OnSite

A Hospital Environmental Health & Safety Engineering Company

Seminar 21 - Putting People First: The Healing Power of Indoor Air

Putting Patients First:

Operating and Intensive Care Room Hospital Acquired Infection Prevention Safety Surveillance System

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ORLANDO 2020 WINTER CONFERENCE AND AHR EXPO

The Overall session learning objectives are:

- Provide a data-driven description of indoor environmental factors that are associated with occupant health, including patient safety
- Explain the application of energy-saving and hygienic approaches to active humidification when supplementation is necessary as an intervention for dry air
- Provide building owners a cost-benefit analysis of occupant health as a building performance metric
- Identify the relationship between water in the liquid and vapor state and the human body

Potential Source Bias Declaration & Acknowledgements

Cross Functional Teamwork Leaders – Admin, Clinical, Infection Prevention, Safety, Quality, D&C, EVS, Facilities

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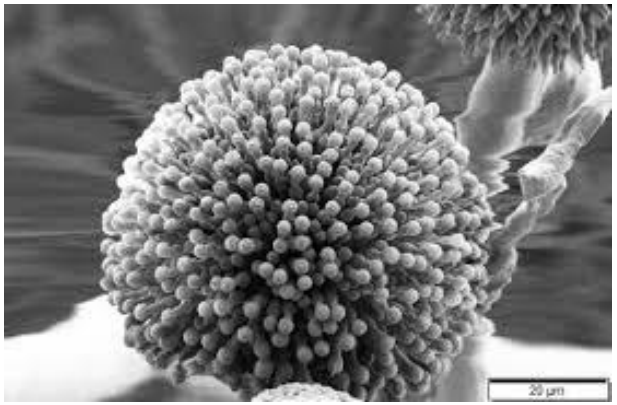
Pharmacy Manager, JSD Pharmacy

Dr. Jennifer Wagner and Damon Greeley are co-inventors of an operating room monitoring algorithm to predict risk of microbial contamination

Contaminated Operating & Procedure Rooms in the News

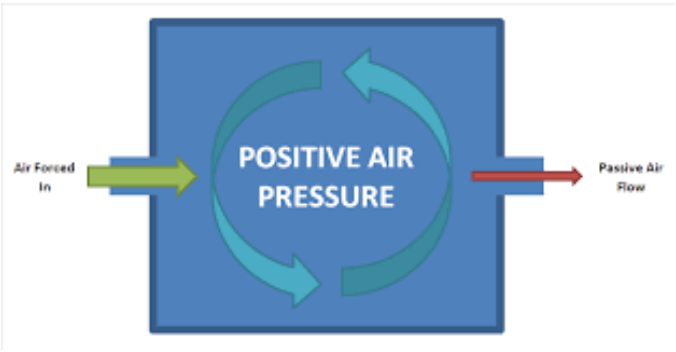
- LA County-USC
- Seattle Children's
- State of Colorado – Surgical Smoke Cessation
- Lint Leading to Blood Clots
- Disposable Attire



Helping Improve the Environment for Patients, Staff, and the Planet

- Harvard BJ
- Airflow and air exchanger studies for 15, 20, and 25

Building Utility Service Type & Climate Zone	Annual Energy Savings per 2 ACPH Reduction*
City Thermal Utilities Climate Zone 5	$4,027
Campus Thermal Climate Zone 4	$2,820
Self-Generated Thermal Climate Zone 4	$2,087



*Energy calculations were based upon ~ 20 ACPH for a 550 SF operating room that included electrical energy from fans, pumps, cooling systems, thermal energy for preheating and terminal unit reheating, and steam humidification. The model also included the appropriate seasonal utilization hours for cooling, heating, economizer, and dehumidification/sub cooling modes of operation. The air handling system was ~40% outdoor air.

