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ANESTHESIA



Professional Anesthesia Handbook

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1 Anesthesia Gas Machine

Anesthesia Apparatus Checkout Recommendations, 19931

This checkout, or a reasonable equivalent, should be conducted before administration of anesthesia. These recommendations are only valid for an anesthesia system that conforms to current and relevant standards and includes an ascending bellows ventilator and at least the following monitors: capnograph, pulse oximeter, oxygen analyzer, respiratory volume monitor (spirometer) and breathing system pressure monitor with high and low pressure alarms. This is a guideline which users are encouraged to modify to accommodate differences in equipment design and variations in local clinical practice. Such local modifications should have appropriate peer review. Users should refer to the operator's manual for the manufacturer's specific procedures and precautions, especially the manufacturer's low pressure leak test (step #5).

Emergency Ventilation Equipment

***1. Verify Backup Ventilation Equipment is Available & Functioning**

High Pressure System

***2. Check Oxygen Cylinder Supply**

- a. Open O₂ cylinder and verify at least half full (about 1000 psi).
- b. Close cylinder.

***3. Check Central Pipeline Supplies**

- a. Check that hoses are connected and pipeline gauges read about 50 psi.

Low Pressure Systems

***4. Check Initial Status of Low Pressure System**

- a. Close flow control valves and turn vaporizers off.
- b. Check fill level and tighten vaporizers' filler caps.

***5. Perform Leak Check of Machine Low Pressure System**

- a. Verify that the machine master switch and flow control valves are OFF.
- b. Attach "Suction Bulb" to common Fresh gas outlet.
- c. Squeeze bulb repeatedly until fully collapsed.
- d. Verify bulb stays fully collapsed for at least 10 seconds.
- e. Open one vaporizer at a time and repeat 'c' and 'd' as above.
- f. Remove suction bulb, and reconnect fresh gas hose.

***6. Turn On Machine Master Switch and all other necessary electrical equipment.**

***7. Test Flowmeters**

- a. Adjust flow of all gases through their full range, checking for smooth operation of floats and undamaged flowtubes.
- b. Attempt to create a hypoxic O₂/N₂O mixture and verify correct changes in flow and/or alarm.

Scavenging System

***8. Adjust and Check Scavenging System**

- a. Ensure proper connections between the scavenging system and both APL (pop-off) valve and ventilator relief valve.
- b. Adjust waste gas vacuum (if possible).
- c. Fully open APL valve and occlude Y-piece.
- d. With minimum O₂ flow, allow scavenger reservoir bag to collapse completely and verify that absorber pressure gauge reads about zero.
- e. With the O₂ flush activated allow the scavenger reservoir bag to distend fully, and then verify that absorber pressure gauge reads <10 cm H₂O.

Breathing System

***9. Calibrate O₂ Monitor**

- a. Ensure monitor reads 21% in room air.
- b. Verify low O₂ alarm is enabled and functioning.
- c. Reinstall sensor in circuit and flush breathing system with O₂.
- d. Verify that monitor now reads greater than 90%.

10. Check Initial Status of Breathing System

- Set selector switch to “Bag” mode.
- Check that breathing circuit is complete, undamaged and unobstructed.
- Verify that CO₂ absorbent is adequate.
- Install breathing circuit accessory equipment (e.g. humidifier, PEEP valve) to be used during the case.

11. Perform Leak Check of the Breathing System

- Set all gas flows to zero (or minimum).
- Close APL (pop-off) valve and occlude Y-piece.
- Pressurize breathing system to about 30 cm H₂O with O₂ flush.
- Ensure that pressure remains fixed for at least 10 seconds.
- Open APL (Pop-off) valve and ensure that pressure decreases.

Manual and Automatic Ventilation Systems

12. Test Ventilation Systems and Unidirectional Valves

- Place a second breathing bag on Y-piece.
- Set appropriate ventilator parameters for next patient.
- Switch to automatic ventilation (Ventilator) mode.
- Fill bellows and breathing bag with O₂ flush and then turn ventilator ON.
- Set O₂ flow to minimum, other gas flows to zero.
- Verify that during inspiration bellows delivers appropriate tidal volume and that during expiration bellows fills completely.
- Set fresh gas flow to about 5 L/min.
- Verify that the ventilator bellows and simulated lungs fill and empty appropriately without sustained pressure at end expiration.
- Check for proper action of unidirectional valves.
- Exercise breathing circuit accessories to ensure proper function.
- Turn ventilator OFF and switch to manual ventilation (Bag/APL) mode.
- Ventilate manually and assure inflation and deflation of artificial lungs and appropriate feel of system resistance and compliance.
- Remove second breathing bag from Y-piece.

Monitors

13. Check, Calibrate and/or Set Alarm Limits of all Monitors

Capnometer	Pulse Oximeter
Oxygen Analyzer	Respiratory Volume Monitor (Spirometer)
Pressure Monitor with High and Low Airway Alarms	

Final Position

14. Check Final Status of Machine

- Vaporizers off
- AFL valve open
- Selector switch to “Bag”
- All flowmeters to zero
- Patient suction level adequate
- Breathing system ready to use

* If an anesthesia provider uses the same machine in successive cases, these steps need not be repeated or may be abbreviated after the initial checkout.

¹<http://www.fda.gov/cdrh/humfac/anesckot.html>

Replacement Sensors



4517 George Road, Suite 200
Tampa, FL 33634
1-800-325-3671
Fax 813-886-2701
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www.sharn.com

Manufacturer	Part #	Part #	Part #	Part #	Part #	Part #	Part #
Analytical Industries	PSR-11-915						
Ceramatec/Maxtec	CAG/MAX-1	CAG/MAX-11	CAG/MAX-2				MAX-22C
Criticare							✓
Drager (N.A.D.) (Narkomed)		6803290, 6850645					
HP/Agilent/Phillips		15201A					
Hudson RCI	5556	5557					
Mercury	10-103-07	10-103-07					10-103-06
MSA (Catalyst)	655264	655263					
Ohmeda (Datex)	0237-2034-700						
Ohmeda (Datex) Estiva 3000 SmartVent						605-004-110	
Ohmeda (Datex) 7900 Series							
Pacifitec/Kentec	PT-10	PT-14					
Paragon Service		PS-2000					
Siemens							✓
Sensor Tec (BPR Medical)	ST-10	ST-13/ST-14					
Teledyne	R15/C-41131	R23 / C-61339					
Vascular Technology/VTI	100352/1012722	100352/1013722					

2 Breathing Circuits

BREATHING CIRCUITS 1

The hospital pipeline is the primary gas source at 50 psi, which is the normal working pressure of most machines. Oxygen is supplied from cylinders at around 2000 psi (regulated to approximately 45 psi after it enters the machine).

Tubing sizes – scavenger 19 or 30mm, ETT or common gas outlet (CGO) 15mm, breathing circuits 22mm.

Oxygen has five “tasks” in the anesthesia gas machine; it powers the

1. Ventilator driving gas
2. Flush valve
3. Oxygen pressure failure alarm
4. Oxygen pressure sensor shut-off valve (“fail-safe”)
5. Flowmeters

Delivery System: Breathing Circuits – Circle System

The circle is the most popular breathing system in the U.S. It cleanses carbon dioxide from the patient’s exhalations chemically, which allows re-breathing of all other exhaled gases (a unique breathing arrangement in medicine, but used extensively in other environments; i.e., space, submarine).

Circle components:

- Fresh gas inflow source
- Inspiratory and expiratory unidirectional valves
- Inspiratory and expiratory corrugated tubing
- Y connector
- Overflow (called pop-off, adjustable pressure-limiting valve, or APL valve)
- Reservoir bag
- Carbon dioxide absorbent canister and granules

Resistance of circle systems is less than 3 cm H₂O (less than the resistance imposed by the endotracheal tube). **Dead space** is increased (by all respiratory apparatus). $VD/VT = 0.33$

normally, 0.46 if intubated, and 0.65 if mask case. **Mechanical dead space** ends at the point where inspired and expired gas streams diverge (the Y-connector).

How is the “best” FGF determined?

The fresh gas flow used determines not just FIO₂, but also the speed with which you can change the composition of gases in the breathing circuit.

- 4L/min is common; a legacy from days when a safety margin was needed for flowmeters and vaporizers which were much less accurate.
- A circle at 1-1.5 times VE is essentially a non-rebreather (5-8L/min for an adult). FGF should be this high during pre-oxygenation and induction (allows wash-in) and emergency (washout).
- Low flows (0.5-2L/min total FGF) should be used during maintenance to conserve tracheal heat and humidity, and economize on volatile agents.
 - Don’t use less than 1 L/min FGF with sevoflurane for more than 2 MAC-hours. The package insert (revised late 1997) advises against it, as lower flows accelerate Compound A formation.

