AHRMM Webinar

The Health Care Supply Chain Response to COVID-19: Provider and Supplier Collaboration Case Study

Rapid Design and Conversion of Anesthesia Circuits to Meet COVID-19 Challenges Through Partnership Between Supply Chain, Clinicians, and Supplier

AHA Events

Presenters

- Kate Mulligan, Perioperative Implementation Manager, Clinical Resource Integration, The Resource, Engineering and Hospitality Group, Providence Health
- Karen Stewart, RN, Clinical Resource Integration Program Manager, The Resource, Engineering and Hospitality Group, Providence Health
- Mark Ursin, Sourcing & Contracts Manager, The Resource, Engineering and Hospitality Group, Providence Health
- Frank Schramm, MD, Clinical Chair, Anesthesia Focus Group, Anesthesia Medical Director, Providence Regional Medical Center Everett, Providence Health
- Jimmy Chung, MD, MBA, FACS, Associate Vice President, Perioperative Portfolio, Providence Health
- Travis Salter, Anesthesia/Respiratory, Medline Industries, Inc.

Providence

Responding to the first patient and preparing for the surge

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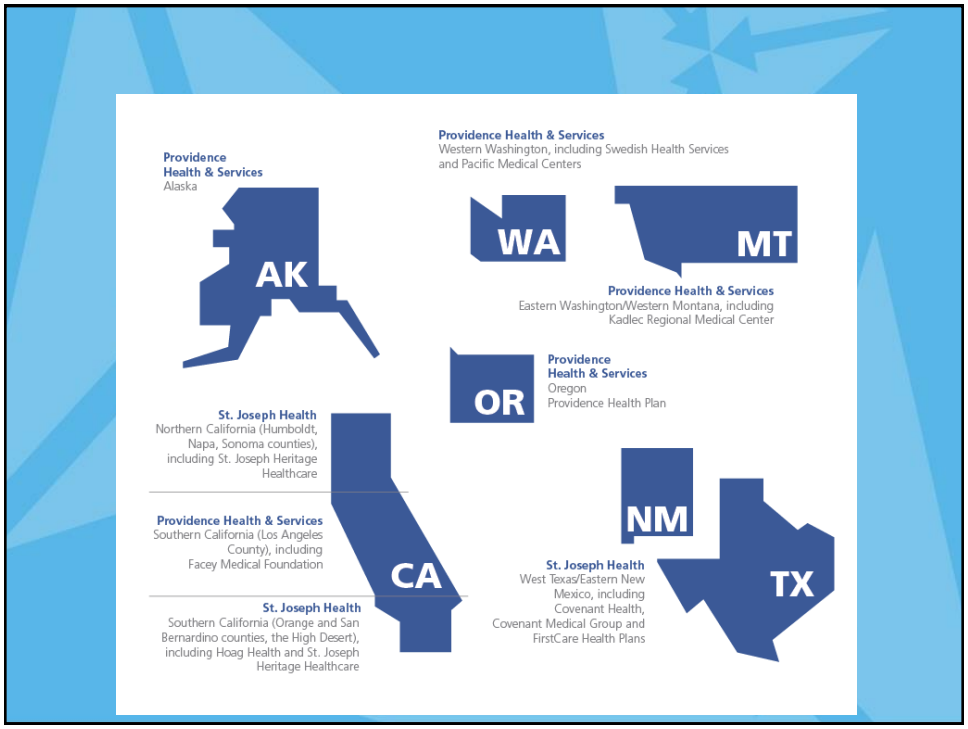
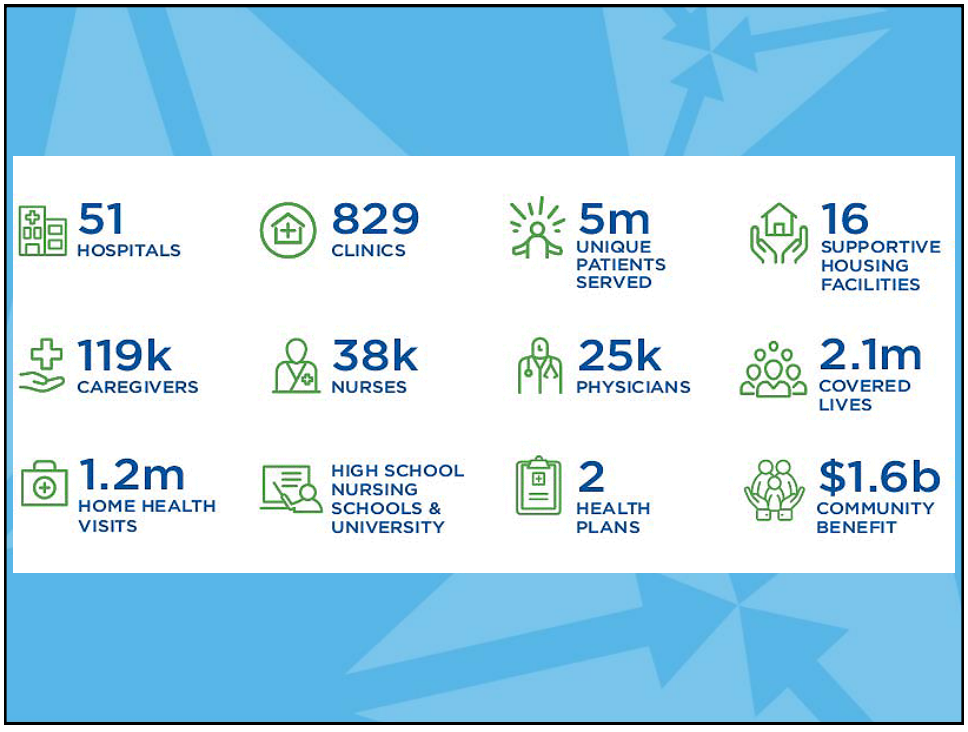
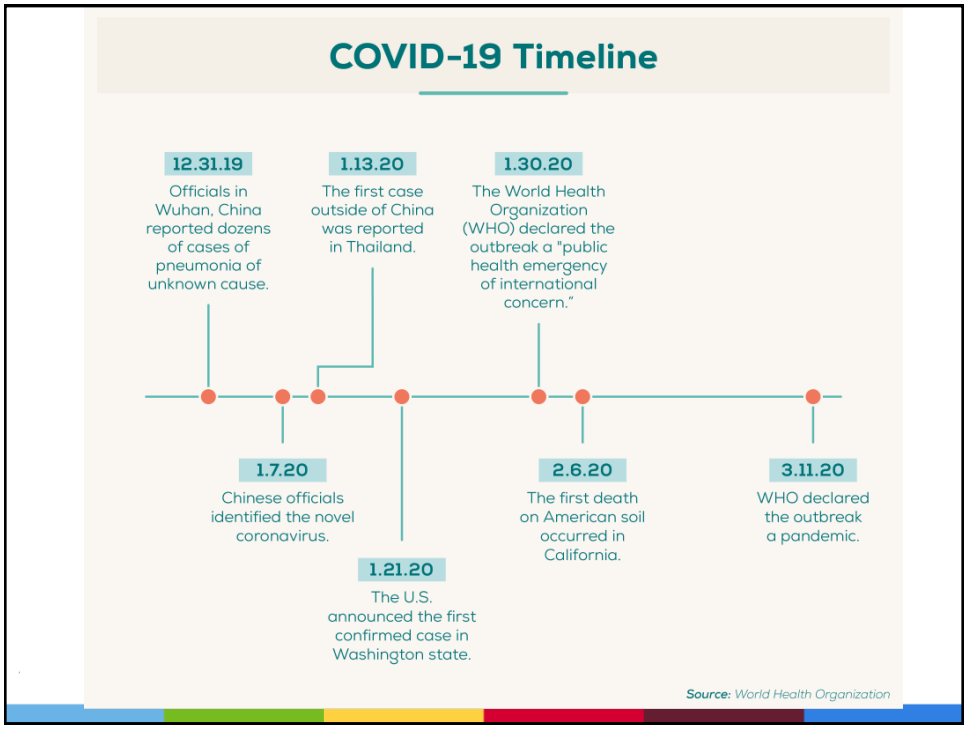
CQO: The Health Care Supply Chain




