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Current Concepts In the Management of The Difficult Airway

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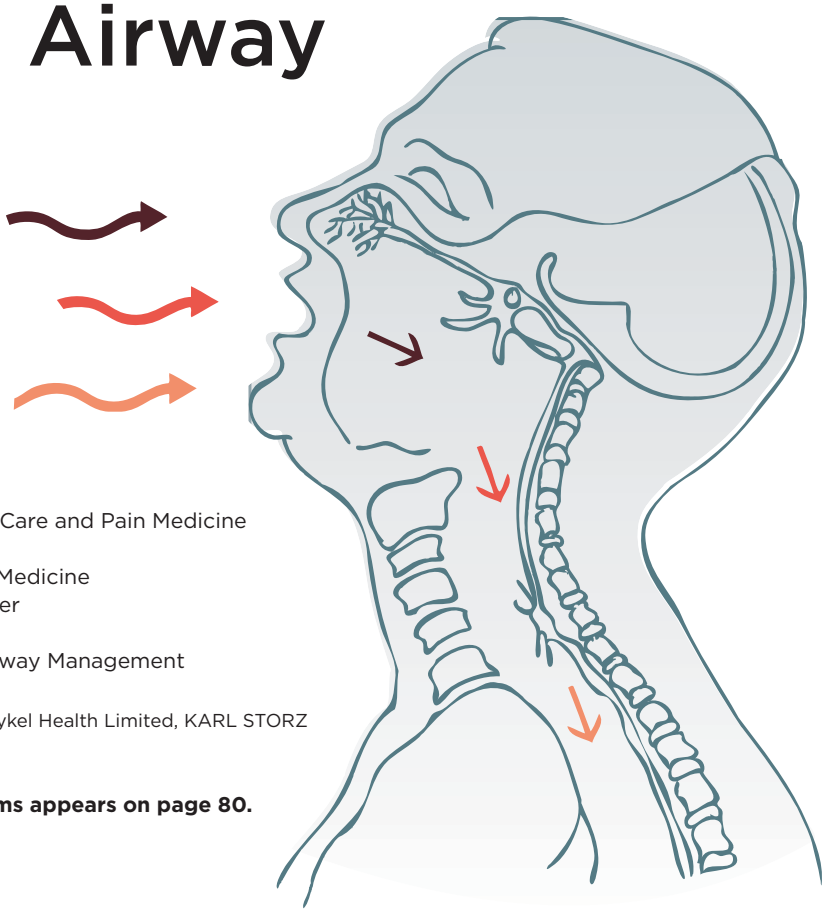

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Editor's note: A key of abbreviations and acronyms appears on page 80.

This edition of "Current Concepts in the Management of the Difficult Airway" marks the 18th anniversary of this biannual review of airway devices and techniques that are currently available to manage both routine and difficult airways, regardless of setting.

Management of the difficult airway remains one of the most relevant and challenging clinical situations encountered by anesthesia practitioners, as major adverse consequences can occur if the airway is not secured in a timely fashion. Most airway problems can be solved with relatively simple devices and techniques, but clinical judgment born of experience is crucial to their application. As with any intubation technique, practice and routine use will improve performance and may reduce the likelihood of complications. Each airway device has unique properties that may be advantageous in certain situations yet limiting in others. Specific airway management techniques are greatly influenced by individual disease and anatomy, and successful management may require combinations of devices and techniques.

Table 1. Endotracheal Tube Guides

Name (Manufacturer)	Description	Length
Aintree Intubation Catheter (Cook Medical)	Polyethylene 19 Fr AEC allows passage of a FIS through its lumen. Has two distal side holes and is packaged with Rapi-Fit adapters. Includes a bronchoscope port. Color: light blue.	56 cm.
AirQ 3 Intubating Laryngeal Airway (Cookgas)	All-silicone intubating laryngeal airway with dual gastric access, color-coded connectors for size identification, manual and self-pressurizing mask tracheal inflation.	Sizes 1, 1.5, 2, 3, 4, 5.
Arndt Airway Exchange Catheter Set (Cook Medical)	Polyethylene 14 Fr AEC with a tapered end, multiple side ports, packaged with a stiff wire guide, a double swivel bronchoscope connector, bronchoscope port and Rapi-Fit adapters. Color: yellow.	Wire: 160 cm. AEC: 70 cm. For insertion of ≥5.0 mm ETs.
Cobra Introducer (Occam Design)	15 Fr airway intubation guide with telescoping extension. Coudé tip and three side holes. Color: orange.	60 cm (73 cm when telescopically extended).
Cobralet (Occam Design)	15 Fr airway intubation guide with hollow interior channel. Color: orange.	60 cm.
Cook Airway Exchange Catheter (Cook Medical)	8, 11, 14 and 19 Fr polyethylene design facilitates exchange of single-lumen ET. Color: yellow.	8 Fr: 45 cm. Other sizes: 83 cm. For exchange of ETs with ID mm: 8 Fr: ≥3.0 mm; 11 Fr: ≥4.0 mm; 14 Fr: ≥5.0 mm; 19 Fr: ≥7.0 mm.
Cook Airway Exchange Catheter Extra-Firm with Soft Tip (Cook Medical)	11 and 14 Fr polyethylene designs facilitate exchange of single-lumen or EF with soft tip. Color: green catheter; soft tip is purple.	100 cm. For exchange of ET/DLT with ID minimum: 11 Fr: ≥4.0 mm; 14 Fr: ≥5.0 mm.
Cook Staged Extubation Set (Cook Medical)	Soft-tipped marked extubation wire to maintain continuous airway access, wire holder and Tegaderm for securement, soft-tipped Reintubation Catheter, Rapi-Fit adapters to assist in O_2 delivery, if necessary. Available outside of US only.	Wire: 145 cm. AEC: 83 cm.
CoPilot VL Disposable Bougie (Dilon Technologies)	14 Fr polyethylene single-use ET introducer with coudé tip. Color: orange.	60 cm (ETs ≥6.0 mm).
CoPilot VL Rigid Intubation Stylet (Dilon Technologies)	Reusable CoPilot VL intubation stylet.	ETs ≥6.0 mm ID.
D-BLADE Reusable Stylet (KARL STORZ)	Reusable stylet designed especially for the C-MAC reusable and single-use adult D-BLADE. Individually peel packed in boxes of 10.	31 cm; diameter shaft: 3-mm tip: 5 mm ID (ETs ≥5.5 mm).
ET Exchanger (Instrumentation Industries)	Single use. Rigid yet flexible with rounded tip and graduated marks for easy placement. Available in nine sizes from 2.5 mm to 7.5 mm ID.	Nine sizes (15- to 29-inch lengths).
Flexible Tip Bougie (Sharn Anesthesia)	Steerable ET introducer with soft, flexible and controllable tip. Ideal when there is a great view but advancing the ET is still a problem.	65 cm, 15 Fr (ETs ≥7.0 mm).
Frova Intubating Introducer (Cook Medical)	Polyurethane 8.0 and Polyethylene 14 Fr malleable introducer with curved distal tip with two side ports. Has hollow lumen and is packaged with a stiffening cannula and removable Rapi-Fit adapters. 14 Fr also available, individually sterile packaged in box of 10, catheter only without stiffening cannula. Colors: 8 Fr, yellow; 14 Fr, blue.	8 Fr: 35 cm. 14 Fr: 70 cm.
GlideRite Single-Use Stylets (Verathon)	Designed for use with hyper-angulated GVL and help facilitate placement of ET.	Large: ETs ≥6.0 mm. Medium: ETs 4.5-5.5 mm. Small: ETs 3.0 mm, 4.0 mm.
GlideRite Reusable Stylets (Verathon)	Same as GlideRite Single-Use Stylets.	ETs and DLTs ≥6.0 mm.
i-Bougie (VBM)	Single-use 14 Fr introducer with angled tip and hollow lumen for oxygenation. Color: orange.	70 cm.

	Clinical Applications	Special Features
	Exchange of SGAs for ETs ≥7.0 mm using a FIS. Its hollow lumen allows insertion of a FIS directly through the catheter so that the airway can be indirectly visualized.	Large lumen (4.7 mm) allows passage of a maximum OD 4.2 mm FIS. Rapi-Fit adapters allow both jet ventilation and ventilation with 15-mm adapter (anesthesia circuit or Ambu bag). Two distal side ports. Single use.
	Intubation aid with ease of ET placement, with pressurizing mask for seal with two gastric channels for NGT up to 18 Fr.	Epiglottis elevator lifts the epiglottis to maximize visibility for cuff placement. ET ramp to facilitate intubation and directs it toward the laryngeal inlet. Dual gastric access channels to allow pressure relief from gastric tube up to 18 Fr.
	Exchange of LMAs and ETs using a FIS.	Tapered end and distal multiple side ports. Rapi-Fit adapters allow both jet ventilation and ventilation with 15-mm adapter (anesthesia circuit or Ambu bag). Single use. The 160 cm–long wire can be inserted through the working channel of the FIS.
	Facilitates tracheal intubation, especially in situations of difficult airway anatomy. Facilitates both DL and VL. Works as a traditional bougie, then additionally extendable while in use, when desired.	Telescoping segment to enhance glottis entry. Malleable, reversible and controllable from middle or either end.
	Facilitates tracheal intubation.	Malleable, hollow interior for O_2 insufflation.
	The Cook AEC is intended for uncomplicated, atraumatic ET exchange for both single-lumen tubes.	Rapi-Fit adapters as above, but should be used primarily for jet ventilation because of length. Two distal side ports. Single use.
	The Cook AEC EF soft tip is intended for uncomplicated, atraumatic ET exchange for both single-lumen tubes and DLTs.	Rapi-Fit adapters as above, but should be used primarily for jet ventilation because of length. The soft-tip version offers a more flexible tip to help minimize tracheal trauma and the additional length Is compatible with DLT exchange. Two distal side ports. Single use.
	Provides a tool for a more complete extubation strategy, which should be in place for every patient. ETs >5.0 mm ID.	Uses an atraumatic wire to maintain continuous airway access and a soft-tipped reintubation catheter to facilitate a successful reintubation if required and delivery of O_2 when desired. Rapi-Fit adapters allow both jet ventilation and ventilation with 15-mm adapter (anesthesia circuit or Ambu bag). Multiple distal side ports. Single use.
	Facilitates tracheal intubation. May also be used for tube exchange.	Single use.
	Reusable CoPilot VL intubation stylet for use with VL to facilitate ET placement.	Reusable, easy to high level disinfect or sterilize.
	The angle of the D-BLADE reusable stylet complements the angle of the C-MAC D-BLADE laryngoscope to help facilitate placement of an ET. The pre-shaped stylet improves maneuverability of the ET tube toward the target.	Sateen finish allows the stylet to pass more easily into ETs. Packaged ready to use; no reprocessing necessary for first use.
	Facilitates simple ET exchange.	Specific exchanger for each ET.
	Useful with DL or VL, single-use Flexible Tip Bougie facilitates ET placement and is particularly helpful when advancement of the airway or a traditional bougie is difficult. Helpful with anterior airway or when tracheal tumors are present and have to be navigated past.	Sliding "tabs" are moved with user's thumb to flex or retroflex the tip to maneuver around the anatomy. Phosphorus tip for improved visualization under UV illuminated laryngoscopy. Useful with DL and VL.
	Facilitates tracheal intubation; not intended for ET exchange. Can also be used by placing it first in the ET, with its tip protruding, or placing it directly into the glottis and then placing the ET over it. Used straight or slightly curved with DL or definitively curved with VL.	Blunt, angled tip, two distal sideports. Rapi-Fit adapters allow both jet ventilation and ventilation with 15-mm adapter (anesthesia circuit or Ambu bag). Hollow lumen allows oxygenation/ventilation/CO_2 detection in all sizes. Single use.
	For use with hyperangulated GlideScope LoPro and GVL blades. Rigid, preformed design enhances ET control during intubation.	Large, medium and small sizes: Single-use, sterile, individually packaged (sold in boxes of 10). Easy-to-use handle design for simple ET securement and stylet removal. Small size: Adjustable stopper.
	For use with hyperangulated GlideScope LoPro and GVL blades. Rigid preformed design enhances ET control during Intubation. DLT Stylet: for use with DLTs.	Reusable. Compatible with high-level disinfectants, autoclave and other sterilization methods. Easy-to-use handle design for simple ET securement and stylet removal. DLT Stylet: integrated tracheal lumen positioning pin.
	Facilitates tracheal intubation. Low friction material is shapeable and allows easy tube passage.	Supplied with two types of O_2 connectors to allow oxygenation through the lateral openings at the tip.

table continues on next page

Table 1. Endotracheal Tube Guides *(continued)*

Name (Manufacturer)	Description	Length
Insight Rigid Stylet (Bell Medical)	Reusable and sterilizable. Designed to work with GVL, C-MAC, and Insight VL, or any other VL.	34 cm 3.8 OD (ETs ≥4.5 mm).
Introes Pocket Bougie (BOMImed)	Single-use 14 Fr (4.7 mm) malleable ET introducer made from special blend of Teflon. Packaged in box of 10.	60 cm (ETs ≥5.0 mm).
Pocket Introducer (VBM)	Single-use 15 Fr Introducer with coudé tip. Color: blue.	65 cm.
Portex Single-Use Bougie (Smiths Medical)	15 Fr, PVC ET introducer with coudé tip. Has a hollow lumen that discourages reuse and is provided sterile. Color: ivory.	70 cm.
Portex Tracheal Tube Introducer (Smiths Medical)	15 Fr ET introducer made from a woven polyester base, with a coudé tip (angled 35 degrees at its distal end). Also known as the gum elastic bougie. Color: golden brown.	60 cm.
Rhinoguard (Davis Medical)	ET introducer/dilator.	25.4 cm: small for ETs 3.0-4.5 mm; 35.5 cm: large for ETs 5.0-8.0 mm.
RPiS, Rapid Positioning Intubation Stylet (Airway Management Enterprises)	Single-use flexible stylet with tip that allows 180-degree flexion and retroflexion. Tip protrudes 5 cm from the end of ET. Color: blue.	38 cm (ETs ≥6.0 mm).
S-Guide (VBM)	Single-use 15 Fr, 11 Fr and 8 Fr stylet, malleable, with atraumatic coudé tip and hollow for oxygenation (only 15 Fr and 11 Fr).	65 cm.
Runnels Articulating Total Control Introducer, TCI (Through the Cords)	Articulating introducer for precision tracheal access with any VL.	(ETs ≥6.0 mm).
Shiley Satin-Slip Intubating Stylet (Medtronic)	Single-use, malleable aluminum with smooth plastic sheath to assist during intubation. Can be used with both VL and DL.	6 Fr: 280 mm; 10 Fr: 350 mm; 14 Fr: 350 mm
VBM Tube Exchanger (VBM)	Single-use 11, 14 and 19 Fr tube exchanger that is hollow to allow oxygenation. Color: blue.	80 cm.
Vie Scope (Adroit Surgical)	Single-use, battery-powered, disposable scope that uses a closed circular tube with a beveled end to visualize the vocal cords.	Adult, one size fits all.
Voir Bougie (Adroit Surgical)	Single-use 15 Fr polyethylene ET introducer with formable tip. Colored safety bands: Light blue bougie with green and red safety depth marking bands gives the user immediate depth insertion distance for rapid and safe intubation.	70 cm, 15 Fr (ETs ≥6.0 mm).