Circle advantages:

- Constant inspired concentrations
- Conserve respiratory heat and humidity
- Useful for all ages (may use down to 10 kg, about one year of age, or less with a pediatric disposable circuit)
- Useful for closed system or low-flow, low resistance (less than tracheal tube, but more than a NRB circuit)

Circle disadvantages:

- Increased dead space
- Malfunctions of unidirectional valves

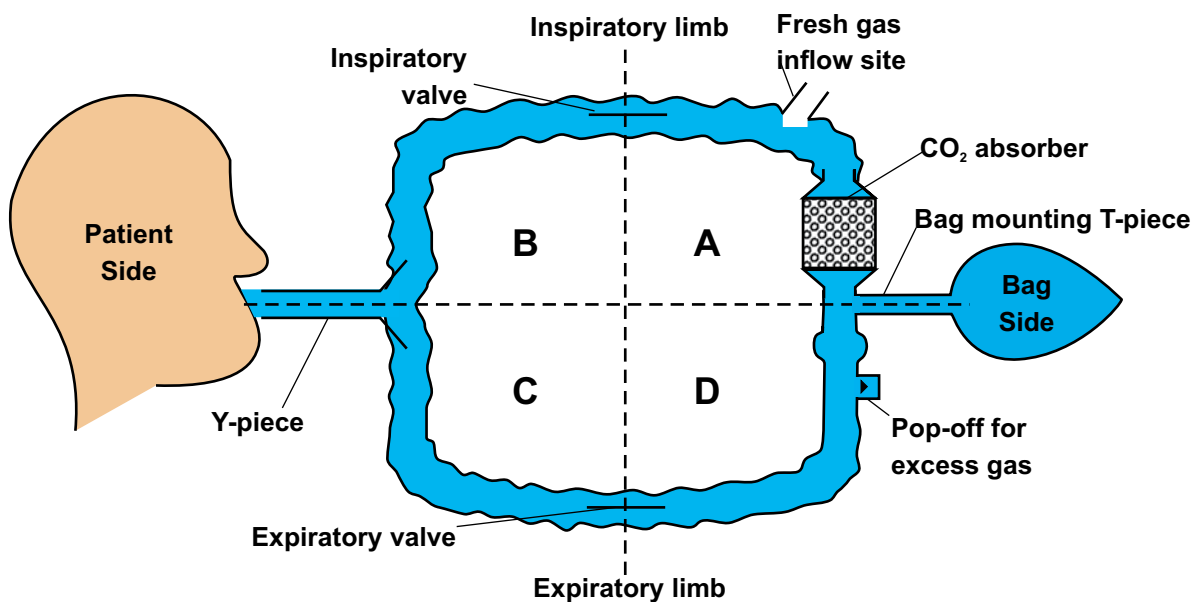
What should you do if you lose oxygen pipeline pressure?

1. Open the emergency oxygen cylinder fully (not just the three or four quick turns used for checking).
 2. Disconnect the pipeline connection at the wall.
 - Why? Something is wrong with the oxygen pipeline.
 - What if the supply problem evolves into a non-oxygen gas in the oxygen pipeline? If so, it will flow (pipeline pressure 50 psi) rather than your oxygen cylinder source (down-regulated to 45 psi).
- If you are lucky, the oxygen alarm will sound to warn you of the change (you do set your alarms, don't you?).
 - If for some reason the oxygen analyzer does not warn of the crossover, the pulse

oximeter will, but only after the oxygen has been washed out by ventilation from the patient's functional residual capacity and vessel-rich group.

- So disconnect the pipeline connection at the wall if oxygen pipeline pressure is lost. It's also easier to remember one strategy which works for any problem with the pipeline, than to remember that sometimes you must, and sometimes it is optional, to disconnect. And use that oxygen analyzer always!
3. Ventilate by hand rather than with the mechanical ventilator (which uses cylinder oxygen for the driving gas if the pipeline is unavailable.).

1 Michael P. Dosch CRNA MS, University of Detroit Mercy Graduate Program in Nurse Anesthesiology, Pontiac MI, *"The Anesthesia Gas Machine, Vaporizers, Compressed Gases, Safety: Avoiding the Pitfalls,"* May 2000



Soft-Tip SpO₂ Sensors

Made of 100% medical grade silicone, this sensor is **Latex Free**. Reinforced with KEVLAR™, the cable is strong and resistant to any damage. The soft silicone is comfortable for almost any size finger. It's specially designed to minimize noise caused by patient movement, ambient light and electrical interferences. Extend the life of your finger probes. Order Soft-tip SpO₂ sensors today! Choose from adult large, adult medium, and pediatric.



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Lg. Adult Order #	Compatible with:	Cable Length	Price
MAX-ST-3222-12	BCI™, all models	3 ft.	\$245.00
MAX-ST-3282-9	CSI™ (Criticare™), all models	3 ft.	\$245.00
MAX-ST-3282-36	CSI™ (Criticare™), all models	10 ft.	\$285.00
MAX-ST-3512-9	Datex™, with interface cable	3 ft.	\$245.00
MAX-ST-3512-40	Datex™, direct-to-monitor	10 ft.	\$285.00
MAX-ST-2412	HP™ (round connector)	10 ft.	\$285.00
MAX-ST-2414-15	HP™ ("D" - shaped Viridia connector)	5 ft.	\$285.00
MAX-ST-2300	Marquette™, see Ohmeda™ or Nellcor™		
MAX-ST-2300	Nellcor™, (DSI00A connector) (not OxiSmart/OxiMax)	3 ft.	\$245.00
MAX-ST-3012	Nonin™ all models	3 ft.	\$245.00
MAX-ST-3262	Novametrix™, (except 500, 512, 513)	10 ft.	\$285.00
MAX-ST-3412	Ohmeda™, (round, direct to monitor)	10 ft.	\$285.00
MAX-ST-3412-9	Ohmeda™, (not Oxy-Tip)	3 ft.	\$245.00
MAX-ST-3912-1	SensorMedics™/Critikon Dinamap™	10 ft.	\$285.00
MAX-ST-3612	Spacelabs™	10 ft.	\$285.00
Med. Adult Order #	Compatible with:	Cable Length	Price
MAX-RM-3222-12	BCI™, all models	3 ft.	\$245.00
MAX-RM-2412	HP™ (round connector)	10 ft.	\$285.00
MAX-RM-3212-9	Nellcor™ (DS100A connector)(not Oxi-Max)	3 ft. cable	\$245.00
MAX-RM-3412	Ohmeda™ (not Oxy-Tip)	10 ft.	\$285.00
Pediatric Order#	Compatible with:	Cable Length	Price
MAX-STs-3222-12	BCI™ all models	3 ft.	\$245.00
MAX-STs-3512-9	Datex™, all with interface cable	3 ft.	\$245.00
MAX-STs-3512-40	Datex™, direct-to-monitor	10 ft.	\$285.00
MAX-STs-2412	HP™ (round Nicolay connector)	10 ft.	\$285.00
MAX-STs-2414-15	HP™ ("D" - shaped Viridia connector)	5 ft.	\$285.00
MAX-STs-2300-9	Nellcor™ (DSI00A connector) (not OxiSmart/OxiMax)	3 ft.	\$245.00
MAX-STs-3012	Nonin™ all models	3 ft.	\$245.00
MAX-STs-3262	Novametrix™, (except 500, 512, 513)	10 ft.	\$285.00



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2 Capnography

Making the Case for Capnography

By: Pat Carroll, RN, C, CEN, RRT, MS

Clinicians have a comfort level with pulse oximetry. Remember what saturation is – it tells you what percent of the hemoglobin binding sites are filled. However, pulse oximetry cannot determine which molecules are occupying those binding sites. For example, if you're taking care of a firefighter who's had smoke inhalation, a third of his binding sites may be filled with carbon monoxide, while two-thirds are filled with oxygen. Yet, the pulse oximeter will read 99% because all of the sites are filled with something. Thus, pulse oximetry will not provide useful information about oxygenation in patients with significant carbon monoxide levels in their blood.

Even if you use the most sophisticated pulse oximetry technology to accurately assess oxygenation, you will not be measuring the other half of respiration – which is ventilation. That's where capnography comes in.

Remember that air flow or ventilation depends on three factors: a stimulus from the brain to breathe, a response from the respiratory muscles, and patent airways. When cardiac output is stable, as it is with most non-critically ill patients, capnography readings reflect ventilation.

Capnography measures exhaled carbon dioxide levels. Three things must happen in order for carbon dioxide to be exhaled. First, there must be adequate blood flow to carry CO₂ from the tissues to the lungs; second, the gas must diffuse across the alveolar-capillary membrane; and third, the air must then be able to leave the lungs.

The American College of Emergency Physicians, the National Association of EMS Physicians, and the ACLS standards all require measuring exhaled carbon dioxide to assure proper tube placement in intubated patients.

Capnography gives you a more comprehensive picture of your patient's respiratory status – much more than you'll ever get using pulse oximetry

alone. The tracings represent each breath a patient exhales. Thus, if apnea occurs, no gas will be exhaled, and the monitor will show a flat line. You'll get a much earlier warning of severe hypoventilation or apnea – in seconds -- than you would ever get with pulse oximetry, which takes minutes to respond.

The beauty of this technology is that it can be used on patients without artificial airways, and it's so simple to use. The patient interface looks like a nasal cannula. All you have to do is place it on the patient's face, attach the tubing, and you're ready to go. You'll get both a digital display of the exhaled carbon dioxide and a waveform display. Don't worry about learning to interpret waveforms – you can start with a few simple principles, and refine your interpretation as you gain experience. If you can read an ECG tracing, you won't have any trouble with capnography.

Since you're monitoring every breath, you'll immediately know if a patient's breathing slows or stops completely. If you're administering oxygen and other medications, you'll have an objective measurement to see if the patient's condition is improving with treatment.

You could use a disposable device that changes color when carbon dioxide is present. But that's only a one-shot assessment. It's safer to monitor exhaled CO₂ breath-to-breath so you know the tube stays in the right place. Capnography will instantly identify accidental extubation -- particularly during repositioning and transfers.

In the past ten years, procedural sedation has moved out of the operating room and into both in- and out-patient settings. The challenge with procedural sedation is that it's a balancing act – you want the patient adequately sedated, but not too deep. Since everyone responds to drugs differently, you have to administer a dose, assess the patient and then titrate from there. This type of patient management requires undivided atten-

tion – in fact, the American Nurses Association guidelines state the registered nurse administering drugs and monitoring a sedated patient must have no other responsibilities.

All medications used for procedural sedation have the potential to depress respirations. But it's impossible to assess whether respirations are adequate to remove carbon dioxide by simply looking at a patient. It's even tougher when a patient is positioned for a procedure, covered with drapes, and often in a room that's darkened during the procedure. Without monitoring technology, it's also easy to misinterpret signals from a patient.

