reduction and Therapeutic Companion Resource Reduction
- Pilot Units for AVASYS Trial at were developed from the highest sitter utilization and fall rates
- Determine Location of Monitor/Computer Equipment for cart so can be moved easily throughout Hospital , Location of tele sitter in a private area
- Review Literature and developed Workflows
- Develop Job Description and responsibilities
- Criteria developed for patients eligible for tele sitter
- Developed Policy and procedures- validated with legal

Sitter utilization hours for January –March:
January 82 hours 33 minutes   February 1128 hours 36 minutes March 1362 hours 31 minutes

Unit	January	February	March
Trauma	75 hours 27 minutes	494 hours 20 minutes	721 hours 53 minutes
3w		4 hours 45 minutes	
Rehab	7 hours 6 minutes	430 hours 50 minutes	
neuro		97 hours 16 minutes	185 hours 54 minutes
HV6			42 hours 20 minutes
HV7			22 hours 39 minutes
Pulmonary			172 hours 58 minutes
6SSU			2 hours 10 minutes
OS9			51 hours 33 minutes
5 E			103 hours 4 minutes
6W			68 hours

- Have an average of 10-20 sits per day
- Currently utilizing average of 4-6 camera /day
- Trauma Unit saved 3.09 FTE in Feb and 4.08 FTE in March

Obstacles/Pitfalls of Technology

Physical Environment

- The physical environment, particularly in older buildings that were never designed to accommodate newer technologies.

- Ergonomic impact- important to not increase strain

- Accessibility of equipment. The environment is critical in the nurses' use of this equipment because if the equipment is not readily accessible, the nurse will be less likely to use it.

Wire less technology and connectivity issues – remediation plan

IT Support system availability

Malfunction of equipment-

- Nurses need equipment available to do her job
- Need IT, maintenance and clinical engineering support
- Need to establish a reporting system for malfunctioning equipment

Education and follow up- ongoing

Technology can make it more challenging to make sure the art of nursing is not overshadowed by technology.

Nurses must always remember that first and foremost, each patient is a whole being and newer technology is being used to improve patient outcomes and patient safety.

Questions?