51
HOSPITALS
829
CLINICS
5m
UNIQUE PATIENTS SERVED
16
SUPPORTIVE HOUSING FACILITIES
119k
CAREGIVERS
38k
NURSES
25k
PHYSICIANS
2.1m
COVERED LIVES
1.2m
HOME HEALTH VISITS
HIGH SCHOOL NURSING SCHOOLS & UNIVERSITY
2
HEALTH PLANS
$1.6b
COMMUNITY BENEFIT


COVID-19 Timeline
12.31.19
Officials in Wuhan, China reported dozens of cases of pneumonia of unknown cause.
1.7.20
Chinese officials identified the novel coronavirus.
1.13.20
The first case outside of China was reported in Thailand.
1.21.20
The U.S. announced the first confirmed case in Washington state.
1.30.20
The World Health Organization (WHO) declared the outbreak a "public health emergency of international concern."
2.6.20
The first death on American soil occurred in California.
3.11.20
WHO declared the outbreak a pandemic.
Source: World Health Organization

- Jan 21, 2020: First case in the US
  - 300 world wide, in 6 countries
  - 6 deaths, all in China
- Feb 29, 2020: First death in US reported from WA
- Mar 4, 2020: 10th US death reported from WA

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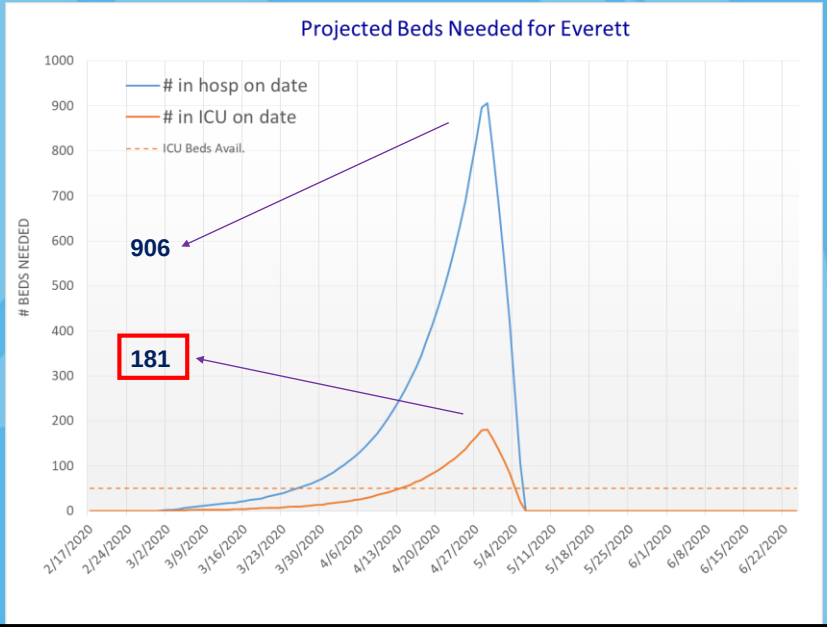
Everett Hospital – Providence Model (3/18/20)



Projections for all regions (3/18/20)

Service Area	Max Med/Surg occupancy	Max ICU occupancy	Max Ventilator need
Alaska	621	154	77
Los Angeles	3082	770	385
Northern California	1484	371	186
Northwest Washington	725	181	91
Orange County	4709	1178	589
Oregon	2369	593	297
Eastern Washington	1303	326	163
Southeast Washington	1146	287	144
Southwest Washington	852	213	107
Swedish Health Sys	2295	573	287
Texas/New Mexico	1231	307	154
Western Montana	311	77	39
Total	**20128**	**5030**	**2519**