	Clinical Applications	Special Features
	Preformed curve matches that of Insight VL, GlideScope and C-MAC.	Reusable, durable stainless steel; easy to clean and sterilize.
	Designed to facilitate both DL and VL tracheal intubation. Unique curvature designed to follow natural path of the airway. Flexibility: Customizable coudé tip angles allow for manipulation of the distal tip for anterior airways.	Self-lubricated bougie, tactiglide technology for tactile sensation, optimal curve with shape memory, balanced rigidity with soft-tissue protection, depth markings, packaged sterile.
	Facilitates tracheal intubation.	Folded to only 20 cm, unfolds to 65 cm within seconds; ideal space solution for emergency bags.
	Single-use product reduces risk for cross-contamination. Otherwise, same as Portex Venn Tracheal Tube Introducer.	Similar to Portex Venn Tracheal Tube Introducer, but hollow lumen allows oxygenation/ventilation. Single use.
	Proven useful in patients with an anterior larynx (grades 2b, 3 and 4) and those with limited mouth opening. Can be used by slightly protruding through the ET, or placing directly into the glottis and then placing an ET over it.	Nondisposable and reusable. Size 5.0 Fr is single use. Has memory properties. Coudé tip effectively detects "tracheal clicks" to confirm correct placement. Part of a range of introducers, stylets, and guides for adults and pediatrics. Can be reused after cold-water disinfection.
	Facilitates nasal intubation.	Optimized longitudinal stiffness to facilitate passage of an ET, especially in challenging nasal passages. Customized for 3.0–8.0 ETs. Optimal OD taper provides ability to utilize larger ET, if desired.
	Provides greater visibility and control of tip similar to a FIS (with one provider) in difficult and routine intubation with VL.	Single-use stylet with atraumatic soft tip.
	Difficult intubation. Ideal for non-channeled VL.	Malleable stylet with color-coded soft tip. Supplied with two types of O_2 connectors to allow oxygenation (only 15 Fr and 11 Fr).
	Useful in anticipated difficult tracheal intubation, anterior airways, limited neck mobility, small mouth opening, airway tumors, rescue after failed VL with a standard stylet and nasal intubation.	Dynamically shapeable introducer with articulating tip and flexible shaft. Designed for cost effective, precision tracheal access during "combined" or "hybrid" intubation with any VL. Allows single-operator self-rescue in situations where glottis can be visualized with VL, but tube delivery is challenging or impossible. Single use.
	Useful for routine intubation to provide structure to an ET. Helpful for first-pass success during difficult intubation.	Satin-Slip soft sheath features atraumatic tip to reduce the possibility of intubation damage.
	Exchange of ETs.	Supplied with O_2 connector.
	Allows for a straight line-of-sight view with 360 degrees maximal illumination to pass a bougie between the vocal cords. Provides the ability to intubate the patient when awake in trauma, routine and difficult situations both in the hospital and in the field.	Patented LED ring illumination located at the proximal end of a self-enclosed clear tube allows light to be transmitted through the lumen of the tube as well as the sidewall to avoid obstruction of light by secretions or blood. Single use.
	Facilitates tracheal intubation and increases patient safety.	Clearly marked color bands (patent pending) permit the user to note the correct depth upon insertion to avoid lung or tracheal injury.

Table 2. Stylets

Name (Manufacturer)	Description	Size
Lighted Stylets		
Aaron Surch-Lite (Apyx Medical)	10-inch sterile, single-use, flexible stylet.	Adult.
AincA Lighted VideoStylet (Anesthesia Associates)	Easily malleable, lighted stylet with adjustable ET holder. Shapes and guides ET while forwardly illuminating passage. Completely reusable device consisting of removable handle with xenon bulb.	Adult and pediatric (ETs ≥5.0 mm). Infant (ETs ≥3.0 mm).
Tube-Stat Oral Intubation Stylet (Medtronic)	Similar to AincA Lighted VideoStylet.	Nasotracheal: 33 cm shaft. Orotracheal: 25 cm shaft.
Vital Signs Light Wand Illuminating Stylet (GE Healthcare)	Similar to AincA Lighted VideoStylet.	Adult.
Viewing Optical Stylets		
AincA VideoStylet (Anesthesia Associates)	Easily malleable, video imaging stylet with built-in ET holder. Shapes and guides ET while forwardly illuminating the passage and providing full-color image. Completely reusable device consisting of removable VideoStylet and attached rechargeable LCD monitor.	Adult and pediatric (ETs ≥6.0 mm).
C-MAC Video Stylet (KARL STORZ)	A high-resolution chip at the distal end of the endoscope. The tip can be angulated anteriorly by up to 90 degrees, which helps in the narrow conditions of the oral cavity. The patented active bend mechanism can be used with an attached ET and supports at the same time the passive return. Intuitive handling with universal C-MAC System interface for C-MAC Monitor (8403 ZXK) and C-MAC PM (8403 XD) Pocket Monitor. Real-time viewing on the C-MAC HD 8-inch touchscreen LCD monitor with PIP and split-screen capability.	With ET adapter and suitable for ET ≥6 mm.
Clarus Levitan (Clarus Medical)	Portable high-resolution fiber optics enclosed in a malleable stainless-steel stylet provide a view from the tip of ET. Built-in tube stops to hold ET in place with integral O_2 port for O_2 insufflation during intubation. Assist with DL/VL like regular stylet to provide an added view from the tip of the tube or can be used independently as an easier-to-learn, less expensive alternative to FIS. Also malleable to be used through intubating supraglottic ventilatory devices. Optional adapter uses smartphones to transform optics to video.	Adult (ETs ≥5.5 mm).
Clarus Pocket Scope (Clarus Medical)	Conveniently sized, easy-to-clean and cost-effective (reusable) flexible stylet that has a patented, deflected, nondirectable tip. Optional adapter uses smartphones to transform optics to video. Often used to confirm placement and patency of airways.	Adult (ETs ≥4.0 mm).
Clarus Shikani (Clarus Medical)	Viewing stylet: high-resolution, stainless steel, malleable fiber-optic stylet. Has adjustable tube stop and integral O_2 port for O_2 insufflation. Assist with DL/VL like regular stylet to add a view from the tip of the tube. Or used independently as an easier-to-learn, less expensive alternative to bronchoscope. Also malleable for use through intubating supraglottic ventilatory devices. Optional adapter uses smartphones to transform optics to video.	Adult (ETs ≥5.5 mm) Pediatric (ETs 2.5-5.0 mm).
Clarus Video Stylet 3000V (Clarus Medical)	Malleable rigid stylet scope with attached LCD screen and adjustable curve shape provides view from end of stylet; built-in tube stop to hold ET in place with integral O_2 port for O_2 insufflation during intubation. Assist with DL/VL like regular stylet to provide view from the tip of the tube or used as independent device as an easier, less expensive alternative to FIS. Also malleable to be used through intubating supraglottic ventilatory devices.	5 mm OD; ETs ≥5.5 mm.
Hugemed Video Lighted Stylet (Bell Medical)	Disposable and reusable options in sizes 3.0 mm, 3.9 mm, 5.0 mm with an adjustable ET tube stop.	3.0 mm diameter 300 mm length, 3.9 mm, 5.0 mm, 380 mm length.
Insight Lighted Video Stylet (Bell Medical)	Malleable rigid stylet video scope with attached HD video display and adjustable curve shape provides view from end of stylet; built-in tube stop to hold ET in place with integral O_2 port for O_2 insufflation during intubation. New wireless or wired communication to the 13-inch HD iWorkstation. Color Display.	34 cm; 3.8 mm OD (ETs ≥4.5 mm).

	Clinical Applications	Special Features
	Usable for routine blind intubation or additional illumination during laryngoscopy, but especially useful when FIS unavailable (e.g., outside locations or ambulances), or when bronchoscopy is difficult to perform (e.g., obscured airway or limited head motion allowed).	Can be used alone or with other techniques. Completely disposable. Intended for single use. Individually packaged in boxes of three.
	Same as Aaron Surch-Lite.	Can be used alone or with other techniques. Handle-mounted xenon light source is always on and keeps stylet tip cold. Uses two AA batteries. System is completely reusable and sterilizable.
	Ideal for difficult intubation, teaching.	Minimizes neck flexion and head hyperextension in trauma cases.
	Flexible lighted stylet for use with or without a laryngoscope. Especially useful in soiled or bloody airways.	Bright light provides excellent verification of ET positioning, even during difficult intubation. ET temperature will not rise above 42°C (108°F).
	Usable for routine intubation or video imaging during laryngoscopy, but especially useful when a FIS is unavailable (e.g., outside locations or ambulances), or when bronchoscopy is difficult to perform (e.g., obscured airway or limited head motion allowed).	Provides rapid learning curve due to similar standard ET advancement techniques, but with added benefit of an attached, clear video image of all landmarks forward of ET tip. Allows for single-handed use with imaging or used in conjunction with a laryngoscope, as desired for physical alignment. Reusable system. Sterilized by glutaraldehyde, and Sterrad or Steris hydrogen peroxide systems.
	Able to elevate a large, floppy epiglottis and navigate through the oropharynx of patients with excessive pharyngeal soft tissue, midline obstruction, limited mouth opening, or fragile veneers on incisors.	Adjustable distal tip to aid in intubating the most anterior airways. Becomes a highly portable device when connected to the C-MAC Pocket Monitor. Includes ET adapter, in addition to adapter for fixation of ETs and O_2 insufflation. Portable, rugged, and better maneuverability than flexible FIS.
	Similar to Shikani and Clarus Video Stylet Scope. Originally designed as adjunct to DL for improved first-pass success. For easy intubation, it is used as a standard stylet. Or, when faced with an unexpected grade 3 or 4 DL view, it offers additional view from "around the corner" via the tip of the tube for successful first-pass intubation. May also be used as a stand-alone device as an alternative to FIS for awake (or anesthetized). See Clarus Video Stylet 3000V.	GreenLine laryngoscope handle or a Turbo LED can be used for light sources. Otherwise, similar to Clarus Video Stylet 3000V, but requires user to cut the ET because it does not have a movable tube stop. Able to connect to an endoscopic tower monitor or a smartphone adapter to connect to a smartphone screen for video viewing. Portable and small enough to carry in airway bag/crash cart when FIS may not be readily available.
	Allows for visualization during intubation through ILMA or quick confirmation of SGA, DLT, or ET placement/positioning patency. May also be used prior to extubation.	Has been modified with a patented deflected tip for a view from the end of the device. Able to connect to an endoscopic tower monitor or a smartphone adapter to connect to a smartphone screen for video viewing.
	Similar to Clarus Video Stylet 3000V.	Comes in adult and pediatric sizes. Light source options are light cable, Turbo LED, or GreenLine laryngoscope handle with adapter. Otherwise, similar to Levitan Viewing Stylet.
	Provides view from tip of the tube. Similar to Shikani and Levitan viewing stylets. Many use it as a stand-alone device as an alternative to FIS for awake (or anesthetized) intubation. Provides access with limited mouth openings, anterior airways, radiation or ENT patients. Malleable stylet allows shaping to reduce cervical movement. May also be used to intubate through a supraglottic airway or checking placement of ETs or SGAs.	Has the simple form of a standard stylet, plus the advantage of a fiber-optic view. Portable, rugged and able to lift tissue. Malleability allows for more universal use in multiple techniques and various airway situations. Red LED provides transillumination. Portable and small enough to carry in airway bag/crash cart when FIS may not be readily available.
	Facilitates tracheal intubation for adults and infants.	The 3.0 mm and 3.9 mm diameter stylets are malleable, and the 5.0 mm is rigid. Available in both reusable and disposable options. Display on stylet is reusable HD with 16 million pixels, > 400 lux illumination.
	Similar to Shikani and Clarus Video Stylet Scope. Used as a standard stylet and ideal for patients with reduced mouth opening ability.	Malleable stylet is a pioneer of semirigid tube core that returns to original shape. HD display, tube secure stop and O_2 insufflation, easy record of pictures and videos.

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Table 2. Stylets *(continued)*

Name (Manufacturer)	Description	Size
J-Wand (D-R Burton Healthcare Products)	Semirigid intubating stylet that can be used with both video and standard laryngoscopy equipment. Flexible angled introducer tip to facilitate ET placement. Oxygenation port built into handle enables providers to perform apneic oxygenation techniques during intubation process.	Can be used with ET ≥6.0 mm.
J-Wand Advantage (D-R Burton Healthcare Products)	Semirigid intubating stylet (without the introducer tip) that can be used with both video and standard laryngoscopy equipment. Oxygenation port built into handle enables providers to perform apneic oxygenation techniques during intubation process.	Same as J-Wand.
Viewing Optical Stylets		
Safe-Cam Video-Stylet System (Medical Safe-Cam)	Single-use, malleable stylet with integrated camera at tip. Image is displayed via a monitor, a cable, or Wi-Fi on phone.	ID ≥6.5 mm (for adults); ≥2.5 mm for pediatrics.
SensaScope (Acutronic Medical Systems)	Hybrid S-shaped, semirigid fiber-optic intubation video stylet. Has a 3-cm steerable tip with video chip that can be flexed in sagittal plane 75 degrees in both directions with lever at proximal end of device. No working channel.	Adult (ETs ≥6.5 mm).
VivaSight 2 DLT (Ambu)	Single-use ET with an integrated camera at the tip. Image is displayed on a monitor via a cable. Built-in camera and light source at the tip of the tracheal lumen, which provides continuous visualization. Offers opportunity to perform One Lung Ventilation with a single-use solution.	ID 7.0, 7.5, 8.0 mm.
VivaSight-SL (Ambu)	Single-use ET with an integrated camera at the tip. Image is displayed on a monitor via a cable.	ID 7.0, 7.5, and 8.0 mm.