Patient Safety and Quality Improvement Act of 2005

To encourage hospitals to pursue safety research, The Patient Safety and Quality Improvement Act of 2005 was passed. This act established a network of patient safety organizations and a national patient safety database. To encourage reporting and peer-review of adverse events, near misses, and dangerous conditions, it also established federal confidentiality protection from legal discovery of patient data collected as part of hospital efforts to assess and resolve patient safety issues. ***Hospital data collected in order to reduce medical errors and improve patient safety continues to be generally exempt from legal exposure.***

TJC EC.02.05.01 EP 15

Where Do Operating Rooms Particulate Levels Rank on ISO Cleanliness?

ISO 1

Can't Be Measured

ISO 5-6

500,000+

ISO 7-9

500,000,000+

ISO 9

How Often Do Facilities Comply?

ISO 5-6

500,000+

> 95%

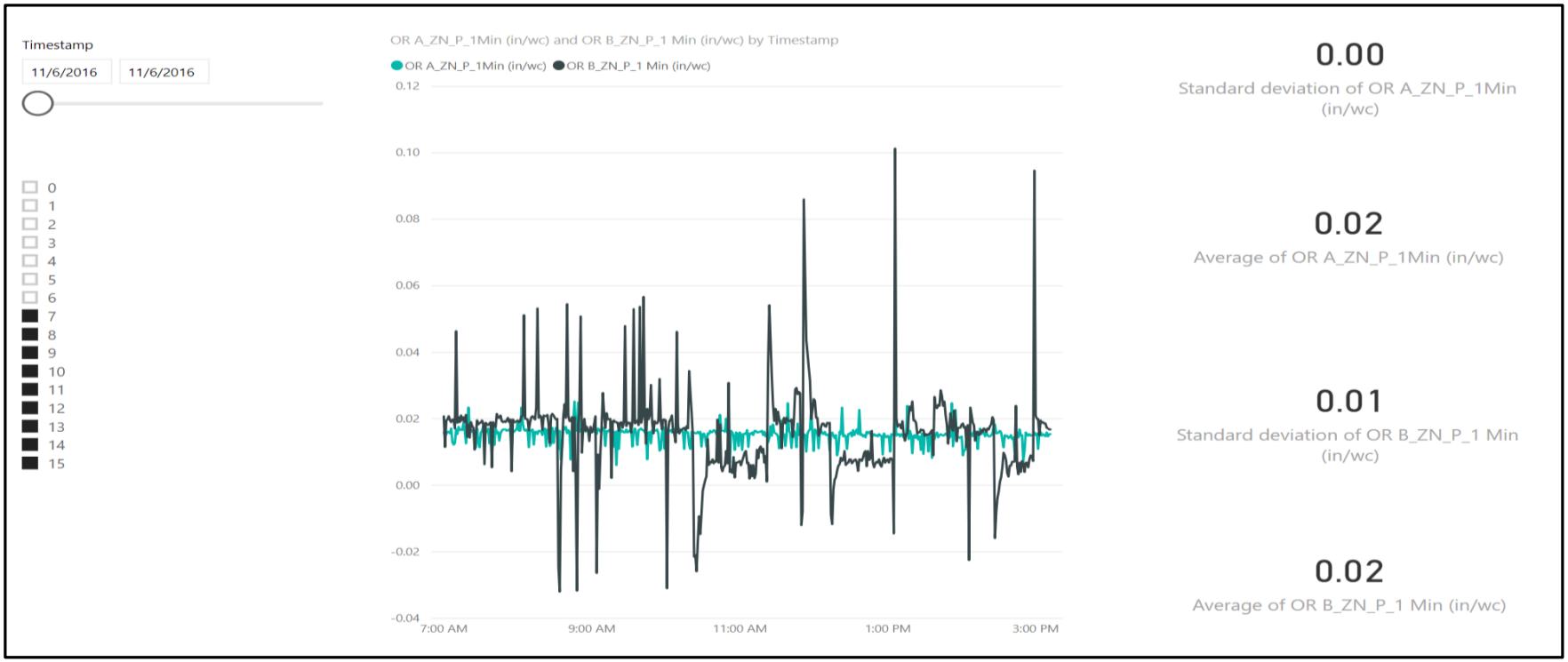
ISO 7-9

500,000,000+

< 40%

Evaluation of Independent Pressure Control vs. PID Loop Control for Critical Rooms In-Activity

1. Venturi valve – Std Dev 0.00” w.c., Avg. 0.01” w.c.
2. Control Exh/Ret Damper or CV – Std Dev 0.01” w.c., Avg. 0.02” w.c.
3. Typical OR needs 2 additional ACPH to achieve 0.01” w.c. greater pressure to account for variability (Std Dev) associated with pressure control method #2.



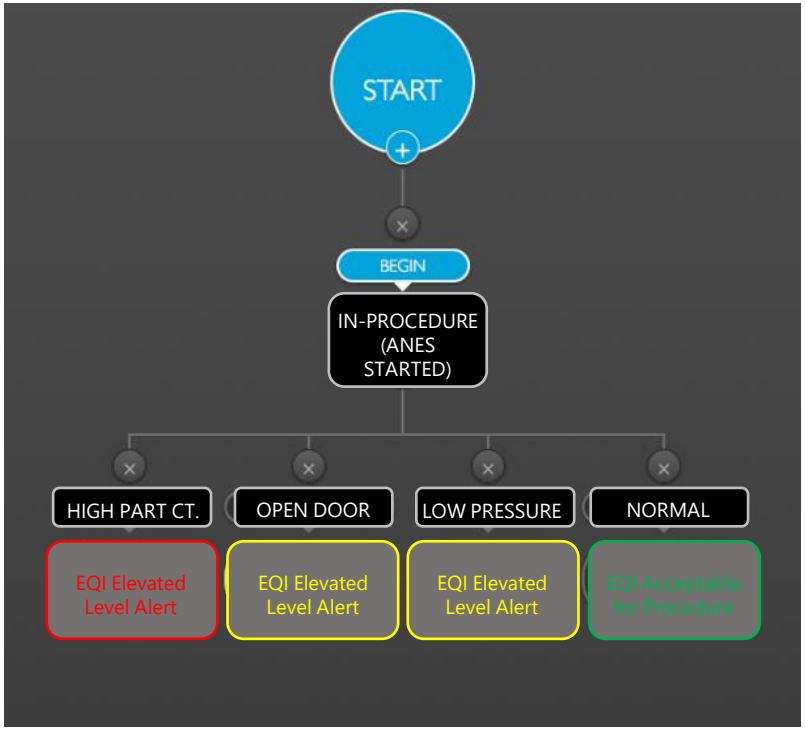
Pressure Trend from BMS

Environmental Quality Index (EQI)
Continuous Environmental Monitoring

Voice User Interface Design – 'Smarter' & Safer Operating Room In Development

Dr. Smith: "***Computer, what is my next case recommended EQI level?"***

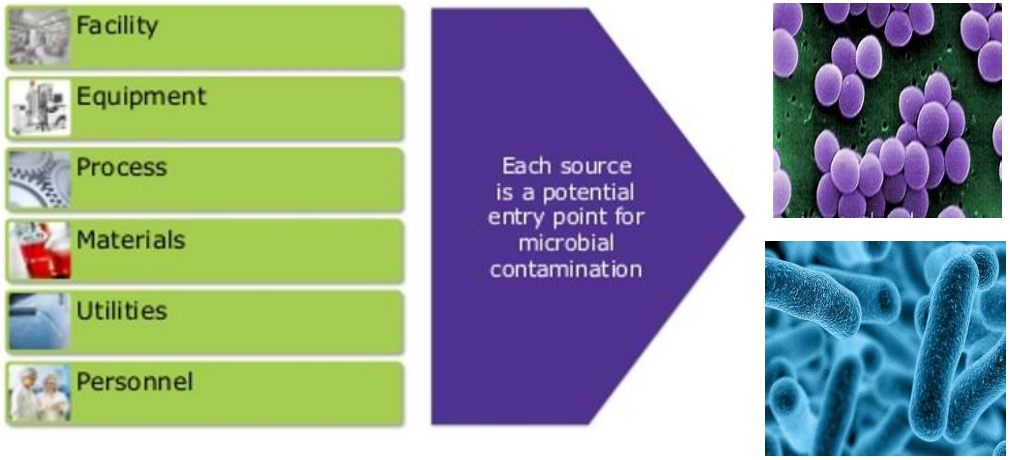
Computer: ***"Hello Dr. Smith, your next primary procedure is a kidney donor laparoscopic. Your recommended maximum EQI level is 1. Are you ready to proceed?"***

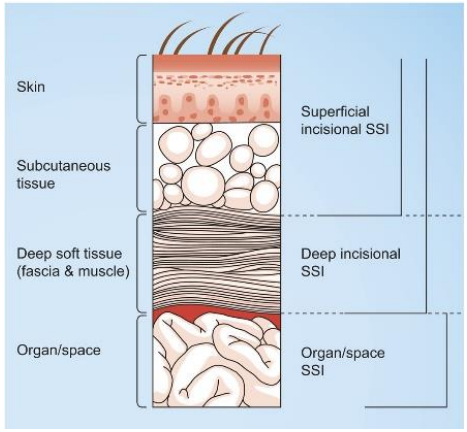


Hospital Acquired Infections (HAI) – Risk Picture and Antibiotics

1. Our clients **holistic risk picture is complicated**
   A. Need to gather and correlate data to develop risk **predictors** by OR according to previous adverse events.

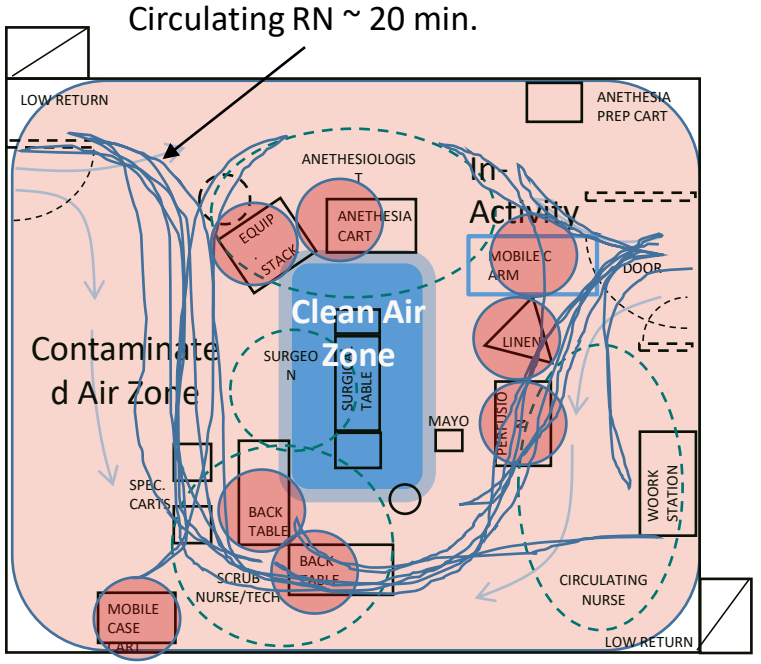
2. Continue to validate the efficacy of the risk **predictors** which is especially important as we enter a **post-antibiotic era**.





Environmental Quality Awareness of Internally Generated & Transmitted Microbial Contaminants

5 to 8	9 to 12	13 to 16	17 to 20
Scrub and glove	Prep patient and draping	Pass instruments	Use Bovie for 10 seconds every minute on the minute
Scrub and glove	Prep patient and draping	Prep Bovie, pass instruments	Time Bovie use
Verify return grilles are not blocked, review testing to make sure info needed for CFD modeling is being obtained	Take pictures and video	Take media plates out of room and blow	Verify info for CFD modeling being collected
Monitor particle counters	Measure air velocity and temp/humidity at surgical field and at outside points	Monitor particle counters check function of temp/humidity measuring devices	Walk around the room to check location of devices and room pressurization
Monitor particle counters	Adjust mask, scratch arm and forehead	Stop samplers at 15 min, media change, seal samplers and hand to Damon	Clean sampler, install plates and start sampler
Open instruments and set up back table	More instruments	Pass instruments	Watch timing of installing plates and restarting samplers
Verify location of samplers and particle counters	More instruments	Stop samplers at 15 min: media change, seal samplers and hand to Damon	Clean sampler, install plates and start sampler



EQI is a simulated surgical procedure that follows proper techniques for scrubbing and gowning with each team member movements and placements similar to typical procedures while they are generating and gathering data

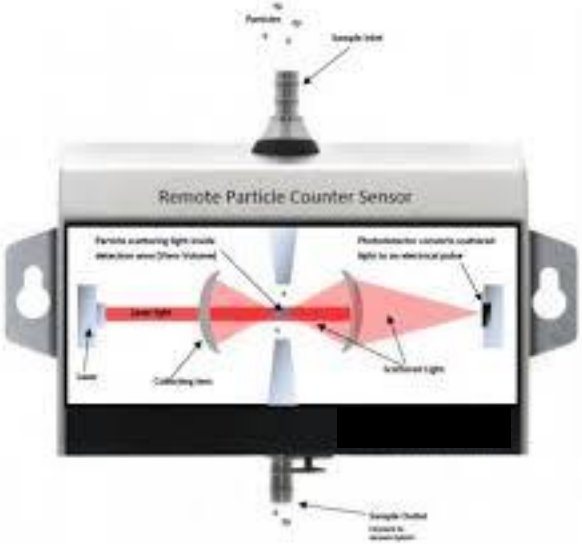
SBAR - FUNDAMENTAL SITUATION: NO REGULAR USER UNDERSTANDS ROOM BY ROOM AIR DISTRIBUTION PATTERNS!

In Vitro & In Vivo Testing

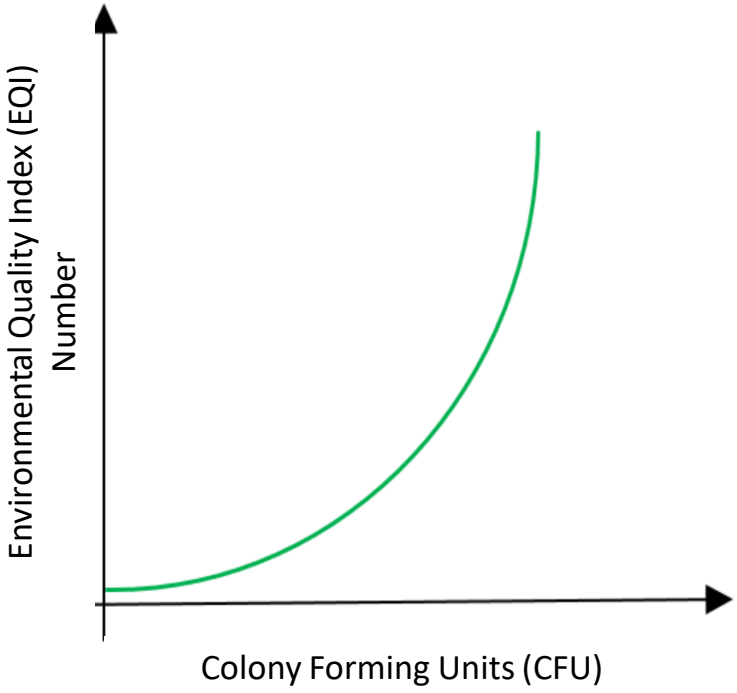
Particle, Microbial, Temp, Velocity, CO2, & RH Monitoring

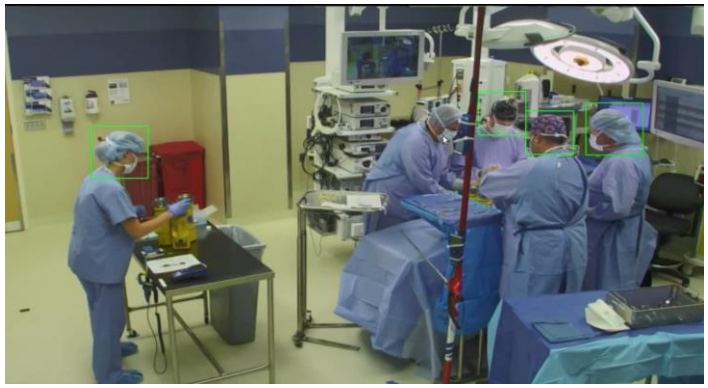
ISO Cleanroom Classification Table

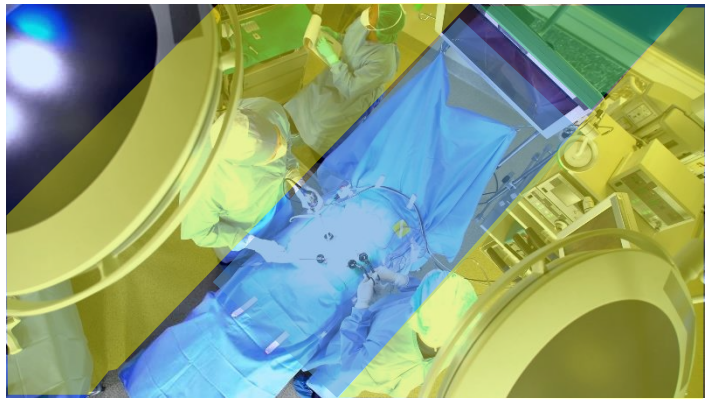
	ISO classification	Highest levels of particle concentrations (particles/m³) equal to or greater than the parameters listed as follows.					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	5.0 µm
Certify every 6 months	Iso Class 1	10	2	-	-	-	-
	Iso Class 2	100	24	10	4	-	-
	Iso Class 3	1,000	237	102	35	8	-
	Iso Class 4	10,000	2,370	1,020	352	83	-
	Iso Class 5	100,000	23,700	10,200	3,520	832	29
Certify every 12 months	Iso Class 6	1,000,000	237,000	102,000	35,200	8,320	293
	Iso Class 7	-	-	-	352,000	83,200	2,930
	Iso Class 8	-	-	-	3,520,000	832,000	29,300
	Iso Class 9	-	-	-	35,200,000	8,320,000	293,000

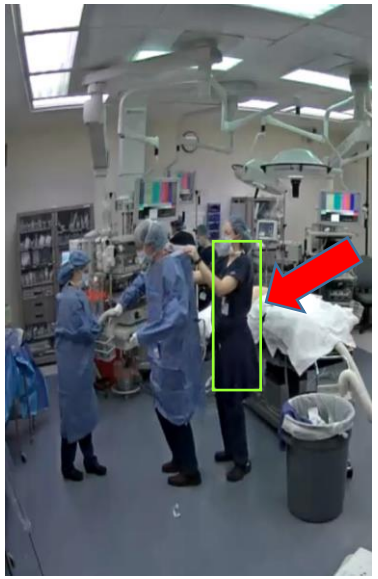


Risk Mapping Algorithm for Surveillance System



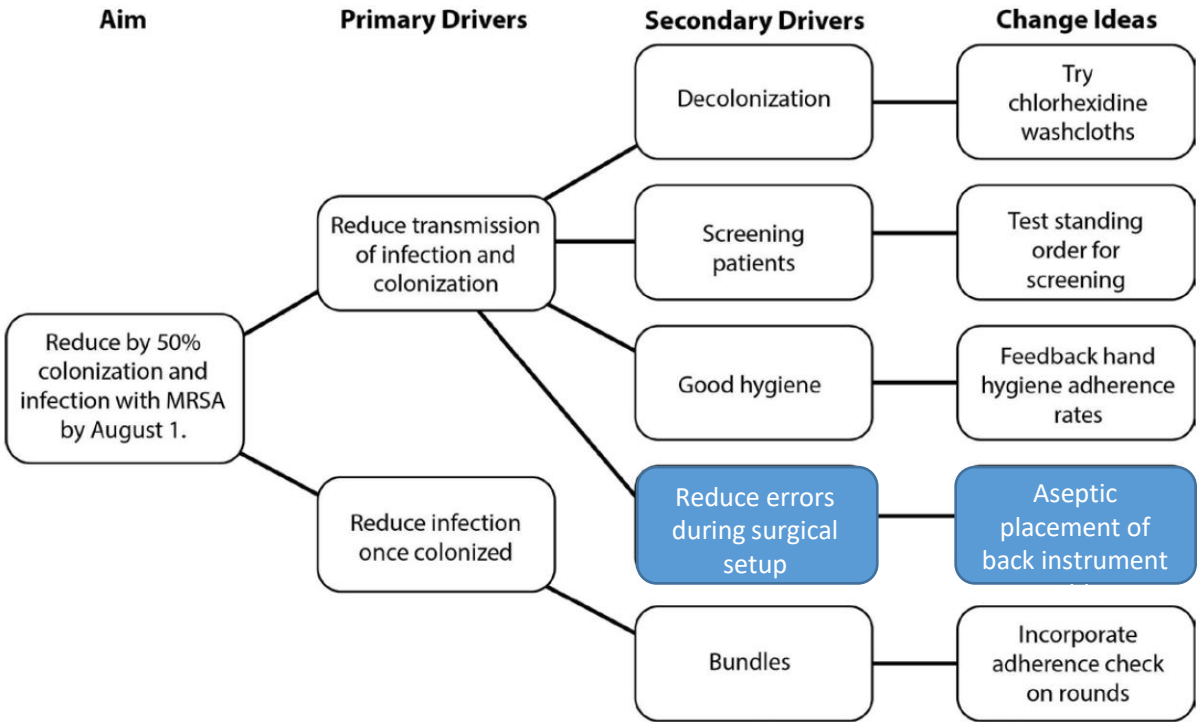






SBAR - FUNDAMENTAL IMPROVEMENT: INFORM USERS OF ROOM BY ROOM AIR DISTRIBUTION QUALITY RISKS!

Example Orthopedic OR - QI Bundle Re-Design



HRO: Evidence based process bundles + performed as intended consistently overtime = clinical excellence.

Twenty Operating Room Optimization Project & Retrospective Study

Operating Room	Improvement Date	#SSI/ #Surgeries	Proportion SSI	#SSI/ #Surgeries before Improvement	Proportion SSI before Improvement	#SSI/ #Surgeries after Improvement	Proportion SSI after Improvement
Control 1	NA	8/63	0.13	NA	NA	NA	NA
Control 2	NA	14/82	0.17	NA	NA	NA	NA
Control 3	NA	4/27	0.15	NA	NA	NA	NA
Control 4	NA	2/30	0.07	NA	NA	NA	NA
Control 5	NA	6/179	0.03	NA	NA	NA	NA
Control 6	NA	9/130	0.07	NA	NA	NA	NA
Optimized 1	Jan 2016	NA	NA	3/8	0.38	0/11	0
Optimized 2	Jan 2016	NA	NA	1/16	0.06	3/49	0.06
Optimized 3	Jan 2016	NA	NA	6/70	0.09	6/171	0.04
Optimized 4	Jan 2016	NA	NA	2/4	0.5	2/18	0.11
Optimized 5	April 2016	NA	NA	1/7	0.14	2/24	0.08
Optimized 6	April 2016	NA	NA	0/3	0	2/9	0.22
Optimized 7	Aug 2017	NA	NA	7/133	0.05	2/83	0.02
Optimized 8	Aug 2017	NA	NA	3/104	0.03	2/55	0.04
Optimized 9	Aug 2017	NA	NA	5/33	0.15	1/7	0.14
Optimized 10	Aug 2017	NA	NA	1/29	0.03	0/1	0
Optimized 11	Aug 2017	NA	NA	13/139	0.09	5/61	0.08
Optimized 12	Aug 2017	NA	NA	13/108	0.12	3/40	0.08
Optimized 13	Aug 2017	NA	NA	1/3	0.3	0/4	0
Optimized 14	Aug 2017	NA	NA	0/2	0	1/10	0.1
					p=0.039		
	%SSI	43/511	8.4%	56/659	8.5%	29/543	5.3%

Environmental Qualities Improvement & Monitoring Benefits

"OnSite's environmental quality improvement (EQI) assessment tools and recommendations helped our team to be recently recognized by The Joint Commission as ***Leading the Nation*** in overall environmental monitoring & performance."

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Director, Infection Prevention
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Thank You!

Questions

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