Converting anesthesia machines to ventilators

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Background

- Ventilator shortage expected = COVID-19 pandemic
- Anesthesia machines (AMs) can be used as ventilators with Anesthesia professionals to operate and manage
- The American Society of Anesthesiologists guidelines on how to convert and manage AMs as ventilators
- The three major manufacturers provided specifications
- FDA temporary approval

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Proactive approach

- 1700 ventilators
- 800 anesthesia machines, multiple models, three companies
- Allotment for emergency surgeries
- Assignment of anesthesia professionals
- ASA, APSF guidelines
- Machines need to be run by anesthesia professional

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Project launch

- Began with SBAR to initiate system-wide project
- Goals:
  - Develop playbook with step-by-step instructions
  - Identify key stakeholders and leaders
  - Create education plan for anesthesia professionals and perioperative leaders

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Key stakeholders

- Anesthesia directors
- Anesthesiology professionals
- Anesthesia techs/assts
- Anesthesia group executives
- OR directors
- ICU directors
- Clinical engineers
- Infection Prevention
- Supply Chain (REH)
- Clinical Education
- IT
- Suppliers/vendors
- CMOs

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Converting the anesthesia machine into a ventilator

- Different machines for different purposes
- Different skillsets required
- Run by different professionals
- EHR interface is different
- More monitoring and maintenance required

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Converting the anesthesia machine into a ventilator

- Logistical challenges
- Privileging/training
- Protecting the patient
- Protecting the caregivers
- Protecting the machine
- What products do we need
- Can current products meet the different needs

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Prepare – Ventilator Process

- Assign local ventilator “lead”
  - Tracks availability of ventilator & AM inventory
  - Serve as liaison between ICU and OR
  - Create a process for critical care staff to request an AM
- Assign specific AMs to the reserve stock
- Create an “vent on-call” list for the AMs

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Prepare – Anesthesia Process

- Assign anesthesia professional(s)
  - Responsible for AMs
  - Set up, monitor, maintain, round hourly
  - Coordinate with clinical team to recommend appropriate settings
- Predetermine role of ANES professional in care team
- Create “vent on-call” schedule for ANES prof’s
- Predetermine appropriate settings and limits to match severity of illness (see ASA document for details)
- Address any issues, (i.e. privileges, compensation, org. structure, etc.) in advance with local leaders

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Prepare – Dry Run Practice

- Perform “dry run” to identify potential problems.
- Ensure ANES profs are familiar with any changes in Epic workflow documentation
- If OR or PACU is to be used as ICU
  - Ensure patient transport/access routes are detailed to avoid exposure to non-COVID patients
  - Ensure that proper level or isolation is feasible (e.g. negative or neutral pressure)
- AMs may need to be moved to non-surgical site
- Ensure appropriate gas, suction, exhaust, and power sources are available at each potential site

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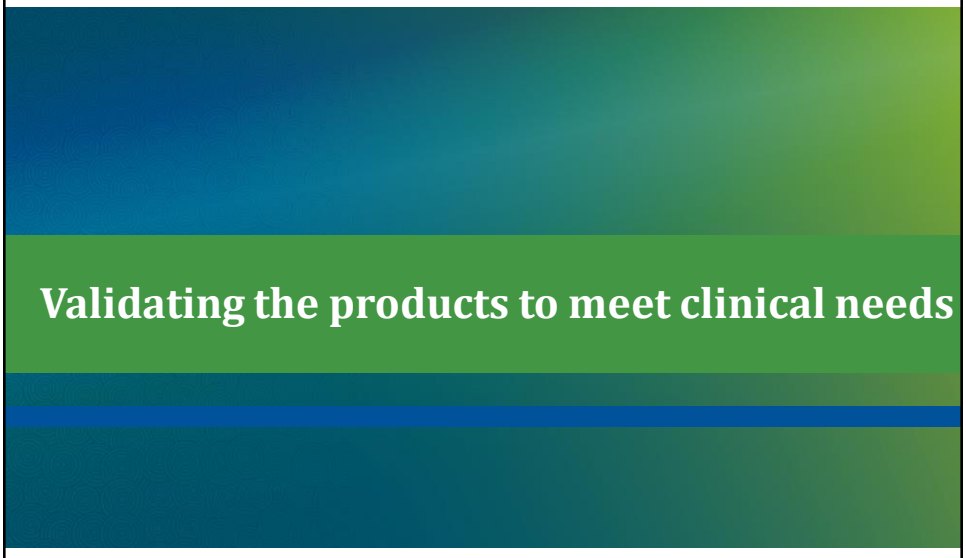

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General Considerations

- Inventory report of available AMs and their specs to facility admin.
- Plan for deployment and staffing in advance
- ANES prof. immediately available at all times to manage and assist
- Consult with intensivists on individual ventilator strategies if possible

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General Considerations

- Routine rounding by ANES prof. on all AMs in use as long term ventilators
- Observation for CO2 absorber exhaustion, moisture accumulation in circuit and HMEF function degradation part of routine rounding
- Create schedules and checklists for specific requirements for each AM (e.g., daily machine check)
- Other personnel (e.g. CC RNs/CRTs) instructed to not adjust AM ventilators without ANES prof. involvement

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Specific mechanical guidelines

- Remove or drain & lock vaporizers and nitrous cylinder and hoses
- Assure that hospital pipeline air and oxygen, or appropriately sized cylinders, are available
- If WAGD or main vacuum line suction connections are unavailable the scavenger system should be disconnected to avoid dangerous over pressurization of breathing circuit
- If O2 supplies are in question, bellows ventilator drive gas can be reconfigured by biomedical engineering to use compressed air (GE)
- APL set to 0 cm H2O and large reservoir bag if available
- Power should be cycled between patients

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Specific mechanical guidelines

- A HMEF with high viral filtration efficiency (VFE) should be installed at the “Y” and a second high VFE (HEPA) filter should be installed at the expiratory inlet to the AM
- Replacement HMEF/HEPA filters should be immediately available and a means to occlude the ETT during HMEF replacement should be assured (e.g., chest tube clamp) in order to reduce airborne contamination

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Specific mechanical guidelines

- If continuous ETCO2 monitoring is in use the source should be from the machine side of the HMEF
- If not feasible due to materials then insert a Luer lock disc HEPA filter at the insertion point to the AGM
- Back up manual resuscitator with appropriate HEPA filter available at all times
- While AM self-testing is recommended every 24 hours manufacturers have extended this to 72 hours during the crisis
- Power should be cycled between patients

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Clinical guidelines

- Due to rebreathing in a circle system, FiO2 must be monitored
- Oxygen sensors must be recalibrated at regular intervals
- Fresh gas flow and FiO2 may be adjusted in different ways based on manufacturer

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Clinical guidelines

- Rebreathing of exhaled gas is the distinguishing feature when comparing AMs and other ventilators
  - The percentage of rebreathed gas is the result of Fresh Gas Flow(FGF) in to the circle system
  - Higher FGF=less rebreathing until FGF exceeds Minute Ventilation (MV) at which time there is little to no rebreathing
  - CO2 absorber (e.g., soda lime) is necessary to allow rebreathing without CO2 accumulation
  - Higher FGFs result in lower humidity and potential mucous plugging and endothelial injury but spare the CO2 absorbent
  - Lower FGFs result in higher passive humidity and potential water accumulation in the circuit as well as early degradation of the CO2 absorbent and decreased filter efficiency
  - Active humidification of the circuit is not recommended and accumulated water must be removed from the circuit

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Clinical guidelines

- Available ventilator modes vary by manufacturer, consult with CC physician regarding the ventilation strategy for each patient individually
  - The highest featured AMs should be deployed first and should at a minimum have SIMV+PS ventilation mode

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What is the best strategy for protecting the anesthesia machine from contamination?