Table 3. Flexible Intubation Scopes

Name (Manufacturer)	Description	Size
aScope 4 Broncho Large (Ambu)	Single-use FIS. OD: 5.8 mm; working channel ID: 2.8 mm.	60 cm (ETs ≥7.0 mm).
aScope 4 Broncho Regular (Ambu)	Single-use FIS. OD: 5.0 mm; working channel ID: 2.2 mm.	60 cm (ETs ≥6.0 mm).
aScope 4 Broncho Slim (Ambu)	Single-use FIS. OD: 3.8 mm; working channel ID: 1.2 mm.	60 cm (ETs ≥5.0 mm).
FIVE S Scope - Single-Use Flexible Intubation Video Endoscope (KARL STORZ)	New single-use FIVE S is compatible with the C-MAC Video Intubation Platform. Similar to the reusable FIVE Scope, the distal chip provides 300,000 pixels resolution and a wide angle of view, and its rigid sheath easily maneuvers to facilitate intubation in even the most challenging situations.	3.5 mm width/65 cm length with 1.2 mm suction channel. ET >4.5 mm, DLT >35 Fr.
Flexible Intubation Video Endoscope (KARL STORZ)	Compact, mobile endoscope. The FIVE Scope complements the C-MAC video intubation devices. All components, such as a camera control unit, camera head, light cable and light source, are already included in the C-MAC system. Distal chip technology enhances image quality, field of view and aspect ratio to facilitate intubation.	5.5 mm with 2.3 mm suction channel; 4.0 mm with 1.5 mm suction channel; 2.85 mm without suction channel.
Flexible Intubation Video Endoscope - FIVE 3.0 (KARL STORZ)	Compact, mobile endoscope. The FIVE Scope complements the C-MAC video intubation devices. All components, such as a camera control unit, camera head, light cable and light source, are already included in the C-MAC system. Distal chip technology enhances image quality, field of view and aspect ratio to facilitate intubation. Real-time viewing on the C-MAC HD 8-inch touchscreen LCD monitor with PIP and split-screen capability.	2.85 mm (no suction), 52 cm length. ET >3.0 mm (3 mm ETs will fit with the adapter removed).

	Clinical Applications	Special Features
	Can be used with both standard and VL equipment. Facilitates placement of ET, especially in anterior airway. Ability to provide direct apneic O_2 delivery from the ET during intubation.	Flexible, angled introducer tip and stylet design that mimics modern curved-blade VL. Apneic oxygenation port built into handle. Semirigid stainless steel support within ET. Ergonomic design facilitates easy insertion and removal of the stylet. Disposable, single use.
	Same as J-Wand.	Apneic oxygenation port built into handle. Semirigid stainless steel support within ET. Ergonomic design facilitates easy insertion and removal of the stylet. Disposable, single use.
	Direct view during intubation, including placement and verification of optimal position during intubation and beyond; with adult and pediatric sizes. Indicated for use during routine or difficult intubation.	Optimal, clear image resolution, with malleability allows tube visualization throughout, without blind spots, and no more invasive than the ET (as within tube at all times of normal operation).
	Able to elevate a large, floppy epiglottis and navigate through the oropharynx of patients with excessive pharyngeal soft tissue, midline obstruction, limited mouth opening, or fragile veneers on incisors.	Offers improved view of glottis, simultaneous direct and endoscopic views, full visual control over passage of ET and confirmation of final position. No need for extreme head extension or forced traction of laryngoscope. Can be rapidly assembled for immediate use.
	Direct view during intubation; useful for verifying ET and endobronchial blocker placement and repositioning. Indicated for use during routine or difficult intubation.	Provides a clinical benefit and can increase patient safety because it allows tube placement and the ability to detect and correct tube malpositioning.
	Direct view during intubation; useful for verifying ET and endobronchial blocker placement and repositioning. Indicated for use during routine or difficult intubation.	Continuous visualization allows real-time observation and monitoring of ET or endobronchial blocker position throughout the procedure.

	Clinical Applications	Special Features
	Alternative to reusable FIS with large working channel (e.g., for BAL or secretion management).	Same as aScope 3 Large but with improved image quality, better bending, and new ergonomic design.
	Alternative to standard reusable FIS.	Same as aScope 3 Regular but with improved image quality, better bending and new ergonomic design.
	Equivalent to standard reusable pediatric FIS. Especially useful for positioning DLTs and bronchial blockers.	Same as aScope 3 Slim but with improved image quality, better bending and new ergonomic design.
	Oral and transnasal intubation and lung separation. Small diameter of the FIVE S 3.5 scope is ideal for DLT placement (smallest is 35 Fr DLT) use with bronchial blockers, pediatric airways, and maneuvering around challenging anatomy and obstructions to access the vocal cords when rigid devices fail to do so. Scopes are compatible with the C-MAC monitor and C-HUB Interface, offering a complete airway management distal chip video solution.	Fully disposable, sterile FIS eliminates need for reprocessing. Ideal in emergent settings such as the ICU, ED and code carts for airway assessment and intubation. Reinforced distal tip prevents buckling of scope when it hits resistance. Suction port position designed with ergonomics and workflow in mind.
	Same as FIVE S Scope – Single-Use Flexible Intubation Video Endoscope.	4:3 aspect ratio and 300,000-pixel distal chip resolution allows improved visualization of anatomy, facilitating ET placement. Part of a system approach: 8403ZX C-MAC Monitor includes Dual Device Input providing a "Plan B" that enables use and simple exchange of several airway devices on one portable video platform (i.e., switch from VL to FIS). Improved image quality over FIS by eliminating moiré effect, providing more detailed anatomic images and permitting a full-screen image.
	Oral and transnasal intubation and lung separation. Small diameter of the FIVE 3.0 scope is ideal for pediatric airways, and 26 Fr DLT, maneuvering around challenging anatomy and obstructions to access the vocal cords when rigid devices fail to do so. Scopes are compatible with the C-MAC monitor and C-HUB Interface, offering a complete airway management distal chip video solution.	4:3 aspect ratio and 300,000-pixel distal chip resolution allows improved visualization of anatomy, facilitating ET placement. Part of a system approach: 8404ZXK C-MAC HD Touchscreen Monitor includes Dual Device Input providing a "Plan B" that enables use and simple exchange of several airway devices on one portable video platform (i.e., switch from VL to FIS). Improved image quality over FIS by eliminating moiré effect, providing more detailed anatomic images and permitting a full-screen image.

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Table 3. Flexible Intubation Scopes *(continued)*

Name (Manufacturer)	Description	Size
Flexible Intubation Video Endoscope – FIVE 4.0 (KARL STORZ)	Same as FIVE 3.0.	4.0 mm with 1.5 mm suction channel. 65 cm length. ET >4.5 mm, DLT >35 Fr.
Flexible Intubation Video Endoscope – FIVE 5.5 (KARL STORZ)	Same as FIVE 3.0.	5.5 mm with 2.3 mm suction channel. 65 cm length. ET >6.0 mm.
GlideScope BFlex 3.8 (Verathon)	Single-use flexible bronchoscope designed for difficult airways and routine bronchoscopy procedures that connects with GlideScope Core and compatible with legacy GlideScope video monitor systems.	3.8 mm with 1.2 mm working channel. ET >5.0 mm, DLT >35 Fr. 61 cm length.
GlideScope BFlex 5.0 (Verathon)	Same as GlideScope BFlex 3.8.	5.0 mm with 2.2 mm working channel. ET >6.0 mm. 61 cm length.
GlideScope BFlex 5.8 (Verathon)	Same as GlideScope BFlex 3.8.	5.8 mm with 3.0 mm working channel. ET >7.0 mm. 61 cm length.
Hugemed Flexible Video Intubation Endoscope, VL3S (Bell Medical)	System comes with a video display or remote display viewing option.	2.8 mm, 3.9 mm, 5.2 mm, 5.8 mm diameter, 650 mm working length.
Insight Flexible Video Endoscope (Bell Medical)	Has a universal HD Insight Color Display that is 3.5 inch and stores 70 h of video and 80,000 photos. Multiple-diameter FIS to work with infants and adults. New wireless or wired communication to the 13" HD iWorkstation Color Display.	2.8, 4.0, 4.5 mm with 1.2 mm channel 5.8 mm with and without channel.

Table 4. Video Laryngoscopes

Name (Manufacturer)	Description	Size
Airtraq Avant (Prodol Meditec)	Disposable VL that provides a magnified angular view of the glottis without alignment of oral, pharyngeal and tracheal axes. Includes a guiding channel to both hold and direct ET toward the vocal cords. Reusable optic piece (up to 100 intubations) and anti-fog heater resists lens fogging. Disposable blade and eyecup. MRI conditional use. Also, optional camera and smartphone adapter.	Regular adult (ETs 7.0-8.5 mm). Small adult (ETs 6.0-7.5 mm).
Airtraq SP (Prodol Meditec)	The SP model is single use with all the features of the Avant but fully disposable. Optional camera has an integrated touch screen and can be attached to all Airtraq models. It records and can connect via Wi-Fi to smartphone/iPad/iPhone/PC.	Six color-coded sizes: regular adult (ETs 7.0-8.5 mm); small adult (ETs 6.0-7.5 mm); pediatric (ETs 4.0-5.5 mm); infant (ETs 2.5-3.5 mm); non-channeled blade; and DLTs.
APA (Venner Medical)	Offers continuous O_2 delivery during laryngoscopy, MAC and MIL style blades for use in pediatric, adult and difficult airway patients. APA VL's modular design, along with its 3.5-in monitor, allows the user to choose the airway management technique required based on each patient. A disposable cover for the device is also available to protect it from contamination risks and a stylet to assist laryngoscopy.	10 disposable blade types: MIL 1 and 2 (pediatric); MAC 3 and 4 (adult); DAB and U-DAB (channeled and non-channeled difficult airway blades); APA Oxy Blade; MAC 3, 4, DAB and U-DAB (oxygenation blades).

	Clinical Applications	Special Features
	Oral and transnasal intubation and lung separation. Small diameter of the FIVE 4.0 scope is ideal for DLT placement (smallest is 35 Fr DLT) use with bronchial blockers, pediatric airways, and maneuvering around challenging anatomy and obstructions to access the vocal cords when rigid devices fail to do so. Scopes are compatible with the C-MAC monitor and C-HUB Interface, offering a complete airway management distal chip video solution.	Same as KARL STORZ FIVE 3.0.
	Oral and transnasal intubation and lung separation. The FIVE 5.5 scope is ideal for adult airways, DLT placement (smallest is 41 Fr DLT) use with bronchial blockers and maneuvering around challenging anatomy and obstructions to access the vocal cords when rigid devices fail to do so. Scopes are compatible with the C-MAC monitor and C-HUB Interface, offering a complete airway management distal chip video solution.	Same as KARL STORZ FIVE 3.0.
	Works in conjunction with nonpowered endoscopic accessories and other ancillary equipment, for endoscopy within the airways and tracheobronchial tree. Especially useful in conjunction with GlideScope Core monitors and GVL for multimodal procedures, allowing simultaneous bronchoscopy and VL views on one monitor to help during difficult airway management.	Reinforced, steady insertion tube for difficult airway cases. Handle is designed for convenience with a responsive lever making it easier to manage the scope. Measurement markers for positional accuracy and clinical reference. Convenient tube retainer to secure ET in place during intubation. Centralized suction and working channel ports. No cost or downtime associated with repair or reprocessing. Plug-and-play simplicity with GlideScope QuickConnect technology.
	Same as GlideScope BFlex 3.8.	Same as GlideScope BFlex 3.8.
	Same as GlideScope BFlex 3.8.	Same as GlideScope BFlex 3.8.
	2.8 mm flexible scope with no channel. 3.9 mm flexible scope with 1.2 mm working channel. 5.2 mm flexible scope with 2.2 mm working channel. 5.8 mm flexible scope with 2.6 mm working channel.	Flexible angulation range 160 degrees up, 130 degrees down.
	Features the 3.5 HD color display integrated with endoscope. Easily removed for cleaning and sterilization.	Uses LED light and LED camera at tip of endoscope eliminating the fiber-optic bundles that can so easily be damaged. Articulates fully and easily to aid clinician in verifying DLT placement or in passing an ET in a difficult intubation.

	Clinical Applications	Special Features
	Intended to facilitate intubation in both routine and difficult airway situations. Useful in all cases where ET intubation is desired. Also appropriate for emergency settings, cervical spine immobilization, fiberscope guidance, tube exchange and foreign body removal.	Lightweight, hand-held VL. Camera enables image capture/record as well as Wi-Fi streaming to larger monitors. Optics fully isolated from patient, preventing cross-contamination. Advanced airway device with built-in anti-fog system and low-temperature light source. Can be used with standard ETs. A built-in guide channel helps direct ET through the vocal cords. May be used in MRI suite as MRI compatible.
	Same as Airtraq Avant.	Same as Airtraq Avant but totally disposable and self-contained. 3-y shelf life.
	Suitable for use in EMS, military, ED, ICU, pediatric units, crash cart settings and teaching hospitals to assist direct and indirect laryngoscopy in routine and difficult airways.	APA VL offers 6 styles of laryngoscopy on one device; traditional, MIL, pediatric, MAC, difficult airways and its newest range of oxygenation blades for improving apnea time. Dual battery system allows device to be used as a traditional or VL, offering users a customized solution with one device. APA Oxy Blade allows oxygenation directly into oropharynx at recommended flow rates of 15 L/min during laryngoscopy.

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Table 4. Video Laryngoscopes *(continued)*

Name (Manufacturer)	Description	Size
C-HUB II (KARL STORZ)	The C-HUB is small plug-and-play video processor box that utilizes existing monitors in the OR. Compatible with KARL STORZ's entire airway management tools, as well as other devices from various specialties (ENT, urology, etc.).	Can be used with reusable and single-use blades. Reusable: MAC 0, 2, 3, 4; MAC 3 and 4 with suction channel; MIL 0, 1, 2; adult and pediatric D-BLADE. Single-use: MAC 3, 4; adult D-BLADE; MIL 0, 1. Reusable and single-use flexible intubation scopes.
ClearVue (Infinium)	Includes a 2.0 megapixel full-view camera with high-resolution monitor. Rechargeable lithium-ion battery for extended use. Anti-fog capability is also provided.	MAC 1-5 (disposable and reusable blades); MIL 0, 1.
C-MAC HD (KARL STORZ)	Instant-on, battery-powered VL with standard-shaped interchangeable MAC and MIL blades for neonates through obese adults as well as a difficult airway blade (D-BLADE) for very anterior airways. Blades house 800P HD distal chip and LED technology. The D-BLADE has angle of view with approximately 80-degree acute curvature design. Real-time viewing on the C-MAC HD 8-in touchscreen LCD monitor with PIP and split-screen capability or portable 3.5-inch Pocket Monitor. Both modalities offer video and still picture recording conveniently located at the laryngoscope handle.	MAC 0, 2, 3, 4; MIL 0, 1, 2, MAC 3 and 4 with channel for suction; adult and pediatric D-BLADE.
C-MAC Pocket Monitor (KARL STORZ)	Highly portable rescue device, 3.5-inch monitor fits directly on all C-MAC premium class reusable and single-use blades and the C-MAC Video stylet. LCD 4:3 ratio high-resolution screen works in direct sunlight; rechargeable and removable lithium-ion battery lasts 1 h; ergonomic screen can be moved in several directions and folded away for transport; fully immersible. Offers video and still picture recording conveniently located at the laryngoscope handle.	Reusable: MAC 0, 2, 3, 4; MAC 3 and 4 with suction channel; MIL 0, 1, 2; adult and pediatric D-BLADE Single-use: MAC 3, 4; adult D-BLADE; MIL 0, 1; C-MAC Video stylet.
C-MAC S (KARL STORZ)	The highly versatile, reusable S-Imager can be used with the C-MAC 7-inch LCD monitor or portable 3.5-inch Pocket Monitor. Both modalities offer video and still picture recording conveniently located at the laryngoscope handle. Anti-fog feature. Uses single-use blades. Imager is available in adult and pediatric sizes.	MAC 3, 4; adult D-BLADE; MIL 0, 1.
CoPilot VL+ (Dilon Technologies)	Portable VL designed to be used in multiple settings for every intubation. Rechargeable lithium polymer battery provides >2 h continuous use. Durable and portable.	Adult size 3 and 4 disposable sheath blades with anti-fog coating.
GlideScope Core 10 (Verathon)	The total airway solution featuring a 10-inch HD touchscreen monitor and comprehensive workstation for streamlined workflow. Compatible with GlideScope's extensive portfolio of VL and the new BFlex single-use flexible bronchoscope. Most comprehensive and flexible airway visualization system for VL, bronchoscopy and multimodal airway procedures.	Spectrum single-use LoPro S1, S2, S2.5, S3 and S4; Miller S0 and S1; DirectView MAC S3, S4; Video Baton QC Large: disposable blade sizes 3, 4; Titanium Reusable; LoPro T2, LoPro 3 and 4 angled blades, and MAC-style 3 and 4 blades; BFlex single-use flexible bronchoscope sizes 3.8, 5.0 and 5.8 mm.
GlideScope Core 15 (Verathon)	The total airway solution featuring a 15-inch HD touchscreen monitor, compatible with GlideScope's extensive portfolio of VL and the BFlex single-use flexible bronchoscope. Most comprehensive and flexible airway visualization system for VL, bronchoscopy and multimodal airway procedures.	Same as GlideScope Core 10.
GlideScope Go (Verathon)	Hand-held, high-resolution VL system. Durable, portable, and intuitive, it uses the portfolio of fully disposable, single-use blades, designed to maximize first-pass success and minimize infection rates in routine and difficult intubation, in a wide range of patient sizes and types.	Spectrum single-use LoPro S1, S2, S2.5, S3 and S4; Miller S0 and S1; DirectView MAC S3, S4; Video Baton 2.0 Large: disposable blade sizes 3 and 4.
Hugemed VL3D (Bell Medical)	3.5-inch display that uses disposable MAC blades.	MAC 1, 2, 3 and 4, and strong curved.
Hugemed VL3R (Bell Medical)	3.5-inch display that uses reusable (1000+ use) stainless steel MIL and MAC blades.	MIL 00, 0 and 1 blades plus MAC 0, 1, 2, 3 and 4 reusable 316 medical grade stainless steel.
Insight VL (Bell Medical)	One of six airway devices that use the universal HD Insight video display. Insight video display fits flexible endoscopes, rigid lighted stylet and VL. The displays are interchangeable on all Insight devices. New wireless or wired communication to the 13-inch HD iWorkstation Color Display. Now with four acute angled blades and MAC 3 and 4 traditional blades.	Four disposable blades, including sizes MAC 1, 2, 3 and 4.

	Clinical Applications	Special Features
	Ideal for integrated ORs/trauma bays to provide access to KARL STORZ VL, FIS and video stylets for cost efficiency. Facilitates timely room turnover, as the system is built into the room versus a rolling cart.	C-HUB II works seamlessly with the facility's OR environment, enabling instant airway visualization on the existing monitors in the video tower or integrated OR. Compatible with the full portfolio of KARL STORZ airway management products, the C-HUB II leverages the video and integration the facility has already made to include anesthesia video intubation technologies, providing a complete airway solution from one source.
	High-resolution view of the glottis enables first-attempt success while minimizing any chance of a complication during the intubation process.	Quick shot camera button for video recording. Optional HDMI port to connect with an external monitor.
	Useful for anterior airways, obese patients, and patients with limited mouth opening or neck extension. Variety of blade sizes and designs accommodates patients ranging from neonate (500 g) to morbidly obese. Additionally, useful for teaching purposes, verification of ET position, aiding application of external laryngeal manipulation, or passage of an intubating introducer. May also be used for nasal intubation and ET exchange.	Unique platform design is compatible with multiple intubation devices, including VL, the FIVE distal chip flexible video scopes and standard eyepiece scopes (fiber-optic and semirigid) via C-CAM camera head. Built-in still and video image capture on memory card, with real-time playback on monitor. Dual input capability allows for toggling between two devices, always ready for "Plan B." Angled distal lens provides 80-degree field of view. Inherent anti-fog design.
	Ideal for ICU, crash carts, ED, and all prehospital environments including EMS, ambulatory services, air transport and military. Has familiar blade design and 80-degree field of view.	Lightweight, handheld and battery-operated device well suited for areas outside the OR. Waterproof. Proprietary data transfer cable allows for better patient Information control. Extension cable allows for tomahawk approach when intubating patients in difficult positions (prehospital/emergency setting). Battery-saving auto shut-off feature with warning indicators, enables user to extend the reset timer with a push of the ergonomically placed blue button.
	Same as C-MAC VL. When used with Pocket Monitor, most ideal for the ED, and all prehospital environments including EMS, ambulatory services, air transport and military where reprocessing of blades can be a challenge. Also, suitable for NICU and PICU because of MIL 0 and 1 blade offering.	Available with a USB connector cable that can be used with RDT Tempus Pro vital signs monitor.
	Blade angle useful for both routine and difficult airways.	Bright, full-color high-resolution camera and display. Only VL with patented bougie port to facilitate ET placement. 4.3-inch display. Fog-free disposables.
	Delivers an all-in-one system to visualize the airway and tracheobronchial tree for routine to difficult intubation and routine bronchoscopy procedures in a wide range of patient sizes and types. Enhances airway management visualization with live picture-in-picture imaging (Dual View on GS Core 15) to help secure difficult airways via multimodal airway procedures. Ideal for the OR, ICU, and ED and in teaching environments.	Dual connection ports for two video inputs; simultaneous dual view with picture-in-picture on GS Core 10 and Dual View on GS Core 15; MagnaView to enlarge the bronchoscopy view; still image and video capture; video playback and image gallery; patient notes annotation feature; SpO_2 and pulse rate reading on screen and on captured videos; 180-degree image rotation; HDMI output for external video display; coupled with a premium workstation that offers an adjustable arm, cable organizer, prep tray, storage bin and disposal bin.
	Same as GlideScope Core 10.	Same as GlideScope Core 10.
	Ideal for use in small spaces, emergent procedures, and whenever the situation demands mobility for routine and difficult airways.	Fully submersible IP67 rating; 3.5-inch landscape color display with vertical tilt adjustment supporting a wide field of view; scratch-resistant screen with anti-glare coating; integrated battery delivers a minimum of 100 min of continuous use on a full charge; configurable auto-shutdown and automatic recording with removable micro-USB drive.
	High-quality airway view facilitates both routine and difficult intubation in a wide range of patient sizes and types.	High-definition display improves laryngeal visualization; single use blades.
	Unique ability to use a MIL blade with benefits of a VL. High-quality airway view enables intubation in a wide range of patient sizes.	High-definition display improves laryngeal visualization; reusable and sterilizable.
	Ideal for routine and difficult airways. Has a HD 3.5-in color display that rotates and tilts 270 degrees and a three-plus-hour rechargeable battery, Wi-Fi, and HDMI-capable, photo and video with storage of 70 h or 80,000 photos and anti-fog technology. The display can be removed for easy sterilization of blade handle.	Innovative Slider Design extends and contracts camera in seconds to allow one VL system to adjust to fit infant and pediatric laryngoscope blades up to adult and large adult blades. Integrated display and handle for total portability.

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Table 4. Video Laryngoscopes *(continued)*

Name (Manufacturer)	Description	Size
i-view (Intersurgical)	Single-use VL incorporating a MAC blade to allow direct and indirect view. Ergonomic design and the integral LCD screen provides an optimal view in a variety of light conditions.	MAC size 4 (adult).
King Vision (Ambu)	Durable, fully portable digital VL with a high-quality reusable display and disposable blades. Hand-held, on-board display avoids cables and encourages patient focus; disposable blades incorporate camera and light source so fresh optics for each use.	Size 3 standard (13-mm minimum mouth opening) and size 3 channeled (18-mm minimum mouth opening); channeled blade allows ETs 6.0-8.0 mm.
King Vision aBlade (Ambu)	Reusable video adapter attaches to the existing display to allow use of lower-cost aBlades. Durable, fully portable digital VL with a high-quality reusable display and disposable aBlades. Hand-held, on-board display avoids cables and encourages patient focus.	aBlade sizes: 1, 2, 3 (standard); 2, 3 (channeled).
McGrath MAC (Medtronic)	Portable VL intubation platform designed for routine use. Equipped with either disposable MAC blades or hyperangulated blades for more anterior airways. Integrated screen displays minute-by-minute battery life countdown for improved reliability. Auto shutoff feature when not in use and bright light wand to illuminate the airway structures.	MAC blade sizes: 1, 2, 3 and 4. X3 (hyperangulated).
ProVu VL (Flexicare)	Sterile, single-use metal blade and handle.	MAC blade sizes: 3, 4. Hyperangulated blade sizes: 3 and 4. Display sizes: 3.5 and 8 inch.
VividTrac (FUJIFILM SonoSite)	Video intubation device that works on many computer systems equipped with USB II port as a standard USB camera, using available video camera applications on Windows, Mac and Linux systems. Alternatively, automated video display software (VividVision) can be downloaded.	ETs 6.0-8.5 mm.

Table 5. Specialty Rigid Laryngoscopes

Name (Manufacturer)	Description	Size
Dörges Emergency Laryngoscope Blade (KARL STORZ)	Developed in Europe as a universal blade that combines features of both the MAC and MIL laryngoscope blades.	One size only for patients >10 kg to adult.
Modified MAC Blades		
AincA Flex-Tip Fiber-Optic Laryngoscope Blade (Anesthesia Associates)	Flexible tip or levering fiber-optic MAC laryngoscope blades designed with a hinged tip controlled by a lever at the proximal end. Designed to fit standard handles.	Adult sizes 3 and 4; pediatric size 2.
AincA Macintosh Viewing Prism (Anesthesia Associates)	An optically polished viewing prism for attachment to most MAC laryngoscope blades (conventional OR fiber-optic). Effectively repositions the practitioner's viewpoint to the forward portion of the MAC curve via a 30-degree refraction without inverting the image. Clips to the vertical flange of the MAC to "look around the curve of the blade."	Sizes 2, 3 and 4 for use on MAC laryngoscope blades of sizes 2, 3 and 4.
NOVALITE Flex-Tip Fiber Optic Blade (NOVAMED USA)	Designed with an integrated fiber-optic bundle for maximized light transmission and optimal task illumination. Using advanced XENON light technology, NOVALITE fiber-optic laryngoscopes deliver enhanced illumination for safer intubation.	MAC 2, 3 and 4.
NOVALITE MRI Conditional Laryngoscope (NOVAMED USA)	Featuring NOVAMED "ULTRA BRITE" fiber-optic laryngoscope technology to afford clinicians a solution for intubation within the magnetic resonance (MR) environment—ensuring improved response time, enhanced patient safety and minimized risk for trauma.	MAC 0-5; MIL 00-4.
NOVALITE Reusable Fiber Optic Laryngoscope (NOVAMED USA)	Reusable fiber-optic laryngoscope blades designed with a removable fiber-optic bundle to optimize cleaning and patient safety. The classic, reusable design is compatible with Green System handles. Green System handles available in Medium, Penlight and Stubby.	MAC 0, 1, 2, 3, 3.5, 4; MIL 00, 0, 1, 1.5, 2, 3, 4; Wis-Hipple 1, 1.5; Robertshaw 0, 1.

	Clinical Applications	Special Features
	Designed to provide direct and indirect visualization of the larynx to facilitate ET intubation in adults. Can be used in pre-hospital, ED, code carts, OR, ICU and satellite areas of the hospital.	Up to 4-h battery life with 3-y shelf life.
	Hyperangulated blade design facilitates both routine and difficult intubation.	Can be used alone or with other techniques. Powered by three AAA batteries; high-fidelity 2.4-inch screen allows wide-angle viewing; anti-fog coating on distal lens; side of channel is soft for separation of ET. Video out for connection to external display or video-capture device.
	Hyperangulated blade design facilitates both routine and difficult intubation.	Can be used alone or with other techniques. Powered by three AAA batteries; high-fidelity 2.4-inch screen allows wide-angle viewing; anti-fog coating on blade window; side of channel is soft for separation of ET. Video out for connection to external display or video-capture device.
	Combines the benefits of video-assisted and direct visualization with a complete blade range to encourage routine use of VL in all care settings. Benefit of direct visualization of the anatomic structures.	Requires no specialized training. Low-profile blades for improved agility and reduced dental interaction. Portrait-oriented display may help reduce blind spot. Highly portable, easy to clean and lightweight with no external cables.
	High-quality airway view facilitates both routine and difficult intubations. An extremely low-profile blade with no sheath, affords more space for maneuverability and ET delivery.	Adaptive lighting, autofocus, optimized camera positioning, antifog glass, blind spot–reduction technology and bright white LED.
	Intended to facilitate intubation in both routine and difficult airway situations.	VividTrac is inserted more like an oral airway device (or SGA) than a laryngoscope blade. The ET can be preloaded or inserted once visualization is achieved in the VividTrac tube channel.

	Clinical Applications	Special Features
	Blade is inserted into oropharynx to appropriate depth, which correlates with patient's size.	10- and 20-kg markings on the blade.
	Controlled manipulation of large or floppy epiglottis. Useful in patients with a recessed mandible and decreased mouth opening.	A lever controls the tip angle through 70 degrees during intubation to lift the epiglottis, if necessary, to improve laryngeal visualization.
	Allows viewing of the vocal cords even in a patient with an anterior airway position. Also useful during nasal intubation (with impaired view) and for postoperative examination of the larynx.	Built-in clip on each prism allows attachment to any MAC-type laryngoscope blade that has a standard thickness vertical flange. Usable on both conventional and fiber-optic–type MAC blades. Reusable and sterilizable.
	Positioning of the 5.0-mm fiber-optic bundle closer to the tip of the blade further enhances visibility and ensures ease of intubation.	Designed for interchangeability with universal Green System.
	Powered by Lithium XENON technology, NOVALITE MRI Conditional fiber-optic laryngoscopes deliver enhanced illumination for safer intubation in the MR suite.	Certified to meet FDA MRI Conditional requirements up to 3.0 tesla.
	Reusable blades with removal fiber-optic bundle facilitate sterilization, helping to prevent cross-contamination and improve reliability. Compatible with Green System fiber-optic handles.	Removable fiber-optic bundle ensures optimal cleaning to improve patient safety. Classic fiber-optic blade design preferred by clinicians.

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Table 5. Specialty Rigid Laryngoscopes *(continued)*

Name (Manufacturer)	Description	Size
NOVALITE Single Use Fiber Optic Laryngoscope (NOVAMED USA)	Single-use fiber-optic hybrid Green System laryngoscope blades with improved illumination and low-profile design for ease of intubations. Combination of stainless steel with polished acrylic bundle duplicates the light output of reusable fiber-optic blades.	MAC 0, 1, 2, 3, 4; MIL 00, 0, 1, 2, 3, 4.
NOVALITE Single Use LED Laryngoscope (NOVAMED USA)	Single-use stainless steel blades available in a complete range of neonatal to adult sizes. Medium/Penlight/Stubby handles are preloaded with batteries, packaged separately.	Blades: MAC 0, 1, 2, 3, 4, MIL 00, 0, 1, 1.5, 2, 3, 4, Wis-Hipple 1.5. Handles: Medium, Penlight, Stubby.
Vie Scope (Adroit Surgical)	Allows for a straight line-of-sight view with 360 degrees maximal illumination to pass a bougie between the vocal cords. Provides the ability to intubate the patient when awake in trauma situations both in the hospital and in the field. Single use.	Adult, one size fits all.

Table 6. Supraglottic Ventilatory Devices

Name (Manufacturer)	Description	Size
AES Ultra (AES)	All-silicone laryngeal mask with standard cuff valve.	Adult sizes 3-6.
AES Ultra Clear (AES)	Silicone cuff and PVC tube, laryngeal mask with standard cuff valve.	Adult sizes 3-6.
AES Ultra EX (AES)	All-silicone, multiple-use laryngeal mask.	Pediatric to adult sizes 1-6.
AES Ultra Flex EX (AES)	All-silicone, wire-reinforced, multiple-use laryngeal mask.	Pediatric to adult sizes 1-6.
air-Q (Cookgas)	Hyper-curved intubating laryngeal airway that resists kinking and removable airway connector. Anterior portion of mask is recessed; larger mask cavity allows intubation using standard ETs. air-Q removal after intubation is accomplished by using air-Q reusable removal stylet.	Sizes (0.5, 1.0, 1.5, 2.0, 2.5, 3.5 and 4.5) that can accommodate standard ETs 4.0-8.5 mm.
air-Q Blocker (Cookgas)	Combines the features of air-Q Disposable laryngeal mask, with an additional soft, flexible guide tube located to the right of the breathing tube. This channel provides access to the esophagus with a NGT or Blocker tube that allows clinicians to vent, suction and further block the esophagus.	Sizes (2.5, 3.5 and 4.5) that can accommodate standard ETs ≤8.5 mm; also available in kits with syringe and lubricant packet.
air-Q Disposable (Cookgas)	Hyper-curved intubating laryngeal airway with removable color-coded connectors. Anterior portion of mask is recessed; larger mask cavity allows intubation using standard ETs. air-Q removal after intubation is accomplished by using air-Q reusable removal stylet.	Sizes (1.0, 1.5, 2.0, 2.5, 3.5 and 4.5) that can accommodate standard ETs ≤8.5 mm.
air-Q SP (Cookgas)	Combines features of the air-Q reusable laryngeal masks with added advantage of a self-pressurizing mask. No inflation line or pilot balloon is needed. PPV or spontaneously breathing patients inflate the mask during the uptake of ventilation.	Sizes (0.5, 1.0, 1.5, 2.0, 2.5, 3.5 and 4.5) that can accommodate standard ETs 4.0-8.5 mm.
air-Q SP Disposable (Cookgas)	Combines features of the air-Q disposable laryngeal masks with added advantage of a self-pressurizing mask. No inflation line or pilot balloon is needed. PPV or spontaneously breathing patients inflate the mask during the uptake of ventilation.	Sizes (1.0, 1.5, 2.0, 2.5, 3.5 and 4.5) that can accommodate standard ETs ≤8.5 mm.
Aura40 (Ambu)	Same design as the Ambu AuraOnce, but reusable.	Pediatric to adult sizes 1-6.
Aura40 Straight (Ambu)	Same design as the Ambu AuraStraight, but reusable.	Pediatric to adult sizes 1-6.

	Clinical Applications	Special Features
	Single-use blades prevent cross-contamination and improve reliability. Compatible with Green System fiber-optic handles.	Closely resembles the construction of reusable fiber-optic blades, while offering the benefits of single use.
	Ideal for code carts and large facilities with infection-control concerns and cost-efficient requirements.	Fixed LED light source remains cool at all times for improved patient safety. Low profile neonatal/pediatric design for MIL 00, 0, 1 and 1.5 sizes.
	Trauma, routine, difficult and awake intubation can now be accomplished with one scope anywhere.	Patented LED ring illumination located at the proximal end of a self-enclosed clear tube allows light to be transmitted through the lumen of the tube as well as the sidewall to avoid obstruction of light by secretions or blood.

	Clinical Applications	Special Features
	Standard all-silicone SGA.	All silicone. Single use.
	Combines all-silicone cuff with PVC tube for cost savings.	All silicone cuff with PVC tube. Single use.
	Reusable, standard SGA.	40 uses.
	Reusable, wire-reinforced SGA, designed to accommodate repositioning of the head and neck during surgery.	40 uses.
	Allows easy access for FIS devices. Use as routine masked laryngeal airway. Removable connector allows intubation with standard ETs ≤8.5 mm.	Designed to minimize folding of the cuff tip on insertion. Integrated bite block reinforces the tube while diminishing need for a separate bite block. Color-coded removable connectors tethered to the airway tube, avoiding episodes of misplaced connectors.
	Enhanced version of the standard air-Q. Indicated as primary airway device when oral ET is not necessary or as aid to intubation in difficult situations.	The soft guide tube allows access to the posterior pharynx and esophagus by supporting and directing medical instruments beneath the air-Q mask and into the pharynx and esophagus. Medical instruments especially suited are suction catheters, NGTs up to size 18.0 Fr, and the newly designed air-Q Blocker tubes. The Blocker tubes are designed to suction the pharynx, or suction, vent, and block the upper esophagus during use of the air-Q Blocker airway.
	Same as air-Q reusable laryngeal mask.	Removable color-coded connector allows intubation with standard ETs ≤8.5 mm.
	More secure than a face mask and less invasive than intubation with an ET when tracheal intubation is not necessary or during unexpected difficult airway situation.	Incorporates the air-Q design with Self-Inflating Mask.
	Same as regular air-Q but eliminates need for mask inflation.	PPV self-pressurizes mask cuff. On exhalation, mask cuff decompresses to level of PEEP. Removable connector allows intubation with standard ETs.
	Routine use of SGA.	Reusable.
	Routine use of SGA.	Reusable. Available only in US.

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Table 6. Supraglottic Ventilatory Devices *(continued)*

Name (Manufacturer)	Description	Size
AuraFlex (Ambu)	Disposable wire-reinforced flexible laryngeal mask.	Pediatric to adult sizes 2-6.
AuraGain (Ambu)	Second-generation laryngeal mask, featuring anatomic curve for rapid placement, gastric access for suction and decompression of the stomach via a gastric tube, and integrated direct intubation capability for management of expected or unexpected difficult airway.	Pediatric to adult sizes 1-6.
Aura-i (Ambu)	A laryngeal mask with built-in curve and bite blocker designed as a conduit for optical tracheal intubation.	Pediatric to adult sizes 1-6.
AuraOnce (Ambu)	A laryngeal mask with a special built-in curve that replicates natural human anatomy. It is molded in one piece with an integrated inflation line and no epiglottic bars on the anterior surface of the cuff.	Pediatric to adult sizes 1-6.
AuraStraight (Ambu)	A straight laryngeal mask featuring a single-mold design and an extra-soft, thin cuff which easily conforms to the airway.	Pediatric to adult sizes 1-6.
i-gel (Intersurgical)	A second-generation, single-use SGA with a non-inflating cuff, designed to mirror the perilaryngeal anatomy, with an integral bite block, buccal cavity stabilizer, and gastric channel. Also incorporates wide-bore airway channel to aid insertion and eliminate the potential for rotation. Can be used as a conduit for intubation with flexible scope guidance (sizes 3-5).	Adult sizes 3-5 and pediatric sizes 1-2.5; adult sizes accommodate ETs 6.0-8.0 mm.
i-gel O_2 Resus Pack (Intersurgical)	A second-generation, single-use SGA with a supplementary O_2 port designed to facilitate ventilation during CCR. A color-coded hook ring is used to secure the airway support strap and aids in size identification. Non-inflating cuff that mirrors the perilaryngeal anatomy, with an integral bite block, buccal cavity stabilizer and gastric channel. The pack contains an i-gel O_2, a sachet of lubricant and an airway support strap.	Adult sizes 3-5; adult sizes accommodate ETs 6.0-8.0 mm.
KING LT-D (Ambu)	Disposable, single-lumen tube with two low-pressure cuffs. Intended for insertion into upper esophagus with ventilatory openings aligned with tracheal inlet; distal cuff seals the esophagus and the proximal cuff seals the oropharynx.	Adult sizes 3-5 and pediatric sizes 2, 2.5.
KING LTS-D (Ambu)	Disposable double-lumen laryngeal tube with separate ventilation and gastric access channels. Intended for insertion into upper esophagus with ventilatory openings aligned with the tracheal Inlet; distal cuff seals the esophagus and the proximal cuff seals the oropharynx.	Adult sizes 3-5 and pediatric sizes 0, 1, 2, 2.5.
LarySeal Pro (Flexicare)	Next-generation SGA with integrated suction, reinforced bite guard, preformed anatomic curve and ET insertion capabilities.	Adult sizes 3-5 and pediatric sizes 1, 1.5, 2, 2.5.
LMA Classic (Teleflex)	Safe, general-purpose airway for routine elective inpatient and outpatient surgical procedures.	Adult sizes 3-6 and pediatric sizes 1, 1.5, 2, 2.5.
LMA Fastrach (Teleflex)	Designed to facilitate blind intubation without moving head or neck, allowing for single-handed insertion. Allows continuous ventilation between intubation attempts.	Adult sizes 3-5 that can accommodate special ETs 6.0-8.0 mm.
LMA Flexible (Teleflex)	Has a reinforced airway tube that allows it to be positioned away from the surgical field while maintaining a good seal.	Adult sizes 3-6 and pediatric sizes 2, 2.5.

	Clinical Applications	Special Features
	Designed for use in ENT, ophthalmic, dental and torso surgeries.	Integrated pilot tube and high flexibility enables positioning away from the surgical field, without loss of seal. Single use. EasyGlide texture and extra-soft cuff ease insertion and removal. Convenient depth marks for monitoring correct position of the mask.
	Useful for ventilation and intubation. Appropriate for management of expected or unexpected difficult airway.	Allowable ET size is designated on each device; maximum OG tube size is also included (e.g., 16 Fr for sizes 3-6). A soft, bite absorption area is integrated into the device as is a pilot fixator. Pediatric sizes 1 and 1.5 feature an innovative connector that reduces dead space by 39%.
	Combines everyday routine use of SGA with direct intubation capability in case of difficult airway situations.	Anatomically correct curve designed as Ambu AuraOnce and Ambu Aura40 but specially designed as a conduit for intubation. Compatible with standard ETs.
	Allows easy access for FIS devices. For use in both anesthesia and emergency medicine.	Anatomically correct curve facilitates placement. One-piece mold. EasyGlide texture for ease of insertion. Convenient depth marks for monitoring correct position of the mask. MRI safe. Extra-soft cuff. If intubation is necessary or desired, recommend intubation over Aintree AEC. Single use.
	For use in both anesthesia and emergency medicine.	Single-use, one-piece mold. EasyGlide texture for ease of insertion. Convenient depth marks for monitoring correct position of the mask. MRI safe. Extra-soft cuff.
	For use in routine and emergency anesthesia and resuscitation in adult patients. Can be used as a conduit for intubation with flexible scope guidance (sizes 3-5). Gastric channel provides early warning of regurgitation, allows for passing of a NGT to empty gastric contents and can facilitate venting of gas from the stomach (except size 1).	Single-use, non-inflating cuff allows easy and rapid insertion, provides high seal pressures, and minimizes risk for tissue compression. Gastric channel provides early warning of regurgitation. Buccal cavity stabilizer reduces risk for rotation or displacement, and integral bite block prevents occlusion of airway channel. Wide-bore airway channel also allows for use as a conduit for intubation with flexible scope guidance (sizes 3-5).
	For use in routine and emergency anesthesia and resuscitation in adult patients. Can be used as a conduit for intubation with flexible scope guidance. i-gel O_2 also can be used to provide supplementary O_2 during postoperative care or patient transfer. Gastric channel provides early warning of regurgitation, allows for passing of NGT to empty gastric contents and can facilitate venting of gas from the stomach.	Single-use, non-inflating cuff allows easy and rapid insertion, provides high seal pressure and minimizes risk for tissue compression. A supplementary O_2 port allows for administration of passive oxygenation as a component of CCR. Gastric channel provides early warning of regurgitation. Buccal cavity stabilizer reduces risk for rotation or displacement and integral bite block prevents occlusion of airway channel.
	Useful for routine or emergency airway management. Two cuffs provide elevated ventilatory seal; esophageal cuff provides physical barrier in esophagus, reducing gastric insufflation and providing potential aspiration protection. Commonly used in EMS.	Both cuffs are inflated with a single pilot tube/valve; printed depth marks; color-coded 15-mm connectors for each size. Also available in a compact, vacuum-sealed kit with inflation syringe and lube.
	Useful for routine or emergency airway management. Two cuffs provide elevated ventilatory seal; esophageal cuff provides physical barrier in esophagus, reducing gastric insufflation and providing potential aspiration protection. Separate gastric access channel allows venting and active removal of gastric fluids. Commonly used in EMS.	Both cuffs are inflated with a single pilot tube/valve; printed depth marks; color-coded 15-mm connectors for each size. Large gastric port (sizes 3-5 allow 18 Fr OG tube passage). Also available in a compact, vacuum-sealed kit with inflation syringe and lube.
	Rapid and secure management for any airway. Equipped with features for difficult airways.	Large channel for improved suction. Guide system for directed ET insertion. Epiglottic fenestrated flap prevents blockage and elevates the epiglottis for ET or FIS insertion.
	Although originally developed for airway management of routine cases with spontaneous ventilation, it is now listed in the ASA Difficult Airway Algorithm as an airway ventilatory device or a conduit for tracheal intubation. Can be used in both pediatric and adult patients in whom ventilation with a face mask or intubation is difficult or impossible. Can also be used as bridge to extubation and with pressure support or PPV.	Aperture bars designed to prevent blockage of the airway by the epiglottis. Reusable ≤40 times. Silicone cuff. Not made with natural rubber latex.
	Designed for anatomically difficult airway and included in AHA's and ASA's difficult airway algorithms.	Supplied as either a sterile version for single-use only, or as a reusable version that may be used ≤40 times. Silicone cuff. Not made with natural rubber latex.
	Ideal for ENT, ophthalmic and dental surgery, or other procedures where the surgeon and anesthesiologist compete for airway access.	Supplied as either a sterile version for single use only, or as a reusable version that may be used ≤40 times. Not made with natural rubber latex.

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Table 6. Supraglottic Ventilatory Devices *(continued)*

Name (Manufacturer)	Description	Size
LMA Gastro with Cuff Pilot (Teleflex)	LMA specifically designed to give clinicians control of their patients' airways while facilitating direct endoscopic access via the integrated endoscope channel. Once placed, the LMA Gastro Airway facilitates end-tidal CO_2 monitoring throughout the procedure to support patient safety.	Adult sizes 3-5.
LMA ProSeal (Teleflex)	Double-cuff design enables seal pressures ≥30 cm H_2O to be achieved, and the drain tube separates the alimentary and respiratory tracts.	Adult sizes 3-5 and pediatric sizes 1, 1.5, 2, 2.5.
LMA Protector with Cuff Pilot (Teleflex)	Second-generation SGA with silicone cuff designed to achieve an oropharyngeal seal equivalent to the LMA ProSeal Airway (>30 cm H_2O). Combines a pharyngeal chamber and dual gastric drainage channels, designed specifically to minimize gastric insufflation and facilitate gastric access.	Adult sizes 3-5.
LMA Supreme (Teleflex)	Combines features of previous LMAs to provide increased safety and ease of use. The higher seal pressure and gastric access provide a higher degree of safety. Designed to channel fluids away from the airway in the unlikely event of active or passive regurgitation and allows for diagnostic positioning.	Adult sizes 3-5 and pediatric sizes 1, 1.5, 2, 2.5.
LMA Unique (Teleflex)	Original, single-use LMA with design based on LMA Classic. Available with or without syringe and lubricant.	Adult sizes 3-5 and pediatric sizes 1, 1.5, 2, 2.5.
LMA Unique EVO with Cuff Pilot (Teleflex)	First-generation, silicone cuffed LMA that offers ET intubation capabilities.	Adult sizes 3-5.
LMA Unique with Cuff Pilot (Teleflex)	A versatile, single-use, first-generation laryngeal mask with a medical-grade silicone cuff and integrated cuff pressure manometer.	Adult sizes 3-6 and pediatric sizes 1, 1.5, 2, 2.5.
Portex Clear PVC, Oral/Nasal, Soft Seal Cuff Tracheal Tubes (Smiths Medical)	Similar in shape to the first-generation laryngeal mask, but differs in its 1-piece design, in which the cuff is softer and there is no "step" between the tube and the cuff, an integrated inflation line, no epiglottic bars on the anterior surface of the cuff and a wider ventilation orifice.	Pediatric to adult sizes 1-5.
Shiley Esophageal Endotracheal Airway, Double Lumen (Medtronic)	A disposable DLT that combines the features of a conventional ET with those of an esophageal obturator airway. Has a large proximal latex oropharyngeal balloon and a distal esophageal low-pressure cuff with 8 ventilatory holes in between.	Two adult sizes: 41 Fr, height >5 ft; 37 Fr, height 4-6 ft.
Soft-Seal (Smiths Medical)	Similar in shape to the first-generation laryngeal mask, but differs in its 1-piece design, in which the cuff is softer and there is no "step" between the tube and the cuff, an integrated inflation line, no epiglottic bars on the anterior surface of the cuff and a wider ventilation orifice.	Pediatric to adult sizes 1-5.
Solus Curve (Intersurgical)	A single-use SGA designed for those who prefer the insertion characteristics of a curved device. Includes a classic cuff shape, integral inflation line and a high-quality valve.	Adult sizes 3-5.
Solus Flexible (Intersurgical)	A range of single-use SGA with a wire-reinforced tube, permitting flexion without kinking. Includes a classic cuff shape, integral inflation line and a high-quality valve.	Adult sizes 3-5 and pediatric sizes 2 and 2.5.

	Clinical Applications	Special Features
	Designed to provide control of a patient's airway while enabling direct access to the esophagus and upper gastrointestinal tract in adult patients undergoing endoscopic procedures.	Endoscope channel enables an endoscope (max OD, 14 mm) to be passed through the device under vision. Cuff Pilot Technology, an integrated cuff pressure indicator that provides constant at-a-glance feedback, alerting clinicians to changes in cuff pressure. Integral bite block reduces the potential for damage to, or obstruction of, the airway tube or endoscope due to biting. Adjustable holder and strap maintain the device in a neutral position during endoscope manipulation.
	The drain tube higher seal pressures together with the flexible airway tube enable longer periods of ventilation with minimal posterior pharyngeal wall damage, therefore expanding the types of procedures where a LMA can be used.	Second cuff allows tighter seal for PPV. Silicone cuff. Reusable ≤40 times. Not made with natural rubber latex.
	For routine procedures or to manage high-risk patients.	Elongated, inflatable silicone cuff is designed to conform to the contours of the hypopharynx and achieve an oropharyngeal seal equivalent to the LMA ProSeal Airway (>30 cm H_2O). The esophageal seal secures the distal tip at the upper esophageal sphincter and is designed to minimize gastric insufflation and facilitate gastric access. The airway tube allows for direct flexible scope–aided intubation with ETs ≤7.5 mm.
	For routine procedures or to manage higher-risk patients.	Allows for easy insertion, higher seal pressures, and provides gastric access to suction or decompress the stomach. First Seal Technology is designed to provide adequacy of gas exchange. Second Seal Technology is designed to reduce risk for insufflation during ventilation. Designed to provide a passive conduit for unexpected regurgitation. The angle of the LMA Supreme Airway facilitates ease of insertion in various head positions.
	Same as LMA Classic. Included in AHA 2000 Guidelines for CPR and Emergency Medicine Cardiovascular Care.	Aperture bars designed to prevent the blockage of airflow by the epiglottis. Single use. Sterile. Not made with natural rubber latex.
	Enhanced design is ideal for unforeseen airway complications where intubation becomes necessary, and the silicone cuff is designed to be gentle to the anatomy.	Also features Cuff Pilot Technology, an integrated cuff pressure indicator that provides constant at-a-glance feedback, alerting clinicians to changes in cuff pressure. Single use. Sterile. Not made with natural rubber latex. MRI safe.
	The LMA Unique Airway is an ideal choice for routine anesthetic procedures, for difficult airway situations, or for airway management during cardiopulmonary resuscitation.	Silicone cuff is soft and flexible and conforms to the anatomy to create an effective oropharyngeal seal. Aperture bars designed to prevent the blockage of airflow by the epiglottis. Cuff Pilot Technology, an integrated cuff pressure indicator that provides constant at-a-glance feedback, alerting clinicians to changes in cuff pressure. Single use. Sterile. Not made with natural rubber latex. MRI safe.
	Allows easy access for flexible scope devices.	If intubation necessary or desired, will accommodate ET up to 7.5 mm. Single use.
	Routine use of SGA but not contraindicated in non-fasting patients. Appropriate for prehospital, intraoperative and emergency use. Especially useful for patients in whom direct visualization of vocal cords is not possible, patients with massive airway bleeding or regurgitation, limited access to airway and patients in whom neck movement is contraindicated.	Ventilation possible with either tracheal or esophageal intubation. Distal cuff seals off the esophagus to prevent aspiration of gastric contents. Allows passage of an OG tube when placed in the esophagus. Single use.
	Allows easy access for flexible scope devices.	If intubation necessary or desired, will accommodate ET ≤7.5 mm. Single use.
	For use in anesthesia and emergency medicine. Single-use SGA comes sterile and ready for use.	Features a curved airway tube. Classic cuff shape provides optimum anatomic conformance with a firm, smooth-surfaced back plate to aid ease of insertion. Essential information, such as device size, is prominently displayed at the top of the tube and on the pilot balloon for quick visual reference. Not made with natural rubber latex.
	For use in anesthesia and emergency medicine. An ideal solution for airway management in procedures such as ENT, dental, oromaxillary and eye surgery.	Classic cuff shape provides optimum anatomic conformance with a firm, smooth-surfaced back plate to aid ease of insertion. Essential information, such as device size, is prominently displayed at the top of the tube and on the pilot balloon for quick visual reference. Not made with natural rubber latex.

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Table 6. Supraglottic Ventilatory Devices *(continued)*

Name (Manufacturer)	Description	Size
Solus MRI Safe (Intersurgical)	A range of single-use SGA fitted with specially tested nonferrous valves, guaranteed not to interfere with the magnet in an MRI scanner. The plastic valve has been selected to ensure full reliability throughout the shelf life of each device.	Adult sizes 3-5 and pediatric sizes 1, 1.5, 2, 2.5.
Solus Satin (Intersurgical)	A range of single-use SGA with a softer airway tube to provide more flexibility. Provides a classic cuff shape, an integral inflation line and a high-quality valve to ensure continual cuff integrity.	Adult sizes 3-5.
Solus Standard (Intersurgical)	A range of single-use SGA featuring a low-friction material, classic cuff shape, integral inflation line and a high-quality valve.	Adult sizes 3-5 and pediatric sizes 1, 1.5, 2, 2.5.

Table 7. Devices for Special Airway Techniques

Name (Manufacturer)	Description	Size
Awake Intubation		
DART Nasal (Pulmodyne)	Intranasal mucosal atomization device.	Average particle size: 50 mcm; Applicator dead space: 0.16 mL; Tip diameter: 0.19 inch (4.9 mm); Applicator length: 1.60 inch (41 mm).
DART-Reach (Pulmodyne)	Laryngo-tracheal mucosal atomization device. With the flexible stylet, adjust the tube for a customized approach.	Average particle size: 50 mcm; Applicator dead space:REACH600/700 = 0.22 mL; REACH720 = 0.13 mL. Tip diameter: 0.19 inch (4.9 mm). Applicator length: REACH600/700 = 8.60" (218 mm); REACH720 = 4.60" (117 mm).
EZ-Spray EZ-100 (Alcove Medical)	Atomizer that delivers a 15-to-60-micron mist of medication in a cost-effective, easy to use, disposable unit.	Length: 7.125 inch; height: 4.125 inch. Nozzle: 0.313 × 0.563 inch. Bottle diameter: 1.375 inch.
LMA MADgic (Teleflex)	Mucosal atomization device that incorporates a small flexible, malleable tube with an internal stiffening stylet that connects to 3 mL syringe.	Typical particle size: 30-100 microns; system dead space: 0.25 and 0.13 mL; tip diameter: 0.18 inch (4.6 mm); applicator length: 8.5 inch (21.6 cm) and 4.5 inch (11.4 cm).
LMA MAD Nasal (Teleflex)	Disposable, compact atomizer for delivery of medications to the nose and throat in a fine, gentle mist.	Typical particle size: 30-100 microns; system dead space: 0.13 and 0.07 mL; tip diameter: 0.17 inch (4.3 mm); applicator length: 1.65 inch (4.2 cm).
LMA MADomizer Bottle Atomizer (Teleflex)	Bottle atomizer comes with a positive displacement pump for delivering a variety of medications to the nose and hypopharynx.	Typical particle size: 30-100 microns; tip diameter: 0.17 inch (4.3 mm); applicator length: 4 inch (10 cm).
Model 15-RD Glass Atomizer (DeVilbiss Healthcare)	Metal atomizer; includes glass receptacle (for liquid), pair of metal outlet tubes extending from metal atomizing nozzle and adjustable tip for directing spray to inaccessible areas of the throat. Can be used with or without the RhinoGuard tip cover.	Length: 10.5 inch.
Procedural Oxygen Mask, POM (POM Medical)	Designed for delivering high concentrations of O_2 and monitoring end-tidal CO_2 during procedural or conscious sedation cases, such as upper GI, ERCP, EUS and EGD.	Pediatric to adult size masks.

	Clinical Applications	Special Features
	For use in anesthesia and emergency medicine. Single-use SGA comes sterile and ready for use. Can be safely used In the MRI suite.	Classic cuff shape provides optimum anatomic conformance with a firm, smooth-surfaced back plate to aid ease of insertion. Essential information, such as device size, is prominently displayed at the top of the tube and on the pilot balloon for quick visual reference. Not made with natural rubber latex. MRI safe.
	For use in anesthesia and emergency medicine. Single-use SGA comes sterile and ready for use.	Classic cuff shape provides optimum anatomic conformance with a firm, smooth-surfaced back plate to aid ease of insertion. Essential information, such as device size, is prominently displayed at the top of the tube and on the pilot balloon for quick visual reference. Not made with natural rubber latex.
	Same as Solus Satin.	Same as Solus Satin.

	Clinical Applications	Special Features
	Application for atomizing solutions across the naso- and oropharyngeal mucous membranes.	Delivers medications quickly with onset of action similar to IV delivery.
	Application of topical anesthetics to oropharynx and upper airway region. Atomize solutions across the nasopharyngeal, laryngeal and oropharyngeal mucous membranes.	Flexible stylet to precisely deliver medications. Two sizes of stylets for custom delivery. Nonsterile. Single use.
	Application of topical anesthetic to the nose, oropharynx and upper airway of patients.	Trigger-valve system provides controlled release of compressed gas to atomizing nozzle, creating liquid spray. Gas flow adjusted to desired setting. Use with either oil- or water-based solutions. Nonsterile. Single use.
	Application of topical anesthetics to oropharynx and upper airway region. Fits through vocal cords, down SGA or into nasal cavity.	Malleable applicator retains memory to adapt to individual patient's anatomy. Delivery of a fine spray mist generated by a piston syringe. Luer connection adapts to any luer lock syringe. Nonsterile. Single use.
	Intranasal medication delivery offers rapid, effective method to deliver selected medications to patient without need for a painful shot and without delays in onset seen with oral medications.	Rapidly effective (atomized nasal medications absorb directly into bloodstream, avoiding first-pass metabolism; atomized nasal medications absorb directly into the brain and cerebrospinal fluid via olfactory mucosa to nose–brain pathway, achieves medication levels comparable to injections). Controlled administration (exact dosing, exact volume, titratable to effect [repeat if needed]; atomizes in any position; atomized particles are optimal size for deposition across broad area of mucosa).
	Delivers topical anesthetics, vasoconstrictors, and other nasal or oral medications. Allows targeted delivery of exact drug doses to the nasal and oral mucosa.	Unique pump design and disposable applicator tip reduces the risk for patient cross-contamination that can occur with compressed air atomizers. One-way check valve ensures unidirectional flow.
	Intended for the application of topical anesthetics to the nose, oropharynx, and upper airway of patients, at the direction/discretion of a clinician.	Includes glass receptacle for dispensing the liquid; adjustable swivel top and vented nasal guard attached to a hand bulb. Can be used with all types of oil or water solutions that are compatible with rhodium metal plating. The all-metal top can be autoclaved. Reusable.
	Dual oral and nasal entry ports for endoscopes, optimizes O_2 concentrations, measures capnography even at high O_2 flows, allows easy unobstructed view and access to patient.	Ideal for oral or nasal FSI while keeping patient oxygenated.

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Table 7. Devices for Special Airway Techniques *(continued)*

Name (Manufacturer)	Description	Size	
Retrograde Intubation			
Cook Retrograde Intubation Set (Cook Medical)	Available as a complete set in 6, 11, or 14 Fr. The 14 Fr version includes Airway Exchange Catheter with Rapi-Fit adapters allow for delivery of O_2.	6.0 Fr=50 cm; 11 Fr=70 cm; 14 Fr=70 cm, extra-stiff flexible J-tipped guidewire = 110 cm.	
Face Mask Ventilation and Nasal Oxygenation			
Endoscopy Mask (VBM)	Face mask with diaphragm to allow simultaneous ventilation and endoscopy.	Newborn, infant, child and adult.	
Ergomask (Tuoren Medical Inc)	Mask with asymmetrical dome with a contoured ridge and a colored marker for finger placement.	Color-coded adult sizes: 3 (small), 4 (medium) and 5 (large).	
Flow-Safe II+ Disposable BiLevel CPAP (Mercury Medical)	Disposable BiLevel CPAP system with deluxe mask with comfortable head harness, including a color-coded manometer for verifying BiLevel CPAP or CPAP pressure. Flow-Safe II+ works with standard flowmeters that can deliver >10 cm H_2O CPAP pressure or approximately 10 cm H_2O IPAP pressure at 15 L/min. The Bilevel CPAP switch allows clinicians to provide either therapy mode.	Child, small adult and large adult.	
Flow-Safe II EZ CPAP (Mercury Medical)	System includes an integrated nebulizer that requires only one O_2 source to run both the CPAP and nebulizer devices. CPAP system includes color-coded manometer for verifying CPAP pressure and pressure-relief system. Flow-Safe II EZ works with standard flowmeters that can deliver >10 cm H_2O at 15 L/min. Higher flow pressures may be necessary when running both CPAP and the nebulizer.	Child, small adult and large adult.	
Optiflow (Fisher & Paykel Healthcare)	Heated humidified nasal high-flow oxygenation system with extra-long (8-foot) heated inspiratory tubing, automated humidity delivery and anatomically designed high-flow nasal cannula. Single patient use kits. Packaged in box of 10. Interfaces are packaged separately (choice of standard or CO_2-enabled interfaces in small, medium and large).	Interfaces: Small, medium and large.	
SuperNO_2VA Nasal PAP (Vyaire Medical)	Nasal mask capable of delivering noninvasive PPV when connected to an anesthesia circuit or Mapleson circuit utilizing low fresh gas flows from simple wall O_2.	Medium and large.	
Naso-Flo (Pulmodyne)	Nasopharyngeal Airway with built-in capnography line, adjustable size, and O_2-port.	4.0 (ID 4.0/18 Fr); 5.0 (ID 5.0/22 Fr); 6.0 (ID 6.0/25 Fr); 7.0 (ID 7.0/29 Fr); 8.0 (ID 8.0/32 Fr); 9.0 (ID 9.0/36 Fr).	

	Clinical Applications	Special Features
	Technique used for securing a difficult airway, either alone or with other alternative airway techniques. Especially useful in patients with limited neck mobility or patients who have suffered airway trauma. 6.0 Fr places tubes ≥2.5 mm ID; 11 Fr places tubes ≥4.0 mm; 14 Fr places ETs ≥5 mm ID.	Packaged as a complete kit with everything needed to perform a retrograde intubation. Tapered AEC allows for oxygenation using Rapi-Fit adapters. Single use.
	FSI; airway endoscopy; gastroenterology; transesophageal echocardiography.	Available in different sizes and with different sizes of diaphragms for a perfect seal during endoscopy. Special bronchoscope airway available to protect equipment and aid endoscopy.
	One- and two-handed BVM ventilation.	Ergonomic design optimizes the one-handed ventilation technique. Improved seal with chin lift, head extension.
	Requires only one O_2 source for delivering CPAP or BiLevel CPAP pressure. Easy EPAP dial allows adjustable EPAP pressure in the BiLevel CPAP mode. Includes a built-in manometer for verified pressure readings. No assembly of separate apparatus, and the pressure-relief valve automatically adjusts to avoid excess pressure.	The lightweight disposable feature allows for easy CPAP or BiLevel CPAP therapy setup and therapy delivery during transport. Flow-Safe II+ is ideal for situations where backup BiLevel CPAP equipment is scarce or unavailable. The contoured, double-seal deluxe mask is designed to form a very good anatomic seal. The elastic head harness is easy to place, with Velcro straps that easily adjust for patient comfort.
	The Flow-Safe II EZ CPAP device is a respiratory aid intended for use with a face mask, nebulizer, and gas-supplying device to elevate pressure in the patient's lungs while delivering aerosolized medication.	Mask features elastic head harness, quick-disconnect clips, and straight rotating port. Built-in manometer and pressure-relief valve. CPAP and nebulization through a single O_2 source.
	Humidification of nasal high-flow O_2 for preoxygenation and short-term supplemental oxygenation during intubation (≤10 minutes). Also used for oxygenation during procedural sedation and post-anesthesia care unit for patients at risk for oxygen desaturation.	Provides apneic oxygenation to extend the safe apnea time at 70 L/min, 100% FiO_2. In spontaneously breathing patients, Optiflow THRIVE will maintain oxygenation, clear CO_2 from the anatomical dead space, provide up to 7 cm H_2O positive airway pressure and increase tidal volume. Humidification enables the high flow to be comfortable, while maintaining normal physiologic conditions of the airway mucosa. The nasal cannula allows shared access to the airway, which is advantageous for upper endoscopic procedures, awake tracheal Intubation and where bag mask ventilation is challenging. The Optiflow TRACE interface enables CO_2 monitoring during sedation.
	Designed to deliver noninvasive nasal PPV to maintain upper airway patency and provide ventilatory support for patients. Ideal for patients with morbid obesity, obstructive sleep apnea, and cardiopulmonary disease intraoperatively or during sedation using an anesthesia circuit and postoperatively during emergence when connected to a Mapleson circuit. With open access to the oral cavity, nasal PPV can also be continued during intraoral procedures such as EGD, TEE and bronchoscopy to combat hypoxemia and respiratory compromise.	Perioperative device to maintain upper airway patency and provide continuous oxygenation and ventilation. Nasal mask may also be beneficial for mask ventilation in edentulous patients and those with facial hair and high BMI.
	Delivers direct O_2, while humidification vents positioned toward the distal tip facilitate heat and moisture transfer. It also supplies an optimal respiratory indicator with or without the hydrophobic filter.	In-line capnography. Direct O_2 port for high flow. Connects to a BVM. Soft tip for easy insertion.

table continues on next page

Table 7. Devices for Special Airway Techniques *(continued)*

Name (Manufacturer)	Description	Size	
Transtracheal Jet Ventilation			
AincA Manual Jet Ventilator (Anesthesia Associates)	Portable jet ventilation device with thumb depression mechanism that initiates controlled burst of O_2 flow. Customizable assembly includes DISS inlet connection, 5 ft of inlet tubing, flow control knob, on/off thumb control, internal filter, back pressure gauge and 2 ft of outlet hose ending in a luer-lock male fitting. Connects to any tool or port that has a luer-lock female connection (i.e., malleable stylets, various adapters, etc.).	Jet ventilation catheters of malleable copper with luer lock fittings accommodate adults, children and infants. Adapters allow direct connection to bronchoscope or ET.	
AincA MRI Conditional 3.0-Tesla Jet Ventilator (Anesthesia Associates)	Similar to AincA Manual Jet Ventilator but certified MRI conditional–compatible for use in units ≤3.0 tesla strength.	Jet ventilation catheters of malleable copper with luer lock fittings accommodate adults, children and infants. MRI conditional 3.0 tesla.	
GO-PAP (Pulmodyne)	Emergency disposable CPAP device, with integrated nebulization.	FiO_2 - approximately 30%. Three PEEP settings. BiTrac ED Mask.	
Manual Jet Ventilator (Instrumentation Industries)	Complete set includes an on/off valve, 6 ft of high-pressure tubing, and 4 ft of small-bore tubing.	Jet ventilation catheter size 13 G can accommodate adults and 14 G children.	
Manujet III (VBM)	Complete set including 13-ft high-pressure hose assembly with O_2 DISS fittings, 40-degree small-bore tube assembly (with luer lock fitting) and three jet ventilation catheters (13, 14 and 16 G).	Jet ventilation catheters can accommodate adults, children and infants.	
O_2-MAX (Pulmodyne)	Emergency disposable CPAP device, with integrated nebulization.	FiO_2 - approximately 30%. Three PEEP settings. BiTrac ED Mask.	
O_2-MAX Trio (Pulmodyne)	Emergency disposable CPAP device, with integrated nebulization.	Three FiO_2 levels. Three PEEP settings. BiTrac ED Mask.	
Transtracheal Catheter (Acutronic Medical System)	Small jet needle for puncturing the trachea in an emergency for use with jet ventilation.	13 G, 14 G.	
Ventrain (Ventinova Medical BV)	Manually operated ventilation device for ventilation through a transtracheal catheter in cannot-intubate/cannot-oxygenate situations. Ventrain requires a high-pressure O_2 source with pressure compensated flow regulator.	Ventrain has a male Luer connector, allowing connection to a transtracheal catheter: Length: 7.5 cm; ID: 2.0 mm.	

Table 8. Positioning Devices

Name (Manufacturer)	Description	
Chin-UP (Dupaco)	Hands-free airway support device used to lift up patient's chin and hold it in position to keep the airway open.	
Face-Cradle (Mercury Medical)	Fully adjustable cushion set accommodates most adult head sizes.	
Pi's Pillow and Pi's Obesity Pillow (American Eagle Medical)	A foam base and removable pad that supports the head in full extension position (sniffing) and maintains proper alignment of the upper airway during airway management. Facilitates mask ventilation, DL/VL and makes intubation easy, safe and efficient in situations of a difficult airway as it creates a very stable head and neck (sniffing) position.	
Rapid Airway Management Positioner, RAMP (Airpal Patient Transfer Systems)	Air-assisted medical device that can be inflated to transfer and position patients for various procedures.	
Troop Elevation Pillow, TEP (Bone Foam Inc.)	Foam positioning device that quickly achieves the HELP. Includes many accessories (head cradle, arm board pads and TEPA). An impermeable barrier cover is also offered for infection control and to protect the product.	

	Clinical Applications	Special Features
	Manual jet ventilation for O_2 saturation maintenance and usable for emergency direct TTJV and for laser throat surgery (elimination of plastic ET in laser path).	Easy factory customization available for hose lengths and O_2 source connection type (DISS vs. various quick-disconnect types) as well as optional pressure regulator (with gauge) and standard or custom regulator-to-source connection hoses. Adapters, fittings and connectors available. Completely reusable and sterilizable.
	Similar to the AincA Manual Jet Ventilator, but fully certified for use in MRI suites with coil strength to 3.0 tesla. Allows emergency O_2 saturation maintenance while determining how to solve airway issues.	Easy factory customization available for hose lengths and O_2 source connection type (DISS vs. various quick-disconnect types). Adapters, fittings and connectors available. Completely reusable and sterilizable.
	Offers PEEP levels 5, 7.5, 10 cm H_2O with FiO_2 level of ~30%. Constant flow and PEEP levels maintained, due to PEEP and flow being independent from the O_2 levels in the tank. Uses the barbed valve on a generator with a flow of 10 L/min.	Disposable CPAP generator with three combinations of FiO_2 and PEEP. Integrated nebulizer closed-circuit system built directly into the elbow. Neb-Connect Accessory available, which allows nebulization and CPAP therapy off of the same tank.
	Same as Manujet III. Can also be used in unobstructed difficult airway management.	Offered with and without an adjustable pressure regulator. Partially reusable outlet tube is disposable. Note: Outlet tube is single use.
	Well-accepted method for securing ventilation in rigid and interventional bronchoscopy. Because airflow is generally unidirectional, it is important that air has a route to escape (unobstructed airway).	Packaged as complete kit with jet ventilation catheters to perform TTJV. Includes gauge and regulator.
	Offers PEEP levels 2.5-20 cm H_2O. With FiO_2 level of ~30%. Constant flow and PEEP levels maintained, due to PEEP and flow being independent from the O_2 levels in the tank. Uses the 50 PSI port.	Disposable CPAP generator with ≤21 cm H_2O specific combinations of FiO_2 and PEEP. Integrated nebulizer closed-circuit system built directly into the elbow.
	Offers PEEP levels 2.5-20 cm H_2O. Allows dial-in FiO_2 levels of ~30%, 60% and 90%. Constant flow and PEEP levels maintained, due to PEEP and flow being independent from the O_2 levels in the tank. Uses the 50 PSI port.	Disposable CPAP generator with ≤21 cm H_2O specific combinations of FiO_2 and PEEP. Integrated nebulizer closed-circuit system built directly into the elbow.
	Applications in ICU for patients with severe lung injuries, ARDS, or bronchopleural fistulas.	Provides ventilation to patient who is unable to be intubated.
	Ventrain provides full ventilation for adults through transtracheal small-gauge lumens when large-bore ventilation is not possible (cannot-intubate/cannot-ventilate situations).	Ventilation is based on bidirectional gas flow. Ventrain not only supplies O_2 during the inspiration phase but also removes gas from the lungs, by suctioning, during the expiration phase. Therefore, Ventrain can be used in situations when the airway is obstructed, reducing the risk for barotrauma.

	Clinical Applications	Special Features
	Aids during monitored anesthesia care and total IV anesthesia sedation procedures.	Disposable polyurethane foam cushions.
	For use in prone-position surgeries.	Fully adjustable offering the clinician greater visibility of patient's face.
	Extremely useful when treating morbidly obese patients' airway since it effectively raises a patient's head, neck and shoulders to chest level and creates an extended head position. The pillow is also very useful in helping with a patient's breathing when administering MAC anesthesia.	Available in disposable and reusable models. The disposable pillow comes with a vacuum package and can easily be stored even within a small OR. A barrier cover is provided for the pillow. Four sizes: small, medium, large and extra-large (obesity pillow).
	Allows for the positioning of a patient for laryngoscopy, extubation and central venous access. Enhances the safe apnea period, bag valve mask ventilation and chest wall excursion.	Base of RAMP is integrated with an Airpal platform (air-assisted lateral patient transfer and positioning device). Inflates and deflates, thus can remain in place during surgery and reinflate for extubation. Reusable.
	Aids airway management for obese patients by aligning upper airway axes. This improves ease of mask ventilation and facilitates intubation via DL or VL. Allows patients to breathe more comfortably during preoxygenation as well as during regional anesthesia. Increases the desaturation safety period.	Disposable and reusable formats. TEPA may be added to the TEP base unit for super morbidly obese patients (BMI >50 kg/m^2).

Table 9. Cricothyrotomy Devices

Name (Manufacturer)	Description	Size
Needle Cricothyrotomy		
Emergency Transtracheal Airway Catheter (Cook Medical)	6 Fr reinforced fluorinated ethylene propylene catheter.	5.0 and 7.5 cm.
Percutaneous Cricothyrotomy		
Control-Cric (Pulmodyne)	Contents include a Cric-Knife, which is a dual-sided 10 mm scalpel with integrated sliding tracheal hook, and a Cric-Key, which is a cuffed 5.5 mm cric tube, with a preloaded stylet to allow for tactile feedback of the tracheal rings.	5.5 mm cric tube.
Melker Cuffed Emergency Cricothyrotomy Catheter Set (Cook Medical)	Different set options available including Seldinger; cuffed or uncuffed. Special operations kit, which is packaged in a slip peel pouch. All Melker catheters have a 15-mm connector.	Uncuffed: 3.5 mm ID/3.8 cm, 4.0 mm ID/4.2 cm, 6.0 mm ID/7.5 cm. Cuffed Seldinger: 5 mm ID/9 cm. Special Operations cuffed: 5 mm ID/9 cm. Special Operations uncuffed: 4 mm ID/4.2 cm, 6 mm ID/7.5 cm.
Pertrach Emergency Cricothyrotomy Kit (Pulmodyne)	Contents include two splitting needles, cuffed or uncuffed trach tube, dilator with flexible leader, twill tape, syringe, extension tube and scalpel (optional).	Adult: 6.8 cm (5.6 mm ID) Child: 3.9 cm (3 mm ID), 4 cm (3.5 mm ID), 4.1 cm (4 mm ID), and 4.4 cm (5.0 mm ID).
Quicktrach I Quicktrach II (VBM)	Complete set includes airway catheter, stopper, needle and syringes that come preassembled. Quicktrach I (without cuff). Quicktrach II (with cuff).	Adult (4 mm ID). Child (2 mm ID).
Surgical Cricothyrotomy		
Control-Cric (Pulmodyne)	Contents include a Cric-Knife, which is a dual-sided 10 mm scalpel with integrated sliding tracheal hook, and a Cric-Key, which is a cuffed 5.5-mm cric tube, with a preloaded stylet to allow for tactile feedback of the tracheal rings.	5.5 mm cric tube.
Melker Surgical Cricothyrotomy Set (Cook Medical)	Cuffed cricothyrotomy tube, scalpel, tracheal hook, Trousseau dilator and blunt curved dilator in compact package for convenient storage.	9 cm (5 mm ID).
Melker Universal Cuffed Emergency Cricothyrotomy Catheter Set (Cook Medical)	Same as Melker Cuffed Emergency Cricothyrotomy Catheter Set for percutaneous technique. Includes components for surgical technique: tracheal hook, safety scalpel, Trousseau dilator and blunt curved dilator.	9 cm (5 mm ID).
ScalpelCric (VBM)	Scalpel cricothyrotomy set "stab-twist-bougie-tube."	6 mm ID.
Surgicric (VBM)	Surgical cricothyrotomy set. Surgicric I: rapid 4-step technique; Surgicric II: classic surgical technique; Surgicric III: Seldinger technique.	6 mm ID.

	Clinical Applications	Special Features
	A lifesaving procedure that is the final option for cannot-ventilate/cannot-intubate patients in all airway algorithms.	Designed to be kink-resistant, specifically for the purpose of needle cricothyrotomy.
	Same as Emergency Transtracheal Airway Catheter.	Designed to perform cricothyrotomy without the need for visualization, air aspiration, or reliance on fine motor skills. Packaged to simplify the procedure.
	Same as Emergency Transtracheal Airway Catheter, is intended to establish emergency airway access when tracheal intubation cannot be performed. Also intended for use with the Seldinger technique via cricothyroid membrane; however, has capability to be used as a surgical cricothyrotomy.	Packaged as a complete kit with all components required to perform percutaneous cricothyrotomy. The Special Operations kit comes in a slip peel pouch for easy transport to off-site locations. Can also be used in the OR. Comes with two different sizes of airway catheter and two introducer needle lengths. Single use.
	Use in failed orotracheal or nasotracheal intubation, and/or flexible scope bronchoscopy. Immediate airway control in patients with maxillofacial, cervical spine, head, neck and multiple trauma. Also used when tracheal intubation is impossible and/or contraindicated. Immediate relief of upper airway block.	Serves as an emergency cricothyrotomy or tracheostomy device that uses a patented splitting needle and dilator to perform rapid and simple procedures.
	Wide-bore cannula cricothyrotomy set.	Packaged as complete set with everything needed to perform a percutaneous cricothyrotomy. Removable stopper is used to prevent a "too-deep" insertion and avoid the possibility of perforating the rear tracheal wall. Conical needle tip allows for the smallest necessary stoma and reduces the risk for bleeding. Easily transported to off-site locations.
	Same as Emergency Transtracheal Airway Catheter.	Designed to perform cricothyrotomy without the need for visualization, air aspiration, or reliance on fine motor skills. Packaged to simplify the procedure.
	This set provides the tools that clinicians can use if they prefer a surgical approach to performing emergency cricothyrotomy.	Complete and convenient packaging.
	Same as Melker Cuffed Emergency Cricothyrotomy Catheter Set, Seldinger or Surgical Cricothyrotomy.	50% of tray same as Melker Cuffed Emergency Cricothyrotomy Catheter Set for the percutaneous technique. The other 50% includes all items needed to perform a surgical emergency cricothyrotomy including a trousseau dilator and tracheal hook.
	Same as Melker Cuffed Emergency Cricothyrotomy Catheter Set.	Complete cricothyrotomy set, which includes size 10 scalpel; 40 cm, 14 Fr bougie; 6 mm cuffed tube.
	Three different sets that provide clinicians several choices for the performance of emergency cricothyrotomy.	Small pack size ideal for emergency bags. Soft tip is atraumatic. Locking mechanism prevents accidental dislocation.

Table 10. Tracheostomy Devices

Name (Manufacturer)	Description	Size
Percutaneous Dilatational Tracheostomy		
240 Blue Tracheostomy Tube Holder (Dale Medical Products)	Designed to provide secure positioning and minimize movement of the tracheostomy tube.	1 inch wide band, fits up to 19.5 inch neck.
Blom Tracheostomy Tubes (Pulmodyne)	Available in four sizes. Each size offers the choice of nonfenestrated and uncuffed tubes, as well as fenestrated cuffed/uncuffed tubes along with other standard inner cannulas.	4, 6, 8 and 10 mm.
Blue Rhino G2-Multi Percutaneous Tracheostomy Introducer Sets and Trays (Cook Medical)	Designed to work with ISO-standard percutaneous tracheostomy tubes, the line consists of multiple configurations including different selections of loading dilators (6.5 mm, 7 mm, 7.5 mm, 8 mm, 8.5 mm, 9 mm and 10 mm). Available standalone and with Shiley Flexible and Flexible Evac tracheostomy tubes sized 7.5 mm and 8.5 mm.	Loading dilators: 6.5, 7.0, 7.5, 8.0, 8.5, 9.0 and 10 mm. Shiley Flexible Adult Tracheostomy Tubes, with Disposable Inner Cannula: 7.5 and 8.5 mm. Shiley Flexible Evac Tracheostomy Tubes with Disposable Inner Cannula: 7.5 and 8.5 mm.
Laserjet Catheter (Acutronic Medical Systems)	Double-lumen jet catheter.	Diameter: 12 Fr; length: 40 cm, 70 cm.
Portex Ultraperc Percutaneous Dilation Tracheostomy Kit (Smiths Medical)	Complete set with or without a tracheostomy tube.	70 mm (7 mm ID); 5.5 mm (8 mm ID); 81 mm (9 mm ID).
Shiley Flexible Adult Tracheostomy Tube (Medtronic)	Each size features the choice of cuffed (with the patented TaperGuard cuff technology) or uncuffed versions. The inner cannula options are available in both reusable and disposable inner cannula options.	4, 5, 6, 7, 8, 9, 10 mm.
Shiley Flexible with Evac Adult Tracheostomy Tube (Medtronic)	Adult tracheostomy tube with TaperGuard cuff and Evac technology for subglottic secretion drainage. Each size features the choice of disposable and reusable inner cannula options.	4, 5, 6, 7, 8, 9, 10 mm.
Shiley TracheoSoft XLT Extended-Length Tracheostomy Tubes (Medtronic)	Available in 4 ISO sizes (5-, 6-, 7- and 8-mm ID). Each size offers the choice of cuffed or uncuffed stylets, and proximal or distal extensions. Disposable inner cannula; replacements sold in packages of 10.	90 mm (5 mm ID); 95 mm (6 mm ID); 100 mm (7 mm ID); 105 mm (8 mm ID.)
Venner PneuX Tracheostomy Tube (Venner Medical)	Works with an automated cuff pressure controller that regulates pressure within the tracheostomy tube cuff as a complete VAP prevention system for intensive or critical care patients.	7, 8, 9 mm ID.
Weinmann-Multi Tracheostomy Exchange Set (Cook Medical)	Includes a Cook Airway Exchange Catheter, five ISO-standard tracheostomy loading dilators and a Blue Rhino dilator for redilation if necessary.	Loading dilators: 7.0, 7.5, 8.0, 8.5 and 9.0 mm for use with tracheostomy tubes with appropriately sized inner diameters.
Surgical Tracheostomy		
Surgical tracheostomies are performed by making a curvilinear skin incision along relaxed skin tension lines between sternal notch and cricoid cartilage. A midline vertical incision is then made dividing strap muscles, and division of thyroid isthmus between ligatures is performed. Next, a cricoid hook is used to elevate the cricoid. An inferior-based flap or Bjork flap (through second and third tracheal rings) is commonly used. The flap is then sutured to the inferior skin margin. Alternatives include a vertical tracheal incision (pediatric) or excision of an ellipse of anterior tracheal wall. Finally, the tracheostomy tube is inserted, the cuff is inflated, and it is secured with tape around the neck or stay sutures.		

	Clinical Applications	Special Features
	Adjustable two-piece holder secures the tracheostomy tube. Moisture-wicking material keeps skin dry to reduce risk for skin breakdown.	Fastener tabs attach to the tracheostomy tube. Adjustable two-piece neckbands. Also available in bariatric and pediatric sizes.
	Features a variety of unique inner cannulas that aid in the clearance and management of secretions to help prevent ventilator-associated events and help allow speech.	Subglottic suctioning inner cannula helps manage patient secretions that pool above the cuff intermittently or continuously through fenestrations.
	Intended for percutaneous dilatational tracheostomy for management of the airway in adults only.	Consists of these primary components: an introducer needle, J-tip wire guide, introducer dilator, guiding catheter, loading dilators and single-staged Blue Rhino G2-Multi dilator. Dilation takes place in one step, using the Seldinger technique. Available in procedure packs with tracheostomy tubes, including with the Shiley Flexible Evac Tracheostomy Tubes, which offer the ability to manage subglottic secretions through a separate built-in suction channel.
	For use in laser airway procedures and difficult airway procedures.	Laser-safe tube; dual lumen provides extra ability for monitoring of pressures and end-tidal CO_2.
	Establishes transcutaneous access to the trachea below level of cricoid cartilage. Allows for smooth insertion of the tracheostomy tube over a Seldinger wire.	Packaged as a complete kit with everything needed to perform a percutaneous dilatational tracheostomy. The dilator is single-staged and prelubricated with an ergonomic handle to facilitate insertion. Disposable.
	The tracheostomy tube is a single-use device.	The tracheostomy tube features a soft, flexible shaft, beveled tip and a clear flange with airflow vents around the integrated 15-mm connector.
	The tracheostomy tube is a single-use device.	The tracheostomy tube features an Evac port above the cuff, a soft, flexible shaft, beveled tip, and a clear flange with airflow vents around the integrated 15 mm connector.
	Flexible dual-cannula tube for patients with unusual anatomy. Proximal length extension for thick necks; distal length extension for long necks, tracheal stenosis or tracheomalacia.	The only fixed-flange extended-length tube with disposable inner cannula. Flexible inner cannula conforms to shape of the outer cannula. 16 configurations to fit a wide variety of patients. Disposable.
	Facilitates ventilation and the evacuation or drainage of secretions from the subglottic space for patients requiring extended periods of tracheal intubation up to 30 days.	Single-use silicone tracheostomy tube features a unique low-volume, low-pressure cuff that forms a no-fold seal within the trachea. Intracuff pressure is constantly monitored and maintained by an automated cuff pressure controller. Tracheostomy tube incorporates multiple subglottic channels allowing secretion drainage and irrigation of the subglottic space. Available as MRI-compatible and also in ET format.
	Intended for adult tracheostomy tube exchange.	Helps maintains stoma access and allows redilation of stoma if resistance is met. Five ISO-standard loading dilators facilitate the insertion of a large range of tracheostomy tubes sizes.

Abbreviation Key

AEC airway exchange catheter
AHA American Heart Association
ARDS acute respiratory distress syndrome
ASA American Society of Anesthesiologists
AVL Advanced Video Laryngoscope
BAL bronchoalveolar lavage
BMI body mass index
BVM bag-valve-mask
CCD charge-coupled device
CCR cardiocerebral resuscitation
CMOS complementary metal oxide semiconductor
CO_2 carbon dioxide
CPAP continuous positive airway pressure
CPR cardiopulmonary resuscitation
CPV Cuff Pilot Valve
DAB difficult airway blade
DCI direct-coupled interface
DISS diameter index safety system
DL direct laryngoscopy
DLT double-lumen tube
ED emergency department
EF extra firm
EGD esophagogastroduodenoscopy
EMS emergency medical services
ENT ear, nose and throat
EPAP expiratory positive airway pressure
ERCP endoscopic retrograde cholangiopancreatography
ET endotracheal tube
EUS endoscopic ultrasound
EVA expiratory ventilation assistance
FDA US Food and Drug Administration
FiO_2 fraction of inspired oxygen
FIS flexible intubation scope
FIVE Flexible Intubation Video Endoscope
Fr French
FSI flexible scope intubation
GI gastrointestinal
GVL GlideScope Video Laryngoscope
HD high-definition
HDMI High-Definition Multimedia Interface
HELP Head Elevated Laryngoscopy Position
HFNCT high-flow nasal cannula therapy
HH-HFNCT heated humidified high-flow nasal cannula therapy
ICU intensive care unit
ID internal diameter
ILMA intubating laryngeal mask airway
IPAP inspiratory positive airway pressure
ISO International Organization for Standardization
IV intravenous
LCD liquid crystal display
LED light-emitting diode
LM laryngeal mask
LMA Laryngeal Mask Airway
LT laryngeal tube
MAC Macintosh
MIL Miller
MRI magnetic resonance imaging
NGT nasogastric tube
NICU neonatal intensive care unit
NTSC National Television System Committee
OD outer diameter
OG orogastric
OR operating room
O_2 oxygen
PAP positive airway pressure
PEEK polyetheretherketone
PEEP positive end-expiratory pressure
PICU pediatric intensive care unit
PIP picture-in-picture
POM procedural oxygen mask
PPV positive pressure ventilation
PSI pounds per square inch
PVC polyvinyl chloride
PVP polyvinylpyrrolidone
RDT Remote Diagnostic Technologies
RTCA Radio Technical Commission for Aeronautics
SGA supraglottic airway
TEE transesophageal echocardiography
TEP Troop Elevation Pillow
TEPA Troop Elevation Pillow Addition
TFE tetrafluoroethylene
TTJV transtracheal jet ventilation
U-DAB unchanneled difficult airway blade
USB universal serial bus
UV ultraviolet
VAP ventilator-associated pneumonia
VL video laryngoscope/laryngoscopy
VLM video laryngeal mask