AIRWAY SAFETY CHANGE PACKAGE

Recognition and Prevention of Airway Events and Harm

American Hospital Association®

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
PARTNERSHIP FOR PATIENTS℠
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HRET
HEALTH RESEARCH & EDUCATIONAL TRUST
In Partnership with AHA

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The AHA/HRET HEN would like to acknowledge our partner, Cynosure Health, for their work in developing the Airway Safety Change Package.

AIRWAY SAFETY OVERVIEW

Background

Approximately 25,000 potentially life-threatening errors occur DAILY in hospital Intensive Care Units. Up to 10% of these adverse events involve unintended incidents in airway management; more than half of these errors have been deemed preventable.

Injury and mortality from difficult airways can result in 20% of all adverse airway events in hospitals.

Sudden-onset, life-threatening critical respiratory events in patients treated with opioid analgesia for post-operative pain have an incidence of 3.6 per 10,000 hospitalized adults.

Suggested AIM

- Decrease airway complications by 40% by December 8, 2014.

Potential Measures

Outcome: Decrease airway complications such as dislodgements, skin and mucosal injury, delayed intubation, and delays in recognition of airway compromise (EOM: OPT-HEN-AIRWAY-25)

Process:

- The extent of compliance with an RCA completion for airway complications (EOM: OPT-HEN-AIRWAY-27)
- The extent of compliance with monitoring standards for patients at high risk for airway compromise. (EOM: OPT-HEN-AIRWAY-26)

KEY ELEMENTS	IDEAS TO TEST
Prevention of Unanticipated Airway Events	• Develop and implement a decision tree/screening tool to identify patients at risk for airway compromise. (e.g. check for PCA use, history of sleep apnea) • Implement a standardized sedation scale assessment on all high-risk patients who are receiving narcotics or sedatives. (e.g. RASS, Pasero) • Educate and train care staff to use a standardized sedation scale with all at-risk patients. • Use a scale that measures changes in sedation as a trigger for a Rapid Response Team evaluation. • Implement O_2 saturation monitoring for all post-op patients. • Implement End Tidal CO_2 monitoring for all high-risk patients. • Consider NIPPV for patients with a high risk for airway compromise.
Optimal Airway Placement	• To identify patients with high-risk airways, develop and utilize a standardized airway assessment tool such as LEMON: LOOK, EVALUATE, MALLAMPATI, OBSTRUCTION, NECK. • Provide an airway management cart in each relevant unit. • Offer simulation training for providers who place airways. • Utilize an LMA vs. ET chart for safety and standardization. **(Operating Rooms ONLY)** • Develop and utilize an algorithm for patients with difficult airways. • Develop a back-up staffing protocol for airway events and post it in a visible location.
Safe Airway Maintenance	• Implement capnography monitoring for all intubated patients in the ICU (model the anesthesia standard) as one mechanism to identify airway dislodgment. • To prevent lumen narrowing and airway blockage, use tracheostomies that have a disposable inner cannula. • Adopt spontaneous awakening trials (SATs), coordinated with spontaneous breathing trials (SBTs), to promote early weaning and extubation. • Develop a method for identification of patients with a difficult airway to ensure appropriate vigilance, personnel, and equipment available if unintended extubation occurs. • Standardize a securement method for endotracheal tubes and tracheostomies to minimize airway dislodgement. • To ensure frequent assessment for risk for skin injury, review and update the standards for tube repositioning and skin and mucosal inspection. • Develop a treatment standard to electively exchange airways that have narrowed and have pilot balloon leaks. • Develop a process for a bedside debriefing when a skin injury occurs to identify future opportunities for improvement in procedures, equipment, or workflows.
Airway Safety Program	• Simulation training for ED, OR, ICU, and OB staff for difficult airway management. • Simulation training for tube dislodgment for ICU staff and respiratory therapists. • Train personnel in airway protection for all patient activities, including transporting, turning, manipulating, and exercising. • Implement family education to ensure family at the bedside is informed about how to obtain assistance if they have a concern regarding the patient or their airway, and to maximize protection and minimize disruption of the airways. • Develop and implement an algorithm for difficult airways (see attached). • Train and schedule airway specialists to serve as back-up if the primary expert coverage (e.g. the anesthesiologist) is unavailable. • Consider training respiratory therapists to be airway specialists (hospital inpatient units only). • Develop a process for timely Root Cause Analysis with the bedside staff for airway safety issues such as delays in recognition, delays in airway placement, airway dislodgement, and skin injury.

Making Changes

- This intervention addresses a LEAPT (Leading Edge Advanced Practice Topics) focus and includes webinars, change packages, and other tools.

Key Resources

- Society of Critical Care Medicine website (www.sccm.org)
- The American College of Emergency Care (www.acep.org)
- Adverse Drug Events change package (www.hret-hen.org; see Adverse Drug Events)
- The American Society of Pain Management Nursing (www.aspmn.org)
- American Society of Anesthesiologists (www.asahq.org)

AIRWAY SAFETY DRIVER DIAGRAM

AIM: Decrease airway complications by 40% by December 8, 2014.