- Place a “high quality” viral filter between breathing circuit and patient’s airway with capability to sample gas from the machine side of the filter.
  - HMEF (Heat and Moisture Exchange Filter) is preferred to preserve humidification.
  - If filter only is used, reducing fresh gas flow is an important strategy for preserving humidity. (1-2 L/min or less)
- Place a second filter at the end of the expiratory limb at the connection to the anesthesia machine.
- Breathing circuits should be discarded after every patient.

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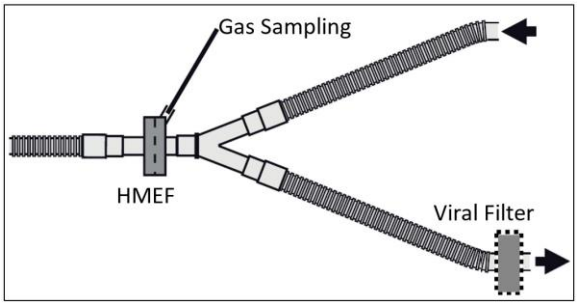
Apsf.org



Preferred Filter Configuration

VFE > 99.99% for each filter. Gas sampling on machine side of filter. (Courtesy Draeger Medical)

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Collaboration and partnership with Supply Chain

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Supply chain (REH): key partner for anesthesia

- Capital strategy (preexisting project to replace machines)
  - About 800 anesthesia machines with majority at or near end of life
  - Developed multi-year replacement schedule to align financial resources with critical needs
- Circuits and filters: meet the clinical need
  - Confirm clinical need and criteria for patient and caregiver safety
    - The product needed to meet criteria for both OR use and ICU (long-term) use
    - Provide protection for the anesthesia machines
  - Work with supplier to create the correct product
  - Convert and distribute across the system

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Supply chain (REH): key partner for anesthesia

- Strategic Partnerships
  - Comprehensive relationship – cost effective clinical outcomes rather than line item savings
  - Leverage established internal teams (Supply Chain, Clinical Resource Integration) with supplier's teams
  - Longer term commitment & Quality Products leads to stronger product availability

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Anesthesia machine circuits

- Usage roughly 20,000 units monthly
- About 30+ different configurations developed locally over the years
- Providence was already working on reducing variation in circuit configuration pre-COVID
- Strong pre-existing relationship with supplier crucial to success as healthcare institutions were struggling to find components to meet ASA recommendations
- Circumstances forced a quick pivot to meeting new expectations
- Trust and collaboration to move from planning to production in rapid order

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COVID-19 ARRIVES!

HOW can we provide ALL needed supplies?

- **ANESTHESIA CIRCUITS FOR COVID PATIENT CARE**:
- Resources already available due to our previous efforts.
  - Clinical leaders and team members from throughout the health system.
  - REH (Supply Chain) with knowledge of available products.
  - Vendor Strategic Partner with awareness of need.
- Mobilization of efforts:
  - Clinical requirements to meet ASA and APSF guidelines.
    - Circuit configuration
    - Filtration requirements
  - REH (Supply Chain) to assess new, specific need.
    - Reconfigure existing circuits?
    - COVID specific circuit?

  Vendor
  - Understood clinical need
  - Expedited sourced materials

COMMUNICATION ■ TRUST ■ TEAMWORK

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Anesthesia Circuit Logistics

- **Challenges to Logistics**
  1. Visibility to Critical Products
  2. Inventory Management Platforms
  3. How do we get these products to our caregivers ***quickly and efficiently***?
- **Solutions Generated**
  - Team Approach
  - HUB Strategy
- **Communication**
  - How do we communicate to many different groups a new process?
  - Connections already established
  - Two communication documents with strong consistency
- **Looking ahead**
  - Increased visibility to processes
  - Established trust in the system approach

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Supplier perspective

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Customer Challenges

- Supply
- Physician Preference
- Waste
- Multiple Vendors
- Standardization

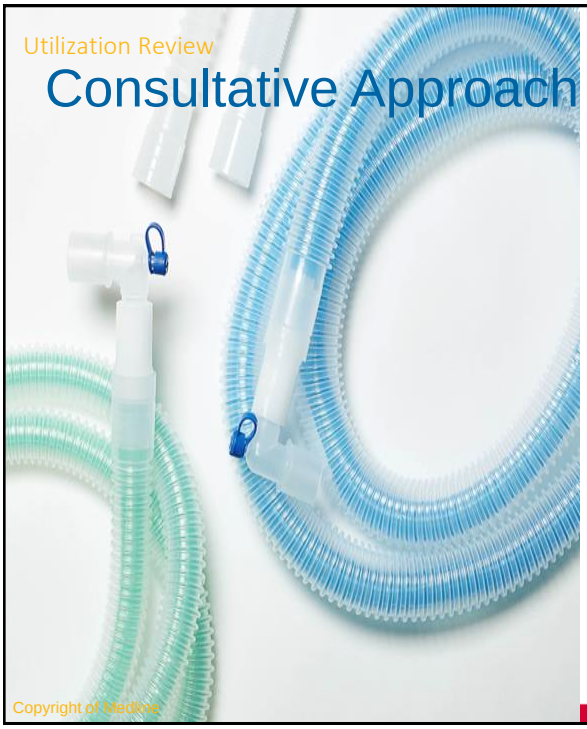
Increased Costs

Decreased Efficiency

Variability

Utilization Review

Consultative Approach



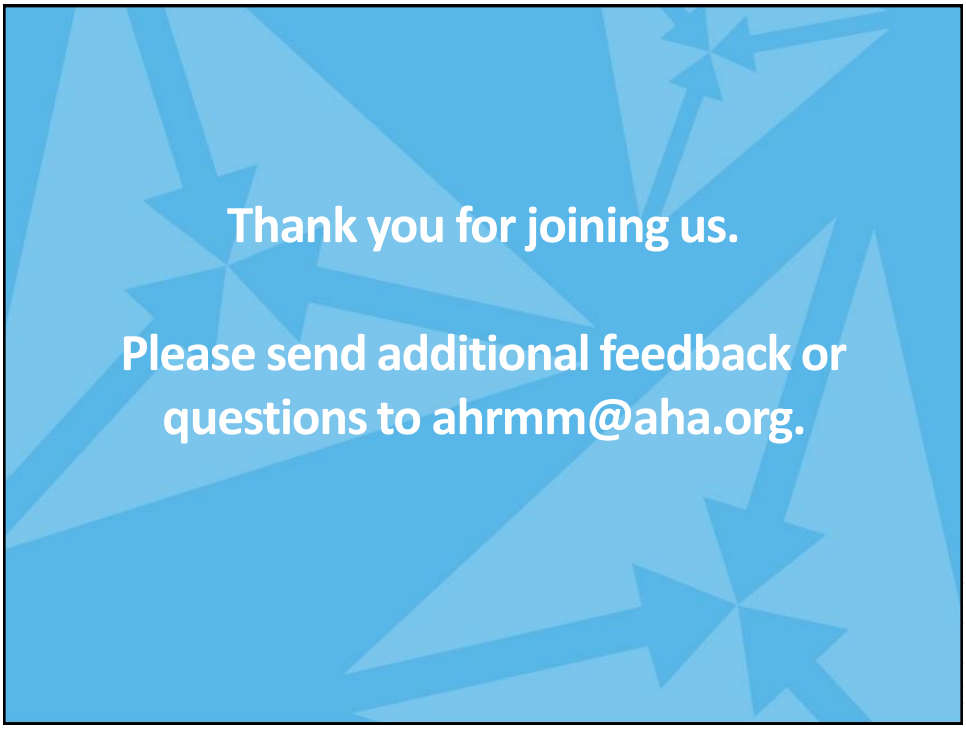
3-Step Process:

1. Review current circuits configurations & market need
2. Observation: Look for items regularly added or discarded
3. Recommendations and samples – Review with key clinical personnel

IDENTIFY A SOLUTION

Simplify	Order One Item Number
Reduce	Touchpoints & Setup Time
Streamline	Inventory
Improve	Turnover Time
Decrease	Labor Costs


Questions?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