

I N T E G R I S

Beyond the BAS

A team approach to managing humidity in critical areas of a hospital

May 2, 2019

At the end of the presentation, attendees will be able to

- Identify critical failures in humidity management and its impact on the clinical environment
- Create a multi-disciplinary approach to ensuring patient safety priorities through plan creation, including standard clinical and facilities response actions when out of range conditions exist.
- Identify key recovery response actions necessary when critical failure occurs
- Describe ways for using technology to assist in this process in both large and small settings



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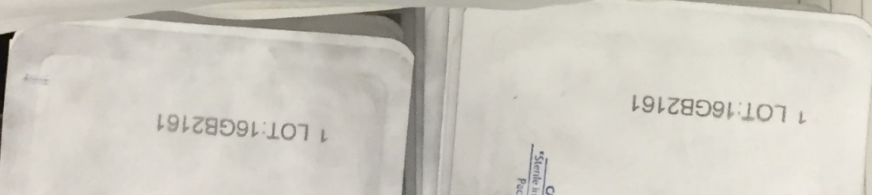
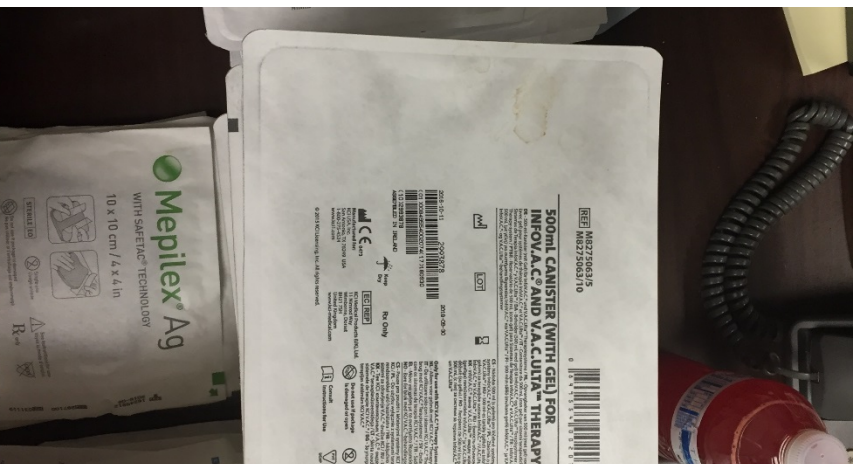
Story Time

THE PERFECT STORM

2 separate facilities with similar conditions

- Stormy rainy conditions
- Late Night no engineer on duty
- Loss of Normal Power
- Chiller not on emergency power
- Air Handler supplying Sterile storage and Perioperative areas Is on emergency power.
- Environmental humidity max
- Water dripping from ceilings and walls





THE PERFECT STORM

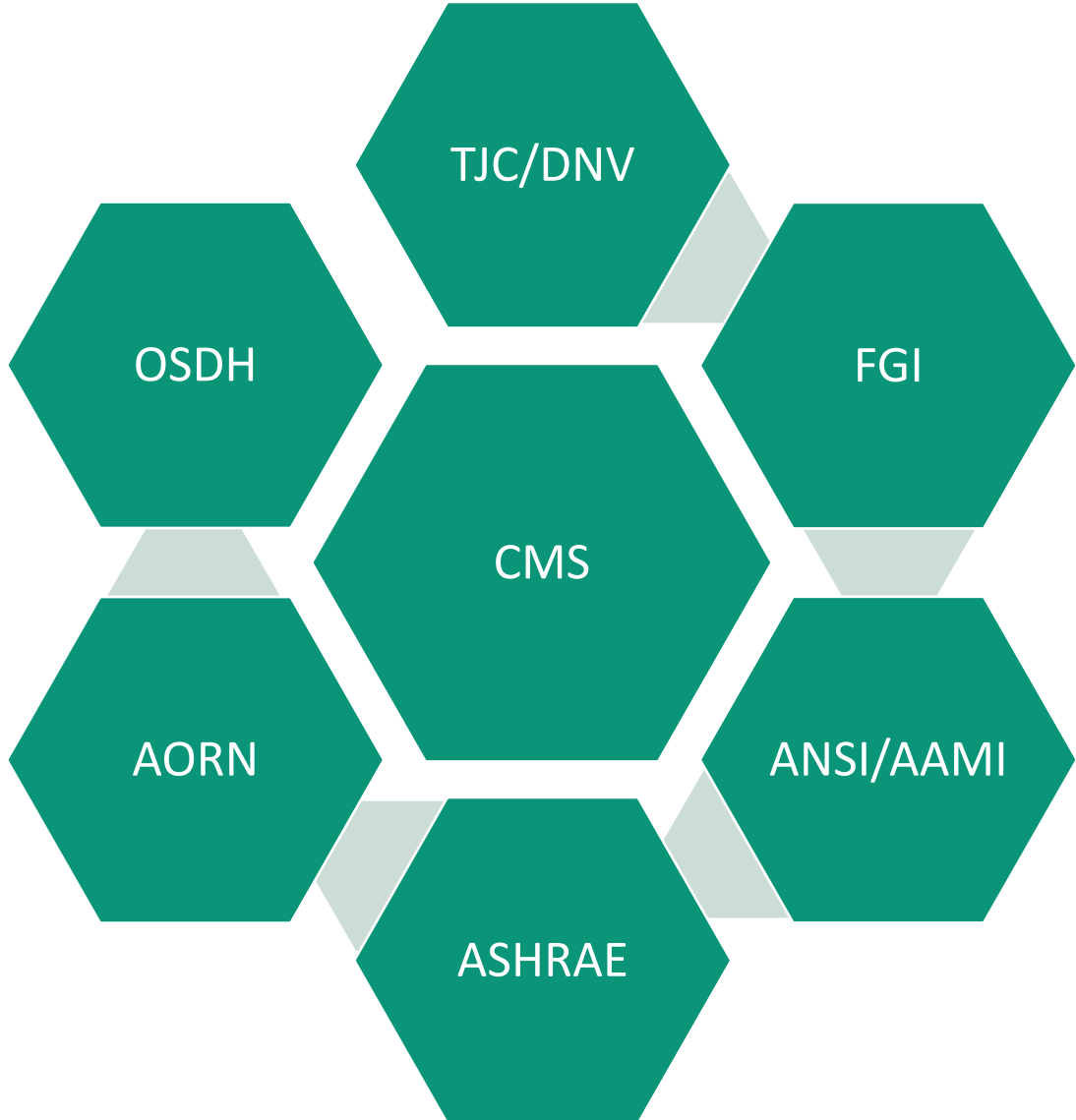


- Sorting Grounds – all supplies discarded.

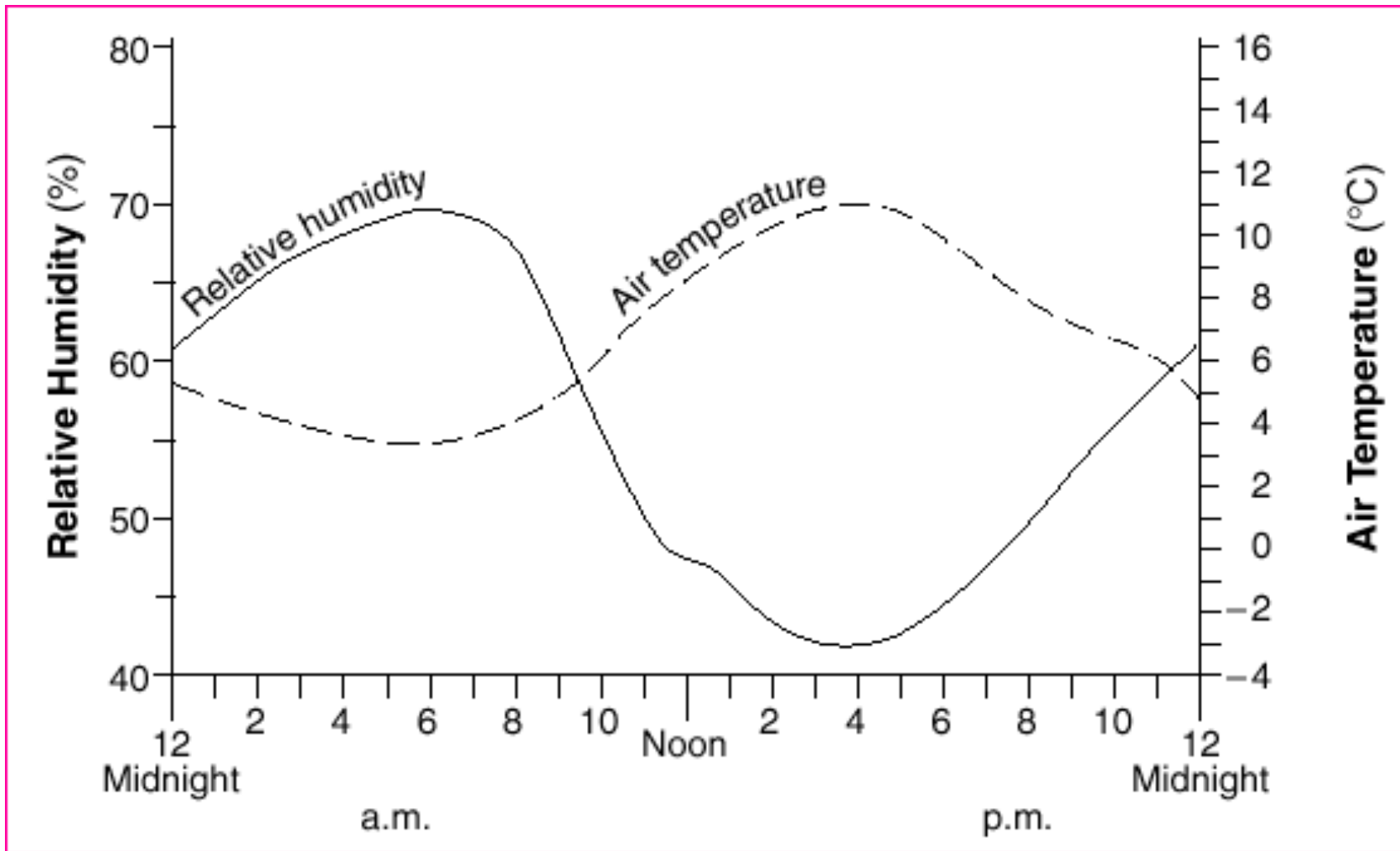


- Cost for these 2 events.....**\$1,246,900**
 - Loss of supplies
 - Upgrade to building automation system and notification

Guideline Review



Time of day and effect on Rh

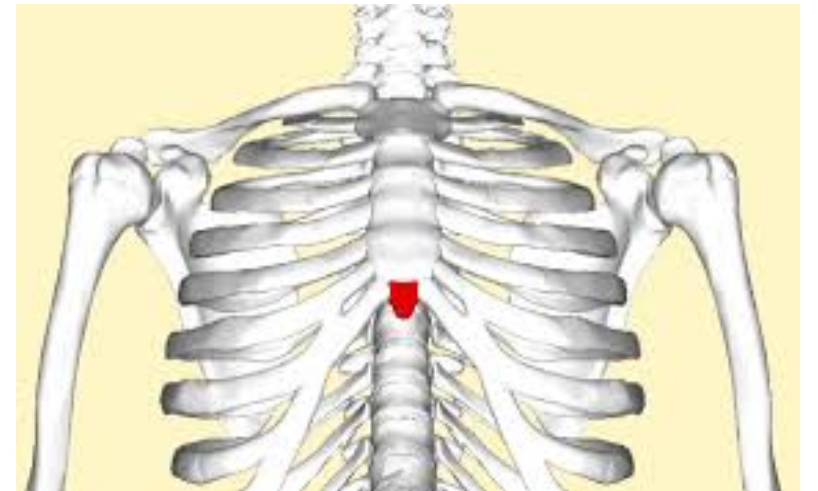


Humidity Management and How Failures Impact Clinical Environments

- Microbial growth*
- Compromise in sterility
 - Wet packs
 - Sterile supplies
- Risk of infection
- Comfort



- Equipment malfunction, calibration issues
- Fire/Spark risk
 - Managing alcohol based prep and dry time
 - Above xyphoid process, time out to evaluate O₂ concentration
 - Combine with medical air to reduce combustibility
 - Cautery precautions
- Shelf life/product integrity
 - Unknown timeframe before products are affected
 - EKG electrodes and foil packaging



- Biological and chemical indicators used for sterilization monitoring used for patient monitoring, are very sensitive to humidity
- Reprocessing of wrapped sterile equipment

Team approach to managing humidity critical events



- **Own your part**
 - How many events have you had?
 - Do you have a documented financial and operational impact of events?
 - What other strategies have you tried?
 - What other support do you need?

- Joint meeting of infection prevention, facilities, engineering (Fall 2018)
 - Global need to identify high humidity (environment and supplies issues) and low humidity (fire safety)
- Reviewed guidelines and evidence based literature**
- Reviewed other organization's guidelines
- Presented draft organizational guidelines to EOC, Infection Prevention, Surgery, and CNO consortiums for approval

Part I

- General standard of environmental monitoring, initial steps when out of range is identified

Part II

- Steps for low humidity

Part III

- Steps for high humidity

Temperature/Humidity Action Log – OR/Procedure Room

| Date | Time | Room | Temp | Humidity | Action Taken |
|------|------|------|------|----------|---|
| | | | | | <input type="checkbox"/> Physician Notified, OK to Proceed <input type="checkbox"/> Physician Notified, Procedure Moved <input type="checkbox"/> Other: <input type="checkbox"/> No Action Required, Room Empty <input type="checkbox"/> Wet Pack Check <input type="checkbox"/> Fire Precautions |

Temperature/Humidity Action Log – Sterile Storage

| Date | Time | Room | Temp | Humidity | Action Taken |
|------|------|------|------|----------|---|
| | | | | | <input type="checkbox"/> Department Leader Notified, OK to Proceed <input type="checkbox"/> Department Leader Notified, Reassess temp/humidity/supply integrity in one hour <input type="checkbox"/> Department Leader Notified, Move supplies to different location <input type="checkbox"/> Department Leader Notified, reprocess some/all due to impact on environment <input type="checkbox"/> Other: |

Temperature/Humidity Action Log – Sterile Processing

| Date | Time | Room | Temp | Humidity | Action Taken |
|------|------|------|------|----------|---|
| | | | | | <input type="checkbox"/> Department Leader Notified, OK to Proceed <input type="checkbox"/> Department Leader Notified, Reassess temp/humidity/supply integrity in one hour <input type="checkbox"/> Department Leader Notified, reprocess some/all due to impact on environment <input type="checkbox"/> Other: |

Recovery Responses for Critical Humidity Events

- Fix humidity concerns which may include just shutting down AHU and postponing cases or relocating sterile supplies.
- Need back up plan for these scenarios.
- Opening up packages (sterile wrap and sterile supply to look for sign of water intrusion)
- Disposal of medications, sharps
- Decision tree of when to destroy medications
- Terminal clean all locations
- Conduct Root Cause Analysis

EVENT REPORT

| | | | |
|--|---|---|---|
| Date of Event: | | Time of Event: | |
| City: | Campus: | Building(s): | Floor: |
| Critical System(s) Impact: | | | |
| <input type="checkbox"/> Fire Detection | <input type="checkbox"/> Fire Suppression | <input type="checkbox"/> Electrical | <input type="checkbox"/> Medical Gas |
| <input type="checkbox"/> Steam/Boiler | <input type="checkbox"/> HVAC/Chiller | <input type="checkbox"/> Domestic Water | <input type="checkbox"/> Communication |
| Clinical Impact: | | | |
| <input type="checkbox"/> Emergency Dept. | <input type="checkbox"/> Surgery | <input type="checkbox"/> Patient Care | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Intensive Care Unit | <input type="checkbox"/> Radiology | <input type="checkbox"/> Laboratory | <input type="checkbox"/> SPD |
| <input type="checkbox"/> Cath Lab | <input type="checkbox"/> Oncology | <input type="checkbox"/> Nursery/NICU | <input type="checkbox"/> Labor/Delivery |
| <input type="checkbox"/> Other: Central Energy Plant | | | |
| 1. | THE EVENT – Describe what happened and any harm that resulted. Identify the proximate cause, if known. | | |
| 2. | BACKGROUND & FACTORS SUMMARY – Answer the following questions (brief summary only)- attach supporting documents). | | |
| 2.1 | What was the sequence of events that was expected to take place? Attach flowchart if available. | | |
| 2.2 | Was there a deviation from the expected sequence? <input type="checkbox"/> Yes <input type="checkbox"/> No If YES, describe the deviation. Attach flowchart if available. | | |
| 2.3 | Was any deviation from the expected sequence likely to have led to or contributed to the adverse event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe with causal statement. | | |
| 2.4 | Was the expected sequence described in policy, procedure, written guidelines, or included in staff training? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, cite source. | | |

| | |
|------|--|
| 2.5 | Does the expected sequence or process meet regulatory requirements and/or practice standards? Cite references and/or literature reviewed by the team. <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If NO, describe deviation from requirements/standards. |
| 2.6 | Did human action or inaction appear to contribute to the adverse event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe the actions and how they contributed. |
| 2.7 | Did a defect, malfunction, misuse of, or absence of equipment appear to contribute to the event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe what equipment and how it appeared to contribute. |
| 2.8 | Was the procedure or activity involved in the event being carried out in the usual location? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A If NO, describe where and why a different location was utilized. |
| 2.9 | Was the procedure or activity being carried out by regular staff familiar with the consumer and activity? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A If NO, describe who was carrying out the activity and why regular staff were not involved. |
| 2.10 | Were involved staff credentialed/skilled to carry out the tasks expected of them? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If NO, describe the perceived inadequacy. |
| 2.11 | Were staff trained to carry out their respective responsibilities? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If NO, describe the perceived inadequacy. |
| 2.12 | Were staffing levels considered to have been adequate at the time of the incident? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If NO, describe why. |
| 2.13 | Were there other staffing factors identified as responsible for or contributing to the adverse event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe those factors. |
| 2.14 | Did inaccurate or ambiguous information contribute to or cause the adverse event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe what information and how it contributed. |
| 2.15 | Did a lack of communication or incomplete communication contribute to or cause the adverse event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe who and what and how it contributed. |

| | | | | | | |
|------|--|----------|----------------|------------------------|-------------------|------------------|
| 2.16 | Did any environmental factors contribute to or cause the adverse event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe what factors and how they contributed. | | | | | |
| 2.17 | Did any organizational or leadership factors contribute to or cause the adverse event. <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe what factors and how they contributed. | | | | | |
| 2.18 | Did any assessment or planning factors contribute to or cause the adverse event? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe what factors and how they contributed. | | | | | |
| 2.19 | What other factors are considered relevant to the adverse event? Describe: | | | | | |
| 2.20 | Rank order the factors considered responsible for the adverse event, beginning with the proximate cause, followed by the most important to less important contributory factors. Attach Contributory Factors Diagram, if available. | | | | | |
| 2.21 | Was a root cause identified? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NK If YES, describe the root cause. | | | | | |
| 3. | RISK REDUCTION ACTIONS TAKEN – List the actions that have already been taken to reduce the risk of a future occurrence of the event under consideration. Note the date of implementation. | | | | | |
| | Action Taken - Description | | | | | Date Implemented |
| | | | | | | |
| 4. | PREVENTION STRATEGIES – List from highest priority to lowest priority the recommended actions designed to prevent a future occurrence of the adverse event. Begin with a rank of 1 (highest). For each strategy or action provide an estimated cost, if known, and any additional considerations or recommendations for implementing the strategy (e.g., phase-in, immediate need, triage by risk). | | | | | |
| | Rank | Strategy | Estimated Cost | Special Considerations | Responsible Party | Target Date |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| | 6 | | | | | |

5 INCIDENTAL FINDINGS – List and describe any incidental findings that should be carefully reviewed for corrective action.

The information contained in this report is confidential and is intended solely to promote safety and reduce risk.

EVENT SUMMARY

| | | | |
|--|---|---|---|
| Date of Event: | | Time of Event: | |
| City: | Campus: | Building(s): | Floor: |
| Critical System(s) Impact: | | | |
| <input type="checkbox"/> Fire Detection | <input type="checkbox"/> Fire Suppression | <input type="checkbox"/> Electrical | <input type="checkbox"/> Medical Gas |
| <input type="checkbox"/> Steam/Boiler | <input type="checkbox"/> HVAC/Chiller | <input type="checkbox"/> Domestic Water | <input type="checkbox"/> Communication |
| Clinical Impact: | | | |
| <input type="checkbox"/> Emergency Dept. | <input type="checkbox"/> Surgery | <input type="checkbox"/> Patient Care | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Intensive Care Unit | <input type="checkbox"/> Radiology | <input type="checkbox"/> Laboratory | <input type="checkbox"/> SPD |
| <input type="checkbox"/> Cath Lab | <input type="checkbox"/> Oncology | <input type="checkbox"/> Nursery/NICU | <input type="checkbox"/> Labor/Delivery |
| <input type="checkbox"/> Other: Central Energy Plant | | | |
| Summary of Event: | | | |
| | | | |
| Summary of Cause(s): | | | |
| | | | |
| Immediate Interventions: | | | |
| | | | |
| Long Term Corrective Actions: | | | |
| | | | |

Using Technology to Your Benefit

- Technology can be a blessing and curse.
- Evaluate Building automation system ability to manage and track events. This will help build your business case. Be prepared for what you are about to receive!!!!
- Hospitals and organizations need to move to continuous real-time monitoring for humidity.
- Develop a plan with IP on how long humidity can be out of range and what actions to take when thresholds are exceeded.
- **If you are using sensor technology annually Recalibrate sensors and evaluate if sensors are in appropriate locations.**

Continuous Notification or visualization

INTEGRIS

Fri 3/29/2019 6:37 AM
IBMC_SBO_Alarms@integrisk.com
AHU-27_OR-19 Humidity High Low Alarm - In High Alarm
To IBMC Temperature and Humidity

Alarm text: AHU-27_OR-19 Humidity High Low Alarm - In High Alarm
Category: Critical Humidity Alarms
Alarm State: Alarm
Value: 62.37 % Rh
Source: /AHU27 OR-Heat Exchanger/Applications/OR Alarms/OR-19 Humidity High Low Alarm

Triggered Timestamp: 2019-03-27 06:49:53 -5H, DST
TimeStamp: 2019-03-27 06:49:53 -5H, DST

The screenshot displays the INTEGRIS OR 17 control panel interface. It is divided into two main sections: CONTROL & SETPOINT and OR STATUS. The CONTROL & SETPOINT section includes a Cooling Only mode set to ACTIVE, a Temp Adjust slider set to 67°F, and the INTEGRIS OR 17 logo. The OR STATUS section includes Mode set to Cooling Only, Temperature at 68.0°F, Humidity at 35.0% Rh, ROOM PRESSURE Status set to Normal, Pressure at 0.00500 inH₂O, and Door Status set to Closed.

| Section | Parameter | Value |
|--------------------|---------------|----------------------------|
| CONTROL & SETPOINT | Cooling Only | ACTIVE |
| | Temp Adjust | 67°F |
| OR STATUS | Mode | Cooling Only |
| | Temperature | 68.0 °F |
| | Humidity | 35.0 % Rh |
| | ROOM PRESSURE | |
| | Status | Normal |
| | Pressure | 0.00500 inH ₂ O |
| Door Status | Closed | |

Don't Just Log It, Review It

Review of work orders for high humidity in critical areas from January 1, 2019 through March 19, 2019 showed we have work to do....

Use this type of information to build you business case!!!!

| Facility | # Work Orders |
|------------|---------------|
| Facility A | 4 |
| Facility B | 57 |
| Facility C | 46 |
| Facility D | 63 |
| Facility E | 9 |
| Facility F | 43 |
| Facility G | 0 |
| Facility H | 199 |
| Facility I | 29 |

Future Work

- How to measure in an appropriate frequency pattern
- How to manage the volume of times that we are out of range
- When to engage the Core Team
- When to engage physician leadership
- When to disclose to the patient

- Full implementation across system for summer 2019 monitoring
- Review 2019 data for trends and operational efficiencies to be gained
- Share information with vested parties (Surgery, C-Suite)
- Review and update process for 2020, as needed
- Use trends and data gleaned to support fiscal budget requests/planning
- Publish & Advocate

Questions

Contact Information

INTEGRIS

- Becky Lewis, RN, MSN, CIC
 - Rebecca.Lewis@integrisk.com

- Jim Trimberger, MS, CHSP
 - Jim.Trimberger@integrisk.com

- CMS, State Operations Manual, Appendix A, §482.41(c)(4)
- Oklahoma Administrative Code. Title 310, Oklahoma State Department of Health. Chapter 667, Hospital Standards, Appendix A (Ventilation requirements for areas affecting patient care in hospitals and outpatient facilities)
- FGI, Guidelines for Design and Construction of Health Care Facilities
- ANSI/ASHRAE/ASHE Standard 170-2008 (and 2013 update), Ventilation of healthcare facilities
- ANSI/AAMI ST79:2017, Comprehensive guide to steam sterilization and sterility assurance in healthcare facilities
- AORN, Guidelines for Perioperative Practice 2018