PRIMARY DRIVERS	SECONDARY DRIVERS	CHANGE IDEAS
Prevention of Unanticipated Airway Events	• Risk stratify and appropriately monitor all patients who are receiving narcotics and/or sedation for airway and ventilatory compromise.	• Develop and implement a decision tree/screening tool to identify patients at risk for airway compromise (e.g. check for PCA use, history of sleep apnea). • Implement a standardized sedation scale assessment on all high-risk patients who are receiving narcotics or sedatives. (e.g. RASS, Pasero). • Educate and train care staff to use a standardized sedation scale with all at-risk patients. • Use a scale that measures changes in sedation as a trigger for a Rapid Response Team evaluation. • Implement O_2 saturation monitoring for all post-op patients. • Implement End Tidal CO_2 monitoring for all high-risk patients. • Consider NIPPV for patients with a high risk for airway compromise.
Optimal Airway Placement	• Ensure proper personnel/training/staffing to address airway management events. • Implement an algorithm for standard care and escalation for patients with difficult airways.	• To identify patients with high-risk airways, develop and utilize a standardized airway assessment tool such as LEMON: LOOK, EVALUATE, MALLAMPATI, OBSTRUCTION, NECK. • Provide an airway management cart in each relevant unit. • Offer simulation training for providers who place airways. • Utilize an LMA vs. ET chart for safety and standardization. **(Operating Rooms ONLY)** • Develop and utilize an algorithm for patients with difficult airways. • Develop a back-up staffing protocol for airway events and post it in a visible location.

AIRWAY SAFETY DRIVER DIAGRAM

AIM: Decrease airway complications by 40% by December 8, 2014.

PRIMARY DRIVERS	SECONDARY DRIVERS	CHANGE IDEAS
Safe Airway Maintenance	• Ensure standard airway securement to prevent dislodged airways. • Develop and implement skin injury prevention standards. • Implement early weaning and extubation.	• Implement capnography monitoring for all intubated patients in the ICU (model the anesthesia standard) as one mechanism to identify airway dislodgment. • To prevent lumen narrowing and airway blockage, use tracheostomies that have a disposable inner cannula. • Adopt spontaneous awakening trials (SATs), coordinated with spontaneous breathing trials (SBTs), to promote early weaning and extubation. • Develop a method for identification of patients with a difficult airway to ensure appropriate vigilance, personnel, and equipment available if unintended extubation occurs. • Standardize a securement method for endotracheal tubes and tracheostomies to minimize airway dislodgement. • To ensure frequent assessment for risk for skin injury, review and update the standards for tube repositioning and skin and mucosal inspection. • Develop a treatment standard to electively exchange airways that have narrowed and have pilot balloon leaks. • Develop a process for a bedside debriefing when a skin injury occurs to identify future opportunities for improvement in procedures, equipment, or workflows.
Airway Safety Program	• Prevention • Personnel • Practice • Performance	• Simulation training for ED, OR, ICU, and OB staff for difficult airway management. • Simulation training for tube dislodgment for ICU staff and respiratory therapists. • Train personnel in airway protection for all patient activities, including transporting, turning, manipulating, and exercising. • Implement family education to ensure family at the bedside is informed about how to obtain assistance if they have a concern regarding the patient or their airway, and to maximize protection and minimize disruption of the airways. • Develop and implement an algorithm for difficult airways (see attached). • Train and schedule airway specialists to serve as back-up if the primary expert coverage (e.g. the anesthesiologist) is unavailable. • Consider training respiratory therapists to be airway specialists (hospital inpatient units only). • Develop a process for timely Root Cause Analysis with the bedside staff for airway safety issues such as delays in recognition, delays in airway placement, airway dislodgement, and skin injury.

AIRWAY SAFETY BACKGROUND

Approximately 25,000 potentially life-threatening errors occur DAILY in hospital Intensive Care Units. Up to 10% of these adverse events involve unintended incidents in airway management; more than half of these errors have been deemed preventable.

Injury and mortality from difficult airways can result in 20% of all adverse airway events in hospitals.[1]

Sudden-onset, life-threatening critical respiratory events in patients treated with opioid analgesia for post-operative pain have an incidence of 3.6 per 10,000 hospitalized adults.[2]

SUGGESTED AIM

The first step to improve airway safety is to make a strong commitment to this goal; this commitment includes a solid aim. An example of an AIM statement for an airway safety change package is:

- Decrease airway complications such as dislodgements, skin and mucosal injury, delayed intubation, and delays in recognition of airway compromise by 40% by December 8, 2014.

Prevention of Unanticipated Airway Events

Prevention of unanticipated airway events can be enhanced by adoption of a reliable routine screening process for patients at high risk for airway compromise. This screening should include: Oxygen saturation monitoring, end tidal CO_2 monitoring (capnography), and monitoring of sedation levels to promote the early recognition of these patients. To standardize the monitoring needed based on patient risk, create a decision tree. Implement a standardized sedation scale to monitor patients who are at high risk for airway compromise: e.g. the elderly, patients with a history of sleep apnea, and/or patients prescribed additional sedatives, PCA, or epidural anesthesia. Using the scale to trigger escalations/consultations for additional evaluation and treatment will help to avert airway and ventilatory events.[3]

Suggested Process Measures

- The compliance with monitoring standards for patients at high risk for airway compromise.
- The percentage of Rapid Response Team calls triggered by sedation scale screenings.

Secondary Driver: Risk stratify and appropriately monitor all patients who are receiving narcotics and/or sedation for airway and ventilatory compromise.

- Implement a standardized sedation scale assessment on all high-risk patients (e.g. the Richmond Agitation Scale (RASS) or the Pasero).
- Educate and train care staff to use a standardized sedation scale for all at-risk patients.
- Use changes in the sedation scale as a trigger to call for Rapid Response Team evaluation.
- Implement O_2 saturation monitoring for all post-op patients.
- Implement end tidal CO_2 monitoring for all high-risk patients.
- Consider NIPPV for patients with a high risk for airway or ventilatory compromise.

OPTIMAL AIRWAY PLACEMENT

Ensuring that there is adequate staffing by properly trained individuals will lay the foundation for consistent optimal airway placement. Development and distribution of standardized equipment carts and provision of simulation training for all individuals performing airway placement are critical to the initiative's success. Clear protocols, readily available rescue equipment, and well-developed algorithms for difficult airways improve airway safety organization-wide.[4]

Suggested Process Measures

- Compliance with the algorithm designed for patients with difficult airways.

Secondary Driver: Ensure proper personnel/training/staffing for airway management events.

Mnemonics for airway assessment and visual charts are helpful tools to promote appropriate airway placement and selection. Practice with protocols and algorithms enhance compliance and improve safety and optimal patient outcomes.[5]

Change Ideas

- Offer simulation training for providers placing airways
- Utilize an LMA vs. an ET chart for safety and standardization **(Operating Rooms ONLY)**
- Develop and establish airway management carts
- Develop back-up staffing protocols for airway events, and post them visibly.

Secondary Driver: Implement an algorithm for patients with difficult airways which outlines standard care and escalation.

Development of a difficult airway algorithm is critical to decrease the number of airway disasters. The number of catastrophic airway incidents may be small, but can be reduced even more if a clear algorithm for difficult airways is developed and utilized. An algorithm offers providers Plans A, B and C, as well as escalation guidance. Practice with the algorithm prior to an event for all team members creates a network that can assist in case a patient presents with a difficult airway. Communication about a patient's history of prior airway events helps to prepare the care team for potential issues before they develop.[6]

Change Ideas

- To identify high-risk airways, develop and utilize a standardized airway assessment tool such as L-E-M-O-N: LOOK, EVALUATE, MALLAMPATI, OBSTRUCTION, NECK.
- Develop and utilize a difficult airway algorithm as appropriate.
- Offer simulation training for airway management to all staff in the ED, ICU, and OB units.

SAFE AIRWAY MAINTENANCE

Maintenance of an open and functioning airway is an essential element for airway safety. Airway dislodgements, blockages, and leakage can account for greater than 80% of post-intubation complications. Adequate securement of airway devices is critical to prevent dislodgement and should be standardized and monitored. Skin and mucosal injuries can also be a complication during airway maintenance, and can be reduced if clear standards of care are developed collaboratively among relevant disciplines. Implementation and coordination of SATs (Spontaneous Awakening Trials) and SBTs (Spontaneous Breathing Trials) have been shown to both decrease the number of days a patient is on a ventilator and decrease patient harm.[7]

Suggested Process Measures

- Compliance with standard airway securement.
- Compliance with skin injury prevention standards.
- Compliance with SATs and SBTs for appropriate patients

Secondary Driver: Ensure standard airway securement to prevent dislodged airways.

Securement of airways is important to prevent airway dislodgment. Capnography monitoring can identify dislodgement that is not evident externally. Training staff to identify potential dislodgement and to adopt and implement standards for securement can reduce the incidence of dislodged airways.

Change Ideas

- Implement capnography monitoring for all intubated patients in the ICU (model the anesthesia standard) as one mechanism to identify airway dislodgment.
- Use tracheostomies that have a disposable inner cannula to prevent lumen narrowing and airway blockage.
- Consider a method for identification of patients with a difficult airway to ensure appropriate vigilance, and that necessary personnel and equipment are available if unintended extubation occurs.
- Standardize the securement method of endotracheal tubes and tracheostomies to minimize airway dislodgement.
- Develop a treatment standard to electively exchange airways that have narrowed and demonstrate pilot balloon leaks.
- Encourage family to call Rapid Response Team if they are worried or see evidence of respiratory issues.

Secondary Driver: Develop skin injury prevention standards for airway devices.

Implementing standard skin care for the skin and mucosa around airway devices will decrease the incidence of skin injury. Regular inspection and tube repositioning are key components of these efforts.

Change Ideas

- Review and update the standards for tube repositioning and skin and mucosal inspection to ensure frequent assessment of the risk for injury.
- Develop a process for a bedside debriefing when a skin injury occurs to identify possible opportunities for improvement in equipment, procedures, or workflows.

Secondary Driver: Implement and coordinate SATs (Spontaneous Awakening Trials) and SBTs (Spontaneous Breathing Trials) to promote early weaning and extubation.

Coordinated SATs and SBTs promote early weaning and extubation. This method allows for a reduction in the number of days on the ventilator and fewer days with an airway device, thereby decreasing the potential for harm.[8]

Change Ideas

- Adopt spontaneous awakening trials (SATs), coordinated with spontaneous breathing trials (SBTs), to promote early weaning and extubation.

AIRWAY SAFETY PROGRAM

An airway safety program is a key part of improvement efforts.[9] Four components that promote a successful safety program include the secondary drivers below.

Secondary Drivers

1. Prevention
2. Practice
3. Personnel
4. Performance

Prevention is focused on the early identification of patients who are at risk for airway compromise. Delays in recognizing at-risk patients should be avoided.

Practice should encompass simulation training for various types of airway complications to ensure all members of the health care team are prepared to respond. Simulation training should include practice in airway establishment for physicians and the experts who may be serving as back-ups (e.g. nurse-anesthetists), as well as dry runs with the ICU and ED teams to streamline the necessary procedures. Teams should have simulation practice and training on how to address airway dislodgements, and how to utilize algorithms for patients with difficult airways. Simulation training is also important for personnel who will be assisting with transporting, repositioning, or exercising patients with airways.

Personnel means it is critical to have available a qualified specialist for urgent and unanticipated airway complications 24 hours a day, 7 days a week. It may be necessary to train additional physicians, or health professionals in other disciplines such as respiratory therapy, to ensure available expertise in this area. Developing escalation/consultation chains for difficult airways is also important, to promote automatic and efficient responses in urgent situations.

Performance requires creating a feedback loop to provide timely information to the organization about the quality of care, the patient outcomes, and the effectiveness of the implemented measures. This data can identify opportunities for improvement in teams' performance. Timely Root Cause Analysis (RCA), or immediate bedside debriefing for all airway complications, will glean invaluable information regarding hospital systems, equipment, training, and protocols that impact airway safety. Develop an automatic prompt for RCAs or debriefing for airway complications when the following occur: delays in recognition, delays in airway placement, airway dislodgements, and skin/mucosal injuries related to airways.

Suggested Measures

- Compliance with an RCA completion for airway complications.
- Percentage of RRT calls/consults for urgent airway issues and intubations.

Change Ideas

- Offer simulation training to ED, OR, ICU, and OB staff for difficult airway management.
- Offer simulation training to address tube dislodgment to ICU staff and respiratory therapists.
- Train personnel in airway protection for all patient activities such as transporting, turning, manipulating, and exercising.
- Develop and implement an algorithm to care for patients with difficult airways (see attached)
- Train airway specialists to back-up when expert coverage is unavailable.
- Consider training respiratory therapists to be airway specialists (in hospital inpatient units only)
- Develop a process for immediate bedside Root Cause Analysis for airway safety issues such as delays in recognition, delays in airway placement, airway dislodgement, and skin injury.

SPECIAL CONSIDERATIONS FOR THE DEVELOPMENT OF RCA PROCESSES

- Enlist leadership commitment and support of the RCA concepts and promote an understanding of the benefits of this method of discovery.
- Allow any member of the team to trigger an RCA for airway complications.
- Ensure RCA leaders and facilitators are trained to conduct the RCA in a non-punitive, non-judgmental environment so as to promote learning rather than blame.
- Develop a systematic process to facilitate discussion and discovery sessions.
- Promote the participation of the bedside staff in the RCA process. Invite the staff that was involved in the event to participate. They often know the gaps and obstacles that may have contributed to a complication.
- Conduct an RCA as close to the event as possible both in timing and proximity. For example: gather a group (physician, nurse, nurse manager, respiratory therapist, quality leader, wound care specialist) together (in a private location not far from the patient's room) during the same shift a skin injury was identified.

- Collect facts and evidence about the incident (not hearsay information).
- Seek to understand why good people might sometimes make bad decisions. Why did the person who made an unfortunate decision think it was the right thing to do at the time? The goal of this inquiry is to obtain clues to a provider's situational awareness to try to understand all the rationales for the decisions made.
- Aggregate RCA results into an easily searchable database that can serve as a resource to instruct others about "lessons learned."
- Root Cause Analysis, when used properly, is a form of "corporate memory." This memory can be lost with retirements, downsizing, and attrition. Preventable misfortunes may then recur.
- Root Cause Analysis can help transform a reactive culture (i.e. one that reacts to problems) into a forward-looking culture that is pro-active (i.e. prevents problems before they occur or addresses them before they escalate). In environments where the RCA process is used, the frequency of problems and negative incidents is reduced.[10]

POTENTIAL BARRIERS

Initiatives that involve multiple disciplines and departments may lead to the identification of necessary tasks as "ours" and "theirs." In other words, instead of embracing all aspects of the change process, individuals may label a component of an initiative as beyond their scope of responsibility, and avoid collaborating and contributing to team efforts.

Including key stakeholders, such as physicians, bedside nurses, anesthesiologists, respiratory therapists, and senior leaders in improvement teams, promotes buy-in and engagement. Encourage stakeholders to collaborate in the development of protocols, workflows, peer education programs, and performance reviews. However, recognize that some physicians may perceive these quality improvement interventions as unnecessary or intrusive, especially if they are being asked to change their practice or participate in simulation training for skills that they already possess.[11, 12] Educating the physicians regarding the proven value of enhancing the entire team's knowledge in reducing errors can mitigate this resistance and increase adoption.

Highlight several physicians to speak about the airway safety efforts and invite representatives from administration, medicine, nursing, respiratory therapy, and anesthesia to participate in this project. This visible commitment will provide early momentum and drive improvement efforts forward.

Use administrative leadership and sponsorship to help remove or mitigate barriers

Each institution committed to this aim should have senior leaders involved in setting the specific aims, so as to ensure that these aims are aligned with the organization's strategic goals. When senior leaders approve the aims, they should also make a commitment to give the team whatever support and resources are needed to achieve the goals. An executive sponsor can assist with communicating the vision of the change initiative to the organization from a "big picture" perspective. Executive leadership can also help educate employees, mitigate obstacles and barriers that may arise, and encourage transparency in the RCA processes.

Enlisting a respected physician or physicians from the relevant departments is crucial in the implementation of changes in practice. Senior leaders from all departments involved (e.g. medicine, nursing, pharmacy) will promote the successful adoption of new ideas and change processes by communicating that change and improvement are beneficial for both patients and staff.

This change in practice may also be a change in culture for your organization.

To achieve these improvement goals, everyone caring for patients who may need airways or who have airways must be involved. Individual awareness and commitment to this effort must be promoted – with assistance from the leadership. Work processes must be carefully scripted and standardized, a team effort that crosses disciplines and departments. Success depends on committed leadership and support from the entire organization, as well as buy-in from all stakeholders involved with the care of these patients.

To promote successful change, three levels of participants should be engaged:

1. An active working team responsible for daily planning, documentation, communication, education, monitoring, and evaluation of the change activities.

The working team **must** be multidisciplinary, with representation from all departments involved in the change processes, e.g. doctors, nurses, respiratory therapists, and other relevant staff such as clerks and central supply technicians. Team members should be knowledgeable about the specific aim to reduce airway complications, the current local work processes, the associated literature, the new procedures to be implemented, and any environmental issues that may develop with these changes.

2. The leadership group or individuals who provides resources, monitors overall progress, removes barriers, and offers suggestions from an institutional perspective.

The working team needs someone with the authority in the organization to overcome or mitigate the barriers that may arise, and who can provide and allocate the resources the team needs to achieve its goals. This leader needs to understand both the implications for the organization of the proposed changes, and the potential unintended consequences the change process might trigger.

3. Finally, providers, including all stakeholders who have an interest in the change.

Effective communication processes are needed to keep providers and other stakeholders informed and to provide avenues to receive feedback. Providers should be encouraged to contribute input, and must be confident that their input will be respected and will influence the change process. Provider engagement builds ownership and buy-in, and facilitates implementation and utilization of the new processes.

TIPS ON THE USE OF THE MODEL FOR IMPROVEMENT

Implement the Airway Safety ideas one element at a time:

Step One: Plan

1. Begin with early recognition of patients at risk for airway or ventilatory compromise.
2. Develop and implement a screening tool and/or decision tree for monitoring patients as appropriate based on risk assessment and the type of potential compromise.

Step Two: Do

1. Ask a receptive, early-adopter physician on your improvement committee to trial these tools with his/her next few patients in the Emergency Department or in the OR.
2. Ask a receptive nurse and respiratory care practitioner on your committee to trial the screening/decision tree tool as well.
3. Test "small": Coordinate with the physician champion to trial the screening/decision tree tool on one patient, in one unit, with one nurse, and one respiratory therapist.

Step Three: Study

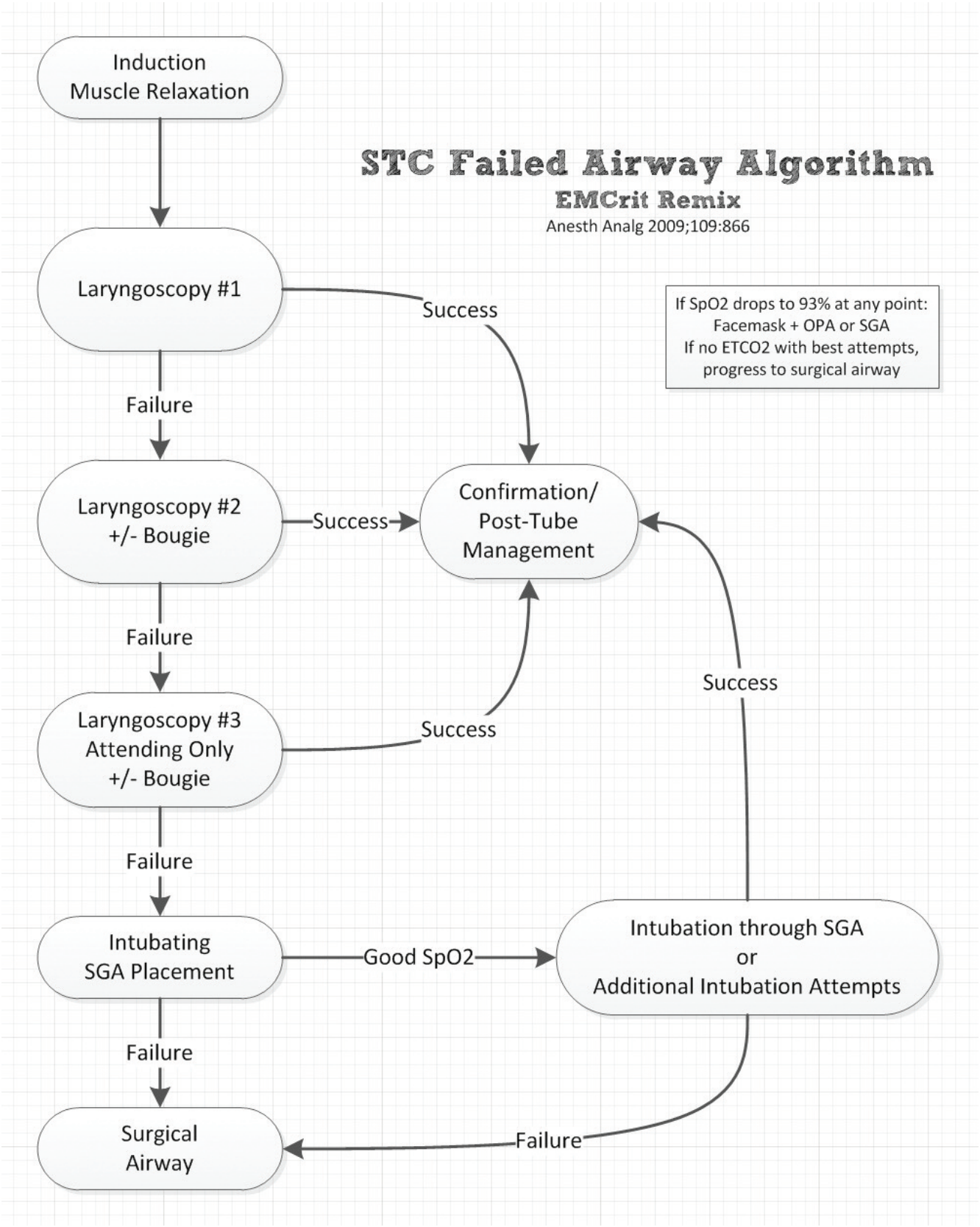
Debrief as soon as possible after the test with those involved, asking:

- What happened?
- What went well?
- What didn't go well?
- What do we need to revise for the next time?

Step Four: Act

Revise and re-test with the same physician, the same nurse, and the same respiratory care practitioner. After the revisions and re-tests are successful, disseminate the protocol to a wider group and mentor the groups' implementations.

Appendix I: Sample Difficult Airway Algorithm



Pasero Opioid-induced Sedation Scale (POSS)

S= Sleep, easy to arouse
Acceptable; no action necessary; may increase opioid dose if needed

1. Awake and alert
Acceptable; no action necessary; may increase opioid dose if needed

2. Slightly drowsy, easily aroused
Acceptable; no action necessary; may increase opioid dose if needed

3. Frequently drowsy, arousable, drifts off to sleep during conversation
Unacceptable; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory; decrease opioid dose 25% to 50% or notify prescriber or anesthesiologist for orders; consider administering a non-sedating, opioid-sparing nonopioid, such as acetaminophen or an NSAID, if not contraindicated.

4. Somnolent, minimal or no response to verbal or physical stimulation
Unacceptable; stop opioid; consider administering nalaxone; notify prescriber or anesthesiologist; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory.

Appendix III: ASA Difficult Airway Algorithm

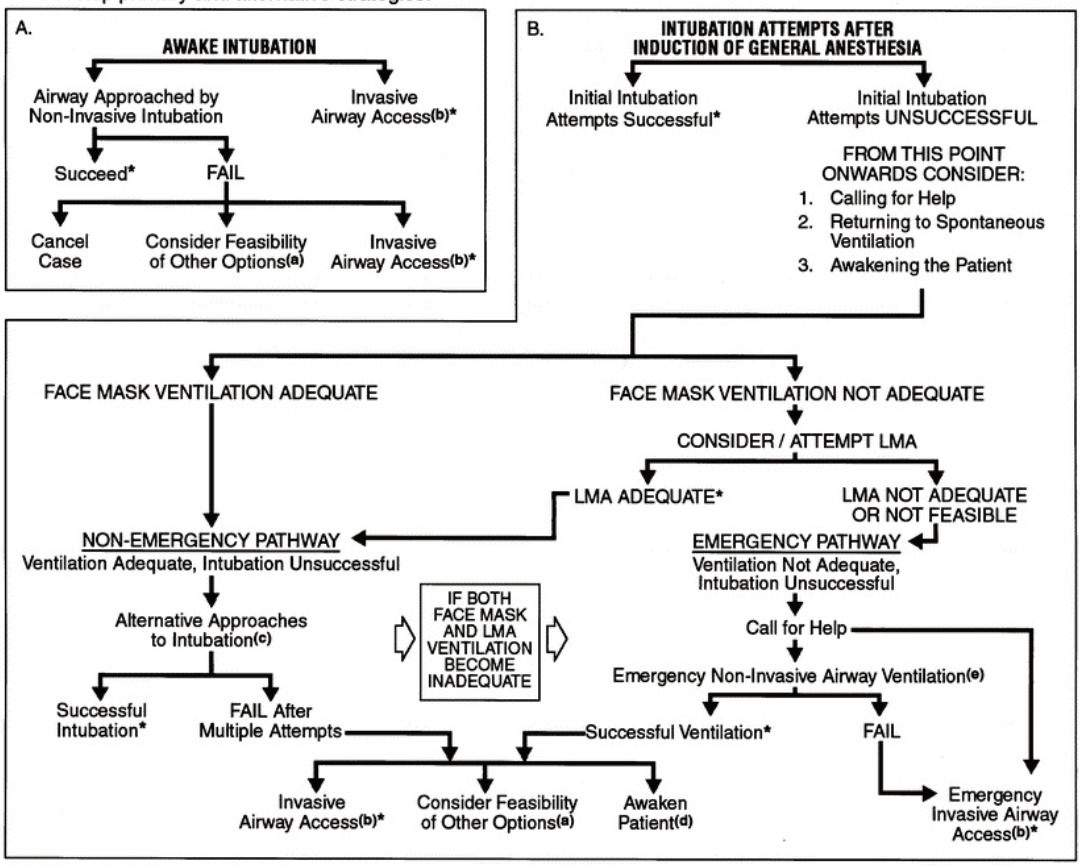
AMERICAN SOCIETY OF ANESTHESIOLOGISTS

DIFFICULT AIRWAY ALGORITHM

1. Assess the likelihood and clinical impact of basic management problems:
   - A. Difficult Ventilation
   - B. Difficult Intubation
   - C. Difficulty with Patient Cooperation or Consent
   - D. Difficult Tracheostomy
2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management
3. Consider the relative merits and feasibility of basic management choices:

A.	Awake Intubation	vs.	Intubation Attempts After Induction of General Anesthesia
B.	Non-Invasive Technique for Initial Approach to Intubation	vs.	Invasive Technique for Initial Approach to Intubation
C.	Preservation of Spontaneous Ventilation	vs.	Ablation of Spontaneous Ventilation

4. Develop primary and alternative strategies:



*** Confirm ventilation, tracheal intubation, or LMA placement with exhaled CO_2**

a. Other options include (but are not limited to): surgery utilizing face mask or LMA anesthesia, local anesthesia infiltration or regional nerve blockade. Pursuit of these options usually implies that mask ventilation will not be problematic. Therefore, these options may be of limited value if this step in the algorithm has been reached via the Emergency Pathway.

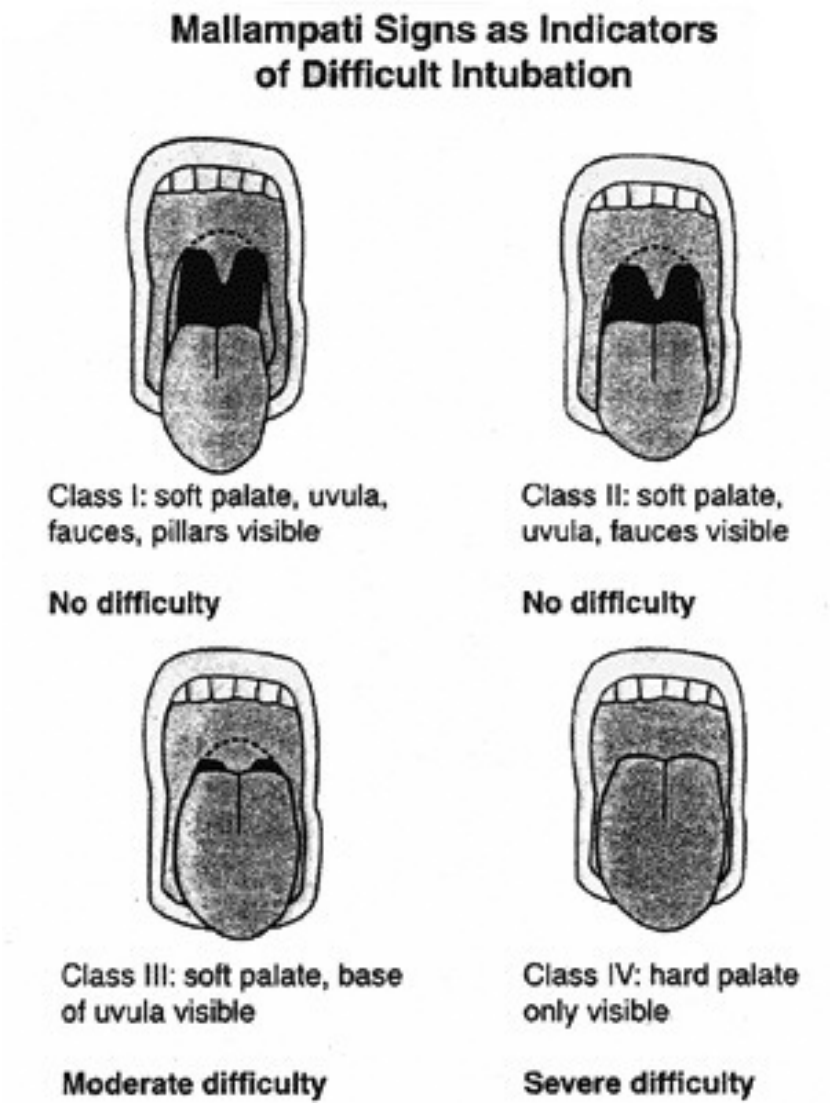
b. Invasive airway access includes surgical or percutaneous tracheostomy or cricothyrotomy.

c. Alternative non-invasive approaches to difficult intubation include (but are not limited to): use of different laryngoscope blades, LMA as an intubation conduit (with or without fiberoptic guidance), fiberoptic intubation, intubating stylet or tube changer, light wand, retrograde intubation, and blind oral or nasal intubation.

d. Consider re-preparation of the patient for awake intubation or canceling surgery.

e. Options for emergency non-invasive airway ventilation include (but are not limited to): rigid bronchoscope, esophageal-tracheal combitube ventilation, or transtracheal jet ventilation.

Appendix IV: Mallampati Classification Chart



Appendix V: L-E-M-O-N Assessment Tool

L-E-M-O-N ASSESSMENT TOOL		
Physical signs	**Less difficult airway**	**More difficult airway**
Look externally	• Normal face and neck • No face or neck pathology	• Abnormal face shape • Sunken cheeks • Edentulous • "Buck teeth" • Receding mandible • "Bull-neck" • Narrow mouth • Obesity • Face or neck pathology
Evaluate the 3-3-2 rule	• Mouth opening > 3F • Hyoid-chin distance > 3F • Thyroid cartilage-mouth floor distance > 2F	• Mouth opening < 3F • Hyoid-chin distance < 3F • Thyroid cartilage-mouth floor distance < 2F
Mallampati	• Class I and II (can see the soft palate, uvula, fauces +/– facial pillars)	• Class III and IV (can only see the hard palate +/– soft palate +/– base of uvula)
Obstruction	• None	• Pathlology within or surrounding the upper airway (e.g. peritonsillar abscess, epiglottis, retropharyngeal abscess)
Neck Mobility	• Can flex and extend the neck normally	• Limited ROM of the neck

Appendix VI: Difficult Airway Communication Tool

Date: (00/00/0000) RE:_____ has a difficult airway, DOB: (00/00/0000)
(Patient Name)

During your recent anesthetic and surgery, your anesthesia providers noted that you have a difficult airway.

Specifically: _____ difficult mask ventilation, _____difficult laryngoscopy, _____difficult intubation, or _____failed intubation.

An unexpected difficult airway is a known potential concern with general anesthesia and can be dangerous. If you should need anesthesia or mechanical ventilation in the future, it is important that you inform your anesthesiologist and surgeon of the potential for a difficult airway. Ideally you would give them this letter to review.

Physical Exam:

Body mass index (BMI < 25____ 25 - 30_____ > 30____

Mallampati airway classification: _____I- soft palate, uvula, pillars _____ II- soft palate, pillars
_____ III-soft palate _____IV-hard palate

Mouth opening: _____ cm

Dentition: Native _____ prominent incisors _____edentulous
_____ Jaw protrusion (can protrude lower incisors beyond upper incisors)

Thyromental distance: _____> 6 cm _____< 6 cm

Neck extension: _____ full (35°) _____limited (<15°O)

Details of what actually took place during airway management:

Intubation: _____ emergency _____elective

Bag and mask ventilation was _____Easy _____Difficult _____Not possible

Muscle relaxants were _____administered _____not administered

Cormack/Lehane Laryngoscopic view:
_____I - full view of the glottis opening _____II - epiglottis and arytenoids
_____III - tip of epiglottis _____IV - only soft palate

Intubation _____Successful _____Not successful

_____An LMA was placed and anesthesia proceeded without further difficulties

_____Intubation was performed _____through a Fast track laryngeal mask airway
_____with video assisted laryngoscopy
_____with fiberoptic bronchoscope guidance

_____An emergency tracheostomy was performed

_____Your surgery and anesthetic were rescheduled

_____Decadron was administered to prevent swelling postoperatively

_____You were admitted postoperatively for_____

_____Other_____

Extubation was _____routine _____over a stylet

Complications

Although a minor sore throat is common after general anesthesia, if you experience a persistent severe sore throat, difficulty swallowing or fever, immediately contact your surgeon and the anesthesiologist on call at the facility.

Sincerely,
Your Anesthesiologist (sign and print your name)

Appendix VII: Airway Safety Top Ten Checklist

Airway Safety Top Ten Checklist

TOP TEN EVIDENCE BASED INTERVENTIONS				
PROCESS CHANGE	**IN PLACE**	**NOT DONE**	**WILL ADOPT**	**NOTES (RESPONSIBLE AND BY WHEN?)**
Adopt an assessment tool to identify patients at high risk for airway compromise.	☐	☐	☐	
Develop a decision tree with monitoring guidelines based on patient risk factors for airway and ventilatory compromise. Educate family for rapid response team activation.	☐	☐	☐	
Adopt the PASERO sedation scale (or another validated tool) to assess sedation levels for patients receiving opioids.	☐	☐	☐	
To provide identification of high-risk airways, develop and utilize a standardized airway assessment tool such as: LEMON: LOOK, EVALUATE, MALLAMPATI, OBSTRUCTION, NECK.	☐	☐	☐	
Provide an airway cart in each relevant unit to ensure necessary equipment is readily available to address unanticipated airway events.	☐	☐	☐	
Develop and utilize an algorithm to address difficult airways.	☐	☐	☐	
Adopt spontaneous awakening trials (SATs), coordinated with spontaneous breathing trials (SBTs), to promote early weaning and extubation.	☐	☐	☐	
Update standards for tube repositioning and for skin and mucosal inspection to ensure skin and mucosa are intact and not at risk for injury.	☐	☐	☐	
Implement simulation training for the care team in airway assessment, difficult airway management, and airway placement.	☐	☐	☐	
Develop a process for timely Root Cause Analysis with the bedside staff for airway safety issues such as delays in recognition, delays in airway placement, airway dislodgement, and skin injury.	☐	☐	☐	

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