For example, a study of patients undergoing endoscopy in a GI lab revealed that restless patients were medicated, assuming they were uncomfortable. But it turned out the restlessness occurred after patients had been apneic, and they moved when they started breathing again! Twenty-one times, patients got more sedation within 2 minutes of being apneic!

This study also compared the sensitivity of capnography and pulse oximetry technology when it came to detecting apnea in sedated patients. Researchers discovered that capnography identified every apnea episode. Pulse oximetry changed enough to alert the clinician 37% of the time in patients who were not receiving oxygen. When patients were getting just a couple of liters of oxygen by a nasal cannula during sedation, apnea was detected by pulse oximetry just 7 percent of the time.

Whether you're sedating patients in an office setting, a diagnostic procedure center, the ED, or in the hospital, your patients will be far safer if you use the best technology – capnography and pulse oximetry together – to monitor vital respiratory functions of both ventilation and oxygenation.

If you are using only pulse oximetry to evaluate your patients' respirations, you are only getting half the picture.

Now with CO₂

SHARN Multiparameter Monitor 750C



BEST IN CLASS

An affordable way to monitor blood pressure, SpO₂, EtCO₂ and respiration.

Now, get all the parameters you need for complete patient monitoring in an economical compact unit. The Model 750C includes the MAXNIBP® technology, Masimo SET® pulse oximetry, and Oridion's CO₂ technology.

The 750C uses the new Microstream® quantitative CO₂ technology with a capnographic waveform that combines the positives of both mainstream and side stream methodology. The monitor contains highly advanced, all-digital signal processing to provide accurate SpO₂ even with low perfusion.

- CO₂ for intubated and non-intubated patients..
- Low sample rate of 50 ml/min.
Great for small patients.
- BP component provides systolic, diastolic, and mean arterial pressure automatically in seconds.
- Automatic, STAT and manual BP modes.
- Pulse rate range from 20-240 beats/min.
- Masimo SET® SpO₂ technology.
- High and low alarm settings for all parameters.
- Trace freeze option.
- Patient history and alarm history displays.
- Operates on AC or rechargeable battery.
- Battery status display.
- Optional printer and rolling stand available.
- Economically priced, light and compact at 4.4 lbs.

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4 Carbon Dioxide Absorption

CARBON DIOXIDE ABSORPTION

Function – makes re-breathing possible, thus conserving gases and volatile agents, decreasing OR pollution, and avoiding hazards of CO₂ re-breathing.

Soda lime-Activator is NaOH or KOH. Silica and kieselguhr added as hardeners.

Indicators for Sodasorb™ are colorless when fresh, and purple when exhausted (such as ethyl violet) because of pH changes in the granules.

Soda lime is absolutely incompatible with trichloroethylene (causes production of dichloroacetylene, a cranial neurotoxin and phosgene, a potent pulmonary irritant). Sevoflurane is unstable in soda lime, producing Compound A (lethal at 130-340 ppm, or renal injury at 25-50 ppm in rats; incidence of toxic [hepatic or renal] or lethal effects in millions of humans are comparable to desflurane). Compound A concentrations of 25-50 ppm are easily achievable in normal clinical practice. Sevoflurane is not recommended at total fresh gas flows less than 1 L/min for more than 2 MAC-Hours. Carbon monoxide is produced by (desflurane ≥ enflurane > isoflurane) >> (halothane = sevoflurane). Worse in dry absorbent, or with baralyme as compared to soda lime. So turn oxygen off at end of case, change absorbent regularly; change if FGF left on over the weekend or overnight, and use low flows.

Amsorb The strong bases (activators NaOH, KOH) have been convincingly implicated in the carbon monoxide problem with the ethyl-methyl ethers, and the generation of Compound A by sevoflurane. Eliminating the activators produces an absorbent, which has equivalent physical characteristics and carbon dioxide absorption efficiency, as compared to soda lime. Amsorb (Armstrong Medical Ltd., Coleraine Northern Ireland) was planned for introduction to the US market in 2000 by Abbott. Read more about Amsorb online, or in *Anesthesiology* 1999 Nov; 91:1342-8.

Baralyme-activator Ba(OH)₂; no hardeners, slightly less efficient. Colorless or pink changing to blue-gray with exhaustion.

Component	Soda Lime	Baralyme	Amsorb
CA(OH) ₂ %	94	80	83
NaOH %	5	-	-
KOH %	1	6	-
CaCl ₂ % (humectant)	-	-	1
CaSO ₄ % (hardener)	-	-	1
Polyvinylpyrrolidone % (hardener)	-	-	1
Water Content %	14 – 19	11 – 16 (as octahydrate)	14
Ba(OH) ₂ ·8 H ₂ O %	-	20	-
Size (mesh)	4 – 8	4 – 8	4 – 8
Indicator	Yes	Yes	Yes

To Change Canisters

1. Wear gloves.
2. Loosen clamp.
3. Remove and discard top canister.
4. Promote the bottom canister to the top and put the fresh canister on the bottom.
5. Check for circuit leaks.
6. Always remove wrap before inserting canister.
7. Don't change mid-case; convert to semi-open circuit by increasing FGF to > 5L/min.

Clinical Signs of Exhaustion of Absorber

- Rise (later a fall) in heart rate and blood pressure
- Hyperpnea
- Respiratory acidosis
- Dysrhythmia
- Signs of SNS activation
 - Flushed
 - Cardiac irregularities
 - Sweating
- Increased bleeding at surgical site
- Increased end tidal carbon dioxide
- NOT dark or cherry-red blood!

Caution on Potential Fires with Sevoflurane for Inhalation

FDA Patient Safety News:
Show #23, January 2004

Abbott Laboratories has sent a letter to healthcare professionals about its product Ultane or sevoflurane, a general anesthetic. The letter warns about rare reports of fires or extreme heat in the respiratory circuit of anesthesia machines when this product is used.

Although the exact cause of the fires has not yet been determined, in most cases the CO₂ absorbent material used with the Ultane had become desiccated. This may have led to an increased exothermic reaction between the sevoflurane and the absorbent material.

The letter from Abbott provides a number of recommendations to reduce the risk of fires or excessive heat. Let us summarize them.

First, replace the CO₂ absorbent if you suspect it's become desiccated because it hasn't been used for a long time.

Turn off the anesthesia machine completely at the end of each clinical use. If the machine is left on, fresh gas continues to flow through it at a low rate, and this may accelerate the drying of the absorbent.

Turn off all vaporizers when not in use.

Before you use a new CO₂ absorbent, check the integrity of the packaging.

Periodically monitor the temperature of the CO₂ absorbent canisters.

Monitor the correlation between the sevoflurane vaporizer setting and the concentration of the inspired sevoflurane. If you notice an unusually delayed rise or an unexpected decline in the inspired sevoflurane concentration when you compare it to the vaporizer setting, this could indicate that there's excessive heating in the absorbent canister.

And finally, replace CO₂ absorbents routinely regardless of what the color indicator shows. The color indicator doesn't necessarily change as a result of desiccation.

There's additional important information in Abbott's letter. If you use Ultane, be sure you have a copy. You can get one on our web site, or from Abbott's Medical Information Department, at 1-800-633-9110.

Additional Information:

MedWatch - 2003 Safety Information Alerts
<http://www.fda.gov/medwatch/SAFETY/2003/safety03.htm#ultane>

Disposable SpO₂ Sensors



Adult



Pediatric



Microfoam



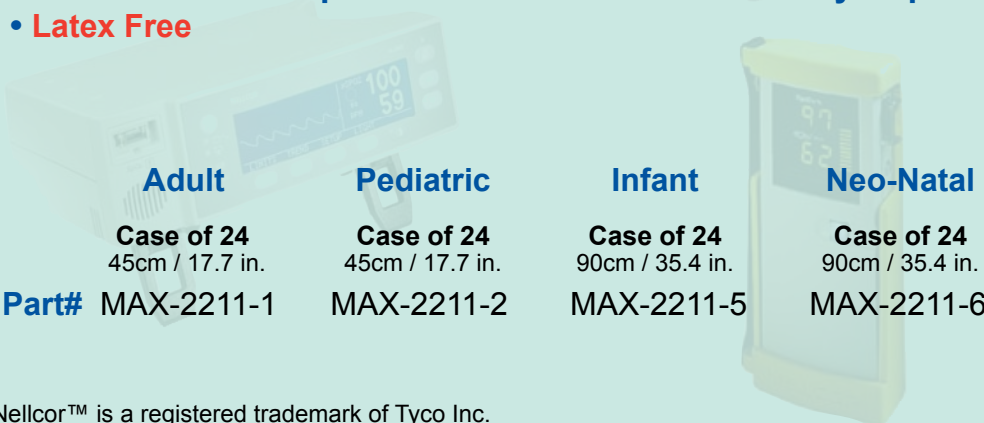
Infant



Neonate



- Economical
- +/- 2% Accuracy same as OEM
- 4 sizes to cover all patient populations
- 3M Microfoam[®] tape for a comfortable fit and easy re-positioning
- **Latex Free**



Available for many other OEM manufacturers...

Call your SHARN representative for more information.

Adult

Case of 24
45cm / 17.7 in.

Part# MAX-2211-1

Pediatric

Case of 24
45cm / 17.7 in.

MAX-2211-2

Infant

Case of 24
90cm / 35.4 in.

MAX-2211-5

Neo-Natal

Case of 24
90cm / 35.4 in.

MAX-2211-6

Nellcor™ is a registered trademark of Tyco Inc.

PULSOX-2™

This small oximeter is great for spot checks and transport. The PULSOX-2 can be used approximately 80 hours with 2 AAA alkaline batteries. Light weight, compact contour and design provide steady, accurate measurements and avoid motion artifact. Splash proof design, and built-in protection against physical and electric shock.



Measuring method	Dual wave length pulse-type oximeter
Measuring range	SpO ₂ : 0 to 100% Pulse rate: 20 to 250 bpm
Accuracy	SpO ₂ : + 2 bpm (70 to 100%, 1 s.d.) Pulse rate: + 2 bpm
Display	Oxygen saturation (SpO ₂) Pulse rate number Pulse level meter Error messages

Order #	Description
MAX-POX2	Pulsox-2

5 Compressed Gas Cylinder Safety

COMPRESSED GAS CYLINDER SAFETY

Compressed gases present a unique hazard. Depending on the particular gas, there is a potential for simultaneous exposure to both mechanical and chemical hazards.

Gases may be:

- Flammable or combustible
- Explosive
- Corrosive
- Poisonous
- Inert
- Or a combination of hazards

If the gas is flammable, flash points lower than room temperature, compounded by high rates of diffusion, present a danger of fire or explosion. Additional hazards of reactivity and toxicity of the gas, as well as asphyxiation, can be caused by high concentrations of even “harmless” gases, such as nitrogen. Since the gases are contained in heavy, highly pressurized metal containers, the large amount of potential energy resulting from compression of the gas makes the cylinder a potential rocket or fragmentation bomb.

Careful procedures are necessary for handling the various compressed gases, the cylinders containing the compressed gases, regulators or valves used to control gas flow, and the piping used to confine gases during flow.

Identification

Always read the label!! Never rely on the color of the cylinder for identification.

All gas lines leading from a compressed gas supply should be clearly labeled to identify the gas, the laboratory or area served, and the relevant emergency telephone numbers.

The labels should be color coded to distinguish hazardous gases (such as flammable, toxic, or corrosive substances).

Signs should be conspicuously posted in areas where flammable compressed gases are stored, identifying the substances and appropriate

precautions (e.g., HYDROGEN – FLAMMABLE GAS – NO SMOKING – NO OPEN FLAMES).

Handling and Use

Gas cylinders must be secured at all times to prevent tipping.

If a leaking cylinder is discovered, move it to a safe place (if it is safe to do so) and inform Environmental Health Services.

Cylinders should be placed with the valve accessible at all times. The main cylinder valve should be closed as soon as it is no longer necessary that it be open (i.e., it should never be left open when the equipment is unattended or not operating).

Cylinders are equipped with either a hand wheel or stem valve. For cylinders equipped with a stem valve, the valve spindle key should remain on the stem while the cylinder is in service. Only wrenches or tools provided by the cylinder supplier should be used to open or close a valve. At no time should pliers be used to open a cylinder valve.

Cylinder valves should be opened slowly. Main cylinder valves should never be opened all the way.

When opening the valve on a cylinder containing an irritating or toxic gas, the user should position the cylinder with the valve pointing away from them and warn those working nearby.

Cylinders containing acetylene should never be stored on their side.

An open flame shall never be used to detect leaks of flammable gases.

Oxygen cylinders, full or empty, shall not be stored in the same vicinity as flammable gases. The proper storage for oxygen cylinders requires that a minimum of 50 feet be maintained between flammable gas cylinders and oxygen cylinders or the storage areas be separated.

Regulators are gas specific and not necessary interchangeable! Always make sure that the regulator and valve fittings are compatible.

After the regulator is attached, the cylinder valve should be opened just enough to indicate pressure on the regulator gauge (no more than one full turn) and all the connections checked with a soap solution for leaks. **Never use oil or grease on the regulator of a cylinder valve.**

When the cylinder needs to be removed or is empty, all valves shall be closed, the system bled, and the regulator removed. The valve cap shall be replaced, the cylinder clearly marked as “empty,” and returned to a storage area for pickup by the supplier.

Empty and full cylinders should be stored in separate areas.

Always use safety glasses (preferably with a face shield) when handling and using compressed gases, especially when connecting and disconnecting compressed gas regulators and lines.

Capacity of Cylinders

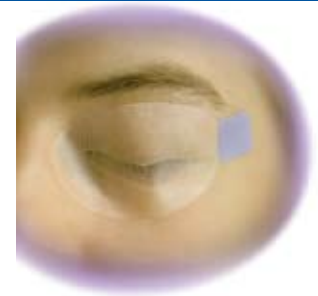
Gas	Color US (international)	Service Pressure psi	Capacity L	Pin Position
Oxygen	Green (white)	1900	660	2 – 5
Nitrous Oxide	Blue (blue)	745	1590	3 – 5
Air	Yellow (black & white)	1900	625	1 - 5

To install:

1. Check and remove labels.
 2. Hold valve away from face and “crack” valve.
 3. Place in hanger yoke.
 4. Observe for appropriate pressure and lack of audible leak.
- Leave cylinders on machine closed.
 - Don't leave empty cylinder on machine.

EYEGARD™

Protect your patient's eyes during surgery with EyeGard. No more handling sticky tape with gloved hands. Simply peel an EyeGard off the backing paper and apply to the eye. The blue tab allows easy removal at the end of the case.



Latex Free

Order #	Qty
S2020	50 pairs per box

Eye & Face Shield



Lightweight and comfortable, the frames are reusable and come in mixed bright colors. The lenses are disposable - simply pull off a dirty lens and replace it with a new one. The lenses are shipped with a protective film covering them to avoid any scratching in transit. Eye & Face Shields fit over eyeglasses comfortably. **Latex Free**



Product #	Description	Qty per pkg.
S1025	Professional Pack (10 frames and 25 lenses)	10 / 25
SD100	Eye Shield Lenses - Dispenser Pack	100
SF100	Eye Shield Frames - Assorted Colors	100
SLF100	Eye Shields Frames and Lenses - Assorted Colors	100
SL250	Eye Shield Lenses - Bulk	250
SF1010	Professional Pack (10 frames, 10 shields)	10 / 10
SF2510	Face Shields	25
SF2511	Face Shield Frames	25
SFF3510	Foam Face Shield	40

Bat Mask

Protect your patient's eyes during general anesthesia against corneal abrasion, lacerations and scleral hemorrhage with the Bat Mask eye cover. This rigid, clear plastic protective cover is supplied with a non-allergenic self-adhesive foam cushion for fast and accurate application. The Bat Mask protects the eyes from blood, fluid and other foreign materials. Bat Mask is packaged sterile. **Latex Free**

Order #	Description
BAT1-25	Adult Sterile - 25 per box
BAT1-100	Adult Sterile - 100 per box



6 Conversion Charts

Conversion Charts

<u>mm</u>	<u>inch</u>	<u>french</u>	<u>lbs</u>	<u>Kg</u>	<u>Estimated Pediatric Weights</u>
1.0	0.039	3	30	13.6	Neonate
1.35	0.053	4	40	18.2	6.6 - 7.7 lbs. = 3 - 3.5 Kg
1.67	0.066	5	50	22.7	
2.0	0.079	6	60	27.3	6 months = 2x birth weight
2.3	0.092	7	70	31.8	13.2 - 15.4 lbs. = 6 - 7 Kg
2.7	0.105	8	80	36.4	
3.0	0.118	9	90	40.9	
3.3	0.131	10	100	45.5	1 year = 3x birth weight
3.7	0.144	11	110	50.0	19.8 - 23.1 lbs. = 9 - 10.5 Kg
4.0	0.158	12	120	54.5	
4.3	0.17	13	130	59.1	For 1 - 7 years, add 2 kg/year
4.7	0.184	14	140	63.6	
5.0	0.197	15	150	68.2	For 7 - 12 years, add 3 kg/year
5.3	0.21	16	160	72.7	
5.7	0.223	17	170	77.3	
6.0	0.236	19	180	81.8	
6.3	0.249	20	190	86.4	
6.7	0.263	21	200	90.9	
7.3	0.288	22	210	95.5	1 Kg = 2.2 lbs.
8.0	0.315	24	220	100.0	
8.7	0.341	26	230	104.5	
9.3	0.367	28	240	109.1	
10.0	0.393	30	250	113.6	
10.7	0.419	32	260	118.2	
11.3	0.445	34	270	122.7	
			280	127.3	
			290	131.8	
			300	136.4	

Fiber Optic Stainless Steel Disposable Blades

GreenLine/D™

Fiber Optic

- Solves Contamination Problems
- Eliminates Cost of Cleaning
- Suitable for Everyday Hospital Use
- Answers the Professional's Request for a Non-Plastic Disposable
- Compatible with all "green" systems including Heine™, Propper™, Rusch GreenSpec®, SunMed™ and Welch Allyn™

DISPOSABLE!



Miller

Order #	Size	Description
FDB-MML-00	Miller 0	Metal Disposable Fiber Optic blade
FDB-MML-01	Miller 1	Metal Disposable Fiber Optic blade
FDB-MML-02	Miller 2	Metal Disposable Fiber Optic blade
FDB-MML-03	Miller 3	Metal Disposable Fiber Optic blade

MacIntosh

Order #	Size	Description
FDB-MMC-02	Mac 2	Metal Disposable Fiber Optic blade
FDB-MMC-03	Mac 3	Metal Disposable Fiber Optic blade
FDB-MMC-04	Mac 4	Metal Disposable Fiber Optic blade
FH-MED	MED	Chrome Plated Fiber Optic Handle
FHSS-MED	MED	Chrome Plated Fiber Optic Handle



Conventional Laryngoscope Blades & Handles

Standard Conventional

- One year unconditional warranty
- Choose chrome plated brass, or **waterproof** stainless steel handles



Great Prices - call us!

- Stainless steel blades
- MacIntosh sizes 0-5
- Miller sizes 00-4
- Over 65 profiles available, including Flex-Tip



All handles are available in Penlight (AA) styles, Stubby (AA), Medium (C), & Large (D).

Call for ordering information: 1-800-325-3671.

7 Drugs Used in Anesthesia

Commonly Used Anesthesia Drug Reference

This guide is intended strictly as a general reference and supply list. Information has been compiled from multiple sources, no endorsement of any pharmaceutical company is intended or implied. Not to be used for patient prescribing. Special thanks to Anesthesia Labels Company for their help.

Generic Name	Trade Name	Primary Supplier
Anesthetics (Gases)		
<i>for general anesthesia, provides analgesia, induces sleep, relaxes muscles and provides pain relief</i>		
N ₂ O	generic	generic
Desflurane	Suprane [®]	Baxter
Enflurane	Ethrane [®]	generic
Fluothane	Halothane [®]	Halocarbon
Isolfurane	Forane [®]	generic
Sevoflurane	Ultane [®] , Sevorane [®]	Abbott, Abbott

The drugs below are shown with the corresponding ASTM Standard Label color for User-applied labels. ASTM Designation D 4774-94

Malignant Hyperthermia Treatment

MH is a rare, potentially fatal syndrome that may be triggered by anesthetic inhalation agents or succinylcholine. Only one known drug, a concentrated muscle relaxant, will reverse this syndrome.

Dantrolene Sodium	Dantrium I. V. [®]	Proctor and Gamble
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Narcotics:

provide pain relief

Alfentanil	Alfenta [®]	Janssen
Fentanyl	Sublimaze [®]	Akorn
Hydromorphone	Dilaudid [®]	Knoll Laboratories
Meperidine	Demerol [®]	GlaxoSmithKline
morphine	generic	generic
Remifentanyl	Ultiva [®]	Abbott Laboratories
Sufentanil	Sufenta [®]	Janssen

Narcotic Reversal:

reverse the effects of narcotics

levallorphan	generic	generic
Naloxone	Narcan [®] , generic	DuPont, generic

Induction Agents:

induce sleep

** also an anesthetic*

Etomidate	Amidate [®]	Abbott Laboratories
Ketamine *	generic	generic
Methohexital	Brevital [®]	Jones Medical
Propofol *	Diprivan [®]	Zeneca
Thiopental	Pentothal [®]	Abbott, generics

Tranquilizers:

*used to calm patient, ** also induce amnesia*

Diazepam **	Valium [®]	Hoffman la Roche Ltd
Midazolam **	Versed [®]	Hoffman la Roche Ltd

Tranquilizer Reversal:

reverse the effects of tranquilizers

Flumazenil	Romazicon [®]	Hoffman la Roche Ltd
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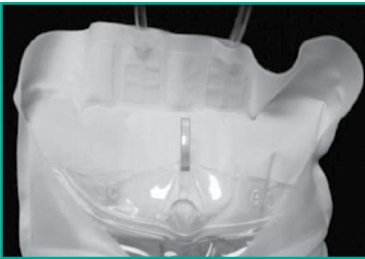
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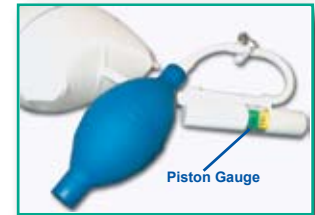
Special thanks to Anesthesia Labels Company for their help.

Generic Name	Trade Name	Primary Supplier
Major Tranquilizers:		
<i>*** antiemetics</i>		
chlorpromazine***	Compazine®	GlaxoSmithKline
Droperidol ***B18	Inapsine®	Akorn
Anesthetics (Local):		
<i>provide pain relief to specific area of the body</i>		
Bupivacaine	Marcaine®	Sanofi Winthrop
lidocaine	Xylocaine®	Astra
Muscle Relaxant - Depolarizing:		
<i>short acting muscle relaxant, usually used for intubation</i>		
succinylcholine	Anectine® Quelicin®	GlaxoSmithKline
Muscle Relaxants - Non Depolarizing:		
<i>used to relax the muscles during surgery, reduces muscle injuries</i>		
Atracurium	Tracrium®	GlaxoSmithKline
Cisatracurium besylate	Nimbex®	GlaxoSmithKline
d-turbocurarine	Curare®	
Mivacurium	Mivacron®	GlaxoSmithKline
Pancuronium	Pavulon®	Organon
Pipecuronium	Arduan®	Organon
Rocuronium Bromide	Zemuron®	Organon
Vecuronium	Norucron®	Organon
Muscle Relaxant Reversal Agents:		
<i>reverses the effects of muscle relaxants</i>		
Edrophonium	Tensilon®, Enlon®, Reversol®	ICN Pharmaceuticals, Ohmeda, Organon
Neostigmine	Prostigmine®	ICN Pharmaceuticals
Pyridostigmine	Regonal®	Organon
Vasopressors:		
<i>stimulates contraction of the arteries, increases blood pressure</i>		
Dopamine	generic	Astra, Elkins-Sinn
Epinephrine	generic	generic
Ephedrine	generic	generic
Phenylephrine	Neo-Synephrine	generic
Hypotensive Agents:		
<i>reduces blood pressure</i>		
Nitroprusside	generic	generic
Nitroglycerine	generic	generic
Phentolamine	generic	generic
Trimethaphan	Arfonad®	Roche
Anticholinergic Agents:		
<i>inhibits parasympathetic nerve activity</i>		
Atropine	generic	generic
Glycopyrrolate	Robinul®	Robbins

Pressure Infusors



This disposable pressure infusor features a transparent sleeve which allows you to read the fluid level of the bag. A hook on the inside of the sleeve keeps the bag in place to receive equal pressure distribution. The plastic loop at the top makes it very easy to hang from an IV pole. The large bulb has 2 one-way check valves preventing retrograde air and leaks. The large bulb also means fewer squeezes to pressurize. **Latex Free**



Piston Gauge with Stopcock #	Aneroid Gauge with Stopcock #	Aneroid Gauge with Thumbwheel #	Description	Qty
Order #	Order #	Order #		
PI-903S-6	PI-803S-6	PI-803T-6	500cc capacity	6
PI-903S-24	PI-803S-24	PI-803T-24	500cc capacity	24
PI-903S-48	PI-803S-48	PI-803T-48	500cc capacity	48
PI-904S-6	PI-804S-6	PI-804T-6	1000cc capacity	6
PI-904S-24	PI-804S-24	PI-804T-24	1000cc capacity	24
PI-904S-48	PI-804S-48	PI-804T-48	1000cc capacity	48
	PI-805S-10		3000cc capacity	10

Manual Blood Pressure Cuffs

- Antimicrobial coating helps prevent cross contamination.
- Large inflation bulb means fewer squeezes to inflate.
- Single or double lumen for use alone or with your gauge.
- **Latex Free**



Call for other sizes!

Single Tube With Sphygmomanometer

Order #	Size	Inflation Range
BP-MAN-0814	Infant	8-14cm range
BP-MAN-1320	Child	13-20cm range
BP-MAN-1826	Small Adult	18-26cm range
BP-MAN-2635	Adult	26-35cm range
BP-MAN-2938	Long Adult	29-38cm range
BP-MAN-3242	Large Adult	32-42cm range
BP-SPHYG		gauge only

Double Tube Without Sphygmomanometer

Order #	Size	Inflation Range
BPR-1320-2MBFL	Child	13-20cm range
BPR-1826-2MBFL	Small Adult	18-26cm range
BPR-2635-2MBFL	Adult	26-35cm range
BPR-2938-2MBFL	Long Adult	29-38cm range
BPR-3242-2MBFL	Large Adult	32-42cm range

8 Gas Sampling

Expired Patient Gas Monitoring

The monitoring of the expired gases of a sedated or anesthetized patient is required.

Commonly referred to as “Gas Sampling”, this can actually comprise the monitoring of a number of gases:

End-tidal CO₂
Oxygen concentration
Nitrous Oxide
Anesthesia agents concentration
Others, e.g. Nitrogen, helium, argon

Obtaining a gas sample:

To obtain a sample of the gas to be measured and monitored, the patient’s exhaled gas or the gas in the patient’s breathing circuit of an anesthetized patient must be collected.

The methods utilized depend upon the following factors:

Is the patient sedated – using nasal prongs (cannulas) or a face mask, or is the patient intubated?

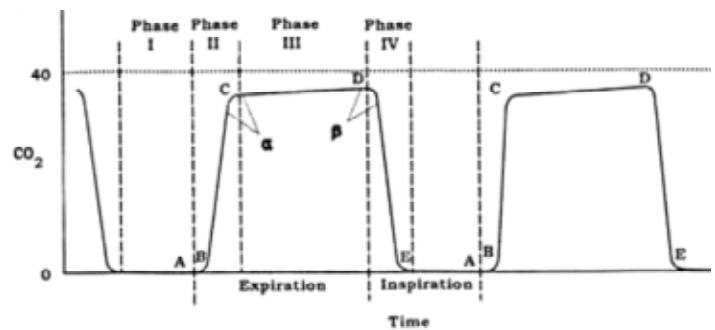
What type of monitor?

- A. “Diverting” - commonly referred to as “sidestream” - where a catheter is placed in the breathing circuit and a gas sample is pulled and goes to the monitor for measurement.
- B. “Non-diverting” - commonly referred to as “mainstream” - where a sensor is placed in the circuit and analyzes the gas as it pass across the sensor.

The most common type of monitor is sidestream. In this case a connector is placed in the circuit which is connected to a small bore tubing (gas sampling line) that is then connected to the gas inlet of the monitor. A sample of gas from the breathing circuit is continuously collected by the monitor and measured. The results are displayed on the monitor in a graphical waveform plus numerical values of the measured gases.

Monitoring end-tidal CO₂ alone with a monitor displaying a wave form can help the clinician to assess the breath rate of the patient and whether there is adequate ventilation provided. For example, hyperventilation, an increase in dead space ventilation, hypoventilation or increase CO₂ delivery to the lungs, obstruction of gas flow, etc, may be observed.

Example: the normal range of EtCO₂ is 5 to 5.5% or 35 to 40 torr.



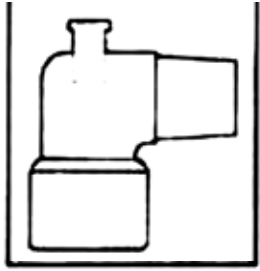
For the sedated patient:

The typical gas sampling method is the use of split nasal prongs, (cannulas) which deliver oxygen and sample expired gas.

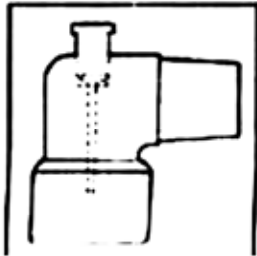
For the intubated patient with a breathing circuit: There are a number of connectors available. In cases the port connecting to the gas sampling line is a female luer lock port.

Connectors

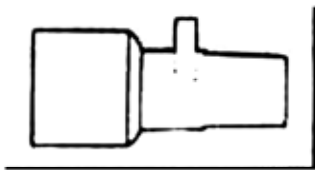
Mask elbow with port



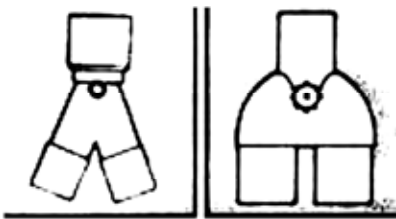
With extended tip for better sampling



Straight connector with port



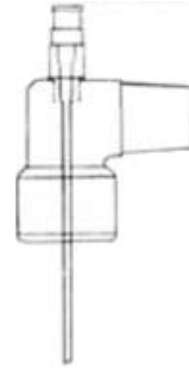
Circuit wye with port



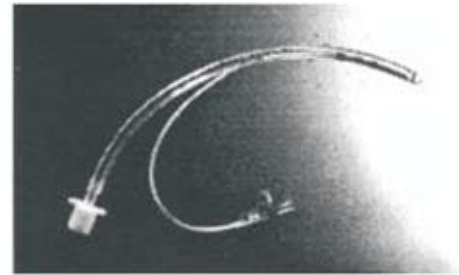
Breathing circuit with internal gas sampling line



Gas sampling catheter - inserted into the endotracheal tube for sampling closer to the end of the ET tube. Special for pediatric and smaller patients.



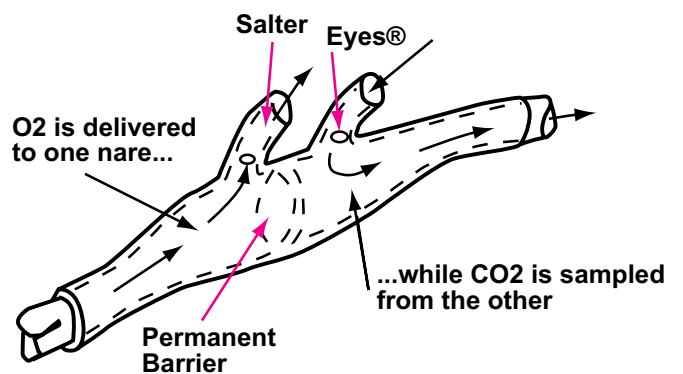
Endotracheal tube with sampling lumen and port in the tip of the tube.



Oxygen face mask with port



CO₂ / Oxygen Cannula



Gas Sampling Lines –

These small bore tubes have luer fittings which connect to the female luer port on the breathing circuit connector via a male luer lock fitting and the opposite end connecting to the monitor gas inlet. The “monitor” end can be a female luer, male luer, plain or a proprietary connector.

The gas sampling lines are either made of PVC or a co-extruded material – internal layer of polyethylene and outside layer of PVC. These “co-extruded” lines are designed to reduce any absorption of anesthetic agents into the tubing.

Problems:

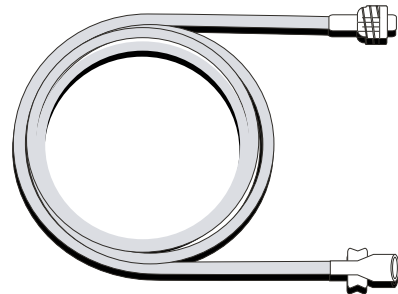
Water vapor can cause a few problems for ET CO₂ monitors.

Water vapor absorbs light similarly to CO₂ and can mask the measured CO₂ results
Water accumulates in the gas sampling line and “plugs” it so gas is delivered to the monitor
Water enters into the electronics of the monitor and causes problems

Water vapor problems are handled by:

Adding an in-line filter to the gas sampling line
Placing a water trap at the entrance of the gas into the monitor
Adding special tubing, called Nafion¹, which is a permeable membrane material, allowing the water vapor to escape to atmosphere

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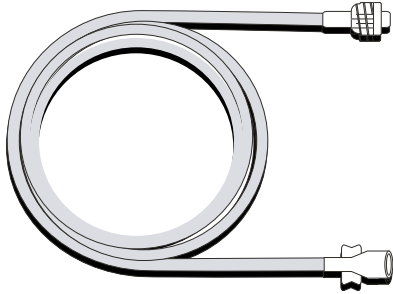
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(Nafion¹ is a registered trademark of Dupont Chemical CO.)

Reference source:

Understanding Anesthesia Equipment Edition 4, Dorsch and Dorsch, Lippincott Williams & Wilkens.

Gas Sampling Lines



Latex Free

Order #	Description	Qty
GSL-90150	PVC, male-male, 10'	100
GSL-90151	PVC, male-female, 10'	100
GSL-90150-H	PVC, male-male, 10'	50
GSL-90151-H	PVC, male-female, 10'	50
GSL-90100	PE/PVC, male-male, 10'	100
GSL-90101	PE/PVC, male-female, 10'	100
GSL-90100-H	PE/PVC, male-male, 10'	50
GSL-90101-H	PE/PVC, male-female, 10'	50

Gas Sampling Catheter

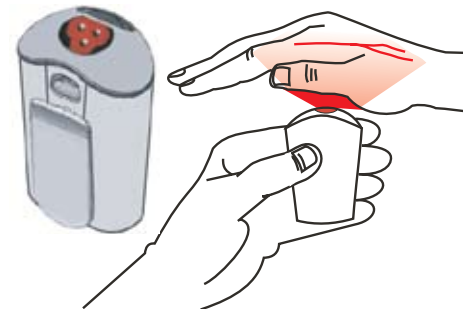


The Gas Sampling Catheter allows sampling within the endotracheal tube, improving the ability to obtain accurate sampling and breath waveforms for patients with low tidal volumes and/or when using high flow anesthesia breathing circuits. The GSC is a simple catheter and luer lock connector that extends through the standard luer port of a gas sampling connector (mask elbow.) **Latex Free**

Order #	Description	QTY
GSC-10	Gas Sampling Catheters	10/box

Vein Locator

The Vein Locator is a portable, battery operated device which uses special lights to trans-illuminate the patient's tissue to highlight veins. Ideal for neonates, pediatric, and frail adult patients, the Vein Locator assists in finding the vein and improves your chance of needing just a single stick. Self-contained, the unit can be cleaned as needed.



Order#	Description	Qty
VL-U	Vein Locator	1 ea.

9 Lab Values

NORMAL LAB VALUES

Complete Blood Count (CBC) with Differential

White Blood Cell Count (WBC)

Adult / Child > 2 years	5000 - 10,000/mm ³ or 5 -10 x 10 ⁹ /L (SI units)
Child < 2 years	6200 - 17,000/mm ³
Newborn	9000 - 30,000/mm ³
Critical Values	WBCs < 2500 or > 30,000/mm ³
Differential Count	
Neutrophils	55% to 70%
Lymphocytes	20% to 40%
Monocytes	2% to 8%
Eosinophils	1% to 4%
Basophils	0.5% to 1%

Red Blood Cell Count (RBC)

Adult / Elderly – Male	4.7 – 6.1 million/mm ³
Adult / Elderly – Female	4.2 – 5.4 million/mm ³
Infant / Child	3.8 – 5.5 million/mm ³
Newborn	4.8 – 7.1 million/mm ³

Hemoglobin (Hb, Hgb)

Adult Male	14 – 18 g/dL or 8.7 – 11.2 mmol/L (SI units)
Adult Female	12 – 16 g/dL or 7.4 – 9.9 mmol/L
Elderly	Values slightly decreased
Child	11 – 16 g/dL
Infant	10 – 15 g/dL
Newborn	14 – 24 g/dL

Hematocrit (Hct)

Adult Male	42 – 52% or 0.42 – 0.52 volume fraction (SI units)
Adult Female	37 – 47% or 0.37 – 0.47 volume fraction (SI units)
Elderly	Values slightly decreased
Child	31 – 43%
Infant	30 – 40%
Newborn	44 – 64%

Red Blood Cell Indices

Mean Corpuscular Volume (MCV)	
Adult / Elderly / Child	80 – 90 m
Newborn	96 – 108 m
Mean Corpuscular Hemoglobin (MCH)	
Adult / Elderly / Child	27 – 31 pg
Newborn	32 – 34 pg
Mean Corpuscular Hemoglobin Concentration (MCHC)	
Adult / Elderly / Child	32 – 36 g/dL (or 32 – 36%)
Newborn	32 – 33 g/dL (or 32 – 36%)
Red Blood Cell Distribution (RDW)	
Adult	11 – 14.5%

Serum Chemistry

Sodium

Adults / Elderly	136 – 145 mEq/L or 136/145 mmol/L (SI Units)
Child	136 – 145 mEq/L
Infant	134 – 150 mEq/L
Newborn	134 – 144 mEq/L

Chloride

Adults / Elderly	90 – 110 mEq/L or 98 – 106 mmol/L (SI Units)
Child	90 – 110 mEq/L
Newborn	96 – 106 mEq/L
Premature Infant	95 – 110 mEq/L
Critical Values	< 80 or > 115 mEq/L

Potassium

Adults / Elderly	3.5 – 5.0 mEq/L or 3.5 – 5.0 mmol/L (SI Units)
Child	3.4 – 4.7 mEq/L
Infant	4.1 – 5.3 mEq/L
Newborn	3.9 – 5.9 mEq/L
Critical Values	
Adult	< 2.5 or > 6.5 mEq/L
Newborn	< 2.5 or > 8.0 mEq/L

Magnesium

Adults	1.2 – 2.0 mEq/L
Newborn	1.4 – 2.0 mEq/L
Critical Values	< 0.5 or > 3.0 mEq/L

Phosphorous

Adults	3.0 – 4.5 mg/dL or .97 – 1.45 mmol/L (SI Units)
Elderly	Values slightly lower than adult
Child	4.5 – 6.5 mg/dL or 1.45 – 2.10 mmol/L (SI Units)
Newborn	4.3 – 9.3 mg/dL or 1.4 – 3.0 mmol/L (SI Units)
Critical Values	< 1 mg/dL

Calcium

Adults	Total: 9.0 – 10.5 mg/dL or 2.25 – 2.75 mmol/L (SI Units) Ionized: 4.5 – 5.6 mg/dL or 1.05-1.30 mmol/L (SI Units)
Elderly	Values slightly lower than adult
Child	Total: 8.8 – 10.8 mg/dL or 2.2 – 2.7 mmol/L (SI Units)
Newborn	Total: 9.0 – 10.6 mg/dL or 2.30 – 2.65 mmol/L (SI Units)
Umbilical Cord	Total: 9.0 – 11.5 mg/dL or 2.25 – 2.88 mmol/L (SI Units)
Critical Values	< 6 mg/dL (may lead to tetany) > 14 mg/dl (may lead to coma)

Glucose

Child > 2 years to Adult	70 – 105 mg/dL or 3.9 – 5.8 mmol/L
Child < 2 years	60 – 100 mg/dL or 3.3 – 5.5 mmol/L
Infant	40 – 90 mg/dL or 2.2 – 5.0 mmol/L
Neonate	30 – 60 mg/dL or 1.7 – 3.3 mmol/L
Premature Infant	20 – 60 mg/dL or 1.1 – 3.3 mmol/L
Critical Values	
Adult Male	< 50 and > 400 mg/dL
Adult Female	< 40 and > 400 mg/dL
Infant	< 40 mg/dL
Newborn	< 30 and > 300 mg/dL

Albumin

Adults / Elderly	3.5 – 5.0 g/dL or 35 – 50 g/L (SI Units)
Child	4.0 – 5.9 g/dL
Infant	4.4 – 5.4 g/dL
Newborn	3.5 – 5.4 g/dL
Premature Infant	3.0 – 4.2 g/dL

Protein

Adults / Elderly	6.4 – 8.3 g/dL or 64 – 83 g/L (SI Units)
Child	6.2 – 8.0 g/dL
Infant	6.0 – 6.7 g/dL
Newborn	4.6 – 7.4 g/dL
Premature Infant	4.2 – 7.6 g/dL

Ammonia

Adults	15 – 100 mg/dL or 47 – 65 mmol/L (SI Units)
Child	40 – 80 mg/dL
Newborn	90 – 150 mg/dL

Blood Urea Nitrogen

Adults	10 – 20 mg/dL or 3.6 – 7.1 mmol/L (SI Units)
Elderly	May be slightly higher than those of adults
Child	5 – 18 mg/dL
Infant	5 – 18 mg/dL
Newborn	3 – 12 mg/dL
Critical Values	> 100 mg /dL (indicates serious renal impairment)

Bilirubin

Adult / Elderly / Child	Total: 0.1 – 1.0 mg/dL or 5.1 – 17.0 mmol/L (SI Units) Indirect: 0.2 – 0.8 mg/dL or 3.4 – 12.0 mmol/L (SI Units) Direct: 0.1 – 0.3 mg/dL or 1.7 – 5.1 mmol/L (SI Units)
Newborn	Total: 1-12 mg/dL or 17.1 – 20.5 mmol/L (SI Units)

Uric Acid

Adult Male	2.1 – 8.5 mg/dL or 0.15 – 0.48 mmol/L
Adult Female	2.0 – 6.6 mg/dL or 0.09 – 0.36 mmol/L
Elderly	Values may be slightly decreased
Child	2.5 – 5.5 mg/dL or 0.12 – 0.32 mmol/L
Newborn	2.0 – 6.2 mg/dL
Critical Values	> 12 mg/dL

Alkaline Phosphatase

Adult	30 – 85 ImU/mL or 42 – 128 U/L (SI Units)
Elderly	Slightly higher than adults
Child / Adolescent	
< 2 years	85 – 235 ImU/mL
2 – 8 years	65 – 210 ImU/mL
9 – 15 years	60 – 300 ImU /mL
16 – 21 years	30 – 200 ImU/mL

Adult Male	0.6 – 1.2 mg/dL
Adult Female	0.5 – 1.1 mg/dL or 44 – 97 mmol/L (SI Units)
Elderly	Decrease in muscle mass may cause decreased values
Adolescent	0.5 – 1.0 mg/dL
Child	0.3 – 0.7 mg/dL
Infant	0.2 – 0.4 mg/dL
Newborn	0.3 – 1.2 mg/dL
Critical Values	> 4 mg/dL (serious renal impairment)

Serum Glutamic Oxaloacetic Transaminase (Aspartate Aminotransferase (AST), (SGOT)

Adults	8 – 20 U/L, 5 – 40 IU/L, or 8 – 20 U/L (SI Units) Females tend to have lower values than males
Elderly	Slightly higher values than adults
Child	Values similar to adults
Newborn / Infant	15 – 60 U/L

Serum Glutamic Pyruvic Transaminase (Alanine Aminotransferase (ALT), (SGPT)

Adult / Child	5 – 35 IU/L or 8 – 20 U/L (SI Units)
Elderly	May be slightly higher than adults
Infant	May be twice as high as adult

Lactic Acid Dehydrogenase

Adult / Elderly	45 – 90 U/L, 115 – 225 IU/L, or 0.4 – 1.7 mmol/L (SI Units)
Isoenzymes in Adult / Elderly Values	
LDH-1	17 – 27%
LDH-2	27 – 37%
LDH-3	18 – 25%
LDH-4	3 – 8%
LDH-5	0 – 5%
Child	60 – 170 U/L
Infant	100 – 250 U/L
Newborn	160 – 450 U/L

Creatinine Phosphokinase

Adult / Elderly – Male	12 – 70 U/mL or 55 – 170 U/L (SI Units)
Adult / Elderly – Female	10 – 55 U/mL or 30 – 135 U/L (SI Units) Values are higher after exercise
Newborn	68 – 580 U/L (SI Units)
Isoenzymes	
CPK-MM	100%
CPK-MB	0%
CPK-BB	0%

“Crystal™” Disposable Laryngoscope Blades

Designed to prevent cross-infection without affecting the clinician’s intubation technique.

- Superb visualization through revolutionary “Crystal” technology
- Smooth, clear, light-transmitting blade
- Strong polycarbonate alternative to metal blades
- Excellent specific and general illumination
- Crystal fits all Green Series handles
- Full size blade
- **Latex Free**



Order #	Description	Qty	Price
FDB-C50552	Macintosh, Size 2	20	\$70.00
FDB-C50553	Macintosh, Size 3	20	\$70.00
FDB-C50554	Macintosh, Size 4	20	\$70.00
FDB-C50550	Miller, Size 0	20	\$70.00
FDB-C50551	Miller, Size 1	20	\$70.00
FDB-C50555	Miller, Size 2	20	\$70.00
FDB-C50556	Miller, Size 3	20	\$70.00



Disposable Laryngoscope Blades

- Compatible with Green Series reusable handles
- Blades are manufactured of **Latex Free** polycarbonate
- **Latex Free** handle features a metal reinforced lock-on assembly



Description	Order # (10/pkg.)	Price	Order # (20/pkg.)	Price
Macintosh size 2	FDB-MAC-2	\$35.00	FDB-MAC-220	\$65.00
Macintosh size 3	FDB-MAC-3	\$35.00	FDB-MAC-320	\$65.00
Macintosh size 4	FDB-MAC-4	\$35.00	FDB-MAC-420	\$65.00
Miller size 0	FDB-MIL-O	\$35.00	FDB-MIL-020	\$65.00
Miller size 1	FDB-MIL-1	\$35.00	FDB-MIL-120	\$65.00
Miller size 2	FDB-MIL-2	\$35.00	FDB-MIL-220	\$65.00
Miller size 3	FDB-MIL-3	\$35.00	FDB-MIL-320	\$65.00

Description	Order #	Price
Disposable Medium Handle	FDH-MED-1	\$29.00
Reusable Chrome Handle	FH-MED	\$60.00

(with 5 year unconditional warranty)



10 Latex Allergy

LATEX ALLERGY¹

What is latex?

The term “latex” refers to natural rubber latex, the product manufactured from a milky fluid derived from the rubber tree, *Hevea brasiliensis*.

What is latex allergy?

Latex allergy is a reaction to certain proteins in latex rubber. The amount of latex exposure needed to produce sensitization or an allergic reaction is unknown. Increasing the exposure to latex proteins increases the risk of developing allergic symptoms. In sensitized persons, symptoms usually begin within minutes of exposure, but they can occur hours later and can be quite varied. Mild reactions to latex involve skin redness, rash, hives, or itching. More severe reactions may involve respiratory symptoms such as runny nose, sneezing, itchy eyes, scratchy throat, and asthma (difficult breathing, coughing spells, and wheezing). Rarely, shock may occur; however, a life-threatening reaction is seldom the first sign of latex allergy.

Who is at risk of developing latex allergy?

Health care workers are at risk of developing latex allergy because they use latex gloves frequently. Workers with less glove use (such as housekeepers, hairdressers, and workers in industries that manufacture latex products) are also at risk.

How is latex allergy treated?

Detecting symptoms early, reducing exposure to latex, and obtaining medical advice are important to prevent long-term health effects. Once a person becomes allergic to latex, special precautions are needed to prevent exposures. Certain medications may reduce the allergy symptoms, but complete latex avoidance, though quite difficult, is the most effective approach.

Are there other types of reactions to latex besides latex allergy?

Yes. The most common reaction to latex products is irritant contact dermatitis – the development of dry, itchy, irritated areas on the skin, usually the hands. This reaction is caused by irritation from wearing gloves and by exposure to the powders added to them. Irritant contact dermatitis is not a true allergy. Allergic contact dermatitis (sometimes called chemical sensitivity dermatitis) results from the chemicals added to latex during harvesting, processing, or manufacturing. These chemicals can cause a skin rash similar to that of poison ivy. Neither irritant contact dermatitis nor chemical sensitivity dermatitis is a true allergy.

How to protect against latex allergy?

Learn to recognize the symptoms of latex allergy: skin rash; hives; flushing; itching; nasal, eye or sinus symptoms; asthma; and (rarely) shock.

What if I think I have latex allergy?

Avoid direct contact with latex gloves and other latex-containing products.

Latex-Free Carts

All hospitals should have available latex-free carts. Develop a list of latex free products to be available for use on patients with latex sensitivity. On the Johns Hopkins web site, you will find a list of specific products, including item numbers and manufacturers that are latex free. Contact the American Latex Allergy Association for more information. Their web site is www.latexallergyresources.org.

What is the well-stocked “latex safe” cart sporting these days?²

Everything from tubing and tourniquets to syringes, stethoscopes and stopcocks. At least that’s the recommendation of the Association of Operating Room Nurses (www.aorn.org), Denver, in

its first-ever latex guidelines, Standards, Recommended Practices and Guidelines, 1999.

Latex-free cart staples, according to AORN

Needles (25 g through 15 g)
Intravenous tubing
Anesthesia breathing bag
Blood tubing
3-way stopcocks
Tourniquet
Dermacil tape (1/2", 1" and 1-1/2")
Feeding tubes (5 fr to 10 fr)
Micropore tape (1/2", 1" and 1-1/2")
Underpads and small chux
Feeding pump bag and tubing
Urinary drainage system
Silastic Foley catheters (3 fr to 18fr)
Blood pressure tubing
Silastic external catheters (pediatric and adult)
Stethoscope
Oxygen cannula, oxygen mask with plastic tie
Exam gloves
Syringes (3cc, 10cc, 20cc, 60cc, tuberculin and insulin)
Sterile gloves
10cc glass ampules of sodium chloride and sterile water
60cc irrigating bulb syringe
Blood pressure cuffs (infant, pediatric, small and large adult and thigh sizes); material to wrap cuffs are not available

ALL SHARN PRODUCTS ARE LATEX FREE

Crystalline® Temperature Strips for anesthesia
DermaTherm® Strips for pain management

1 DHHS (NIOSH) Publication No. 98-113,
"Latex Allergy, A Prevention Guide"
2 Philip A. Perry, Article Display "A savvy guide to
the latex-safe cart,"

Heath Facilities Management

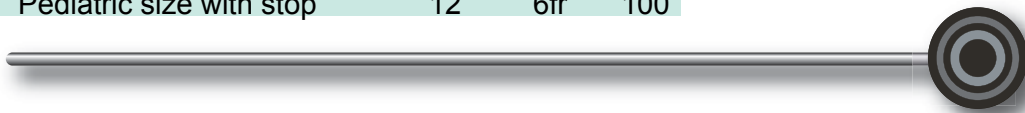
Disposable Stylettes

Disposable Safety Stylette

These Safety Stylettes feature a one-way adjustable stop that helps keep the tip of the stylette right where you want it. For added safety the tips are blunt and atraumatic. Teflon® coated to facilitate easy insertion. Choose adult or pediatric sizes. They are available individually bagged in boxes of 25, 50, or 100.



Order #	Description	in	fr	Qty
ST1000-25	Adult size with stop	16"	10fr	25
ST1000-50	Adult size with stop	16"	10fr	50
ST1000-100	Adult size with stop	16"	10fr	100
ST5000-25	Pediatric size with stop	12"	6fr	25
ST5000-50	Pediatric size with stop	12"	6fr	50
ST5000-100	Pediatric size with stop	12"	6fr	100

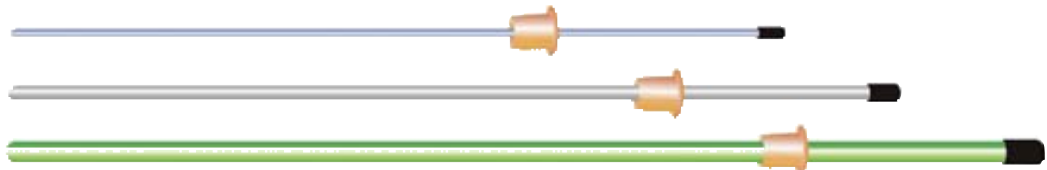


Disposable Aluminum Stylette

Satin finish aluminum, sterile and **Latex Free**. These stylettes are more malleable than our safety stylettes.

Order #	Description	Qty
ST-90204-A	Adult, 16"	25
ST-90204-A50	Adult, 16"	50
ST-90204-A100	Adult, 16"	100
ST-90204-P	Pediatric, 11 1/2"	25
ST-90204-P50	Pediatric, 11 1/2"	50
ST-90204-P100	Pediatric, 11 1/2"	100

- **Latex Free**
- **Sterile**
- **Color-coded**

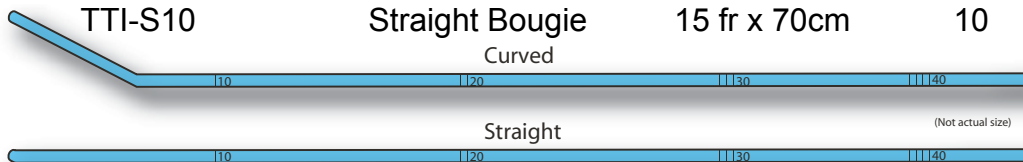


Order #	Description	Qty
ST-90209-71	Disposable Neonatal stylette w/ stopper, blue For use in 2.0 to 3.5 mm tubes, 6 fr.	box of 25
ST-90209-72	Disposable Child stylette w/ stopper, gray For use in 4.0 to 7.0 mm tubes, 8 fr.	box of 25
ST-90209-73	Disposable Adult stylette w/ stopper, green For use in 7.0 to 10.0 mm tubes, 10 fr.	box of 25

Tracheal Tube Introducer

This disposable Eschmann-style "bougie" is used to guide the endotracheal tube during difficult intubations. The tube slides over the introducer which helps to guide the way, especially helpful for "blind" intubations.

Order #	Description	Size	Qty
TTI-C10	Curved Bougie	15 fr x 70cm	10
TTI-S10	Straight Bougie	15 fr x 70cm	10



Latex Free

11 Perfusion Monitors

Some Applications for Perfusion Monitors

To help confirm DIAGNOSIS OF RSD and other sympathetically maintained pain disorders. By placing one DermaTherm[®] band on the affected site and one on the contralateral site, you will have a fast, accurate indication of any significant temperature differences that may help confirm a diagnosis of RSD. DermaTherm bands have a very light adhesive and would be the least painful to your RSD patients.

For NERVE BLOCK ASSESSMENTS. This is one of the leading applications for DermaTherm. Simply place a DermaTherm monitor at the distal end of the affected extremity. Within minutes you will see a significant change in temperature, indicating a successful block. By leaving the DermaTherm in place, you may continue to assess the progress of the block. Some practitioners have reported that they have noticed a dip in temperature just prior to the return of pain, suggesting the need to re-dose and/or adjust the dosage given.

As an adjunct to BIOFEEDBACK TRAINING. This is an excellent application of DermaTherm, for both you and your patient. As the patient relaxes and vasodilation occurs, a marked increase in skin temperature also occurs. In your office, your patient will read the DermaTherm and learn to associate the change in temperature with their level of comfort. When they leave with the DermaTherm on, they will have a tool to provide quantifiable feedback all day as they practice their therapy. We recommend the bands for all day use for comfort, because the small size makes them inconspicuous and the patient won't feel embarrassed.

With EMG TESTS. It is generally accepted that temperature affects conductivity. A quick, easy, and inexpensive way to determine if an extremity is at a desirable temperature for an EMG test is to place a DermaTherm on the site. You'll be able to read the skin temperature in seconds!

HYDRO-THERAPY/TREATMENT. Whether for wound debridement or muscle therapy, or any of the many other times you choose a hot water therapy for your patients, it is important that the water be at a safe temperature relative to the patient. To quickly determine the patient's skin temperature, simply apply

a DermaTherm. You'll know the temperature in seconds and will be able to adjust the water temperature, rather than risking unnecessary injury.

As an adjunct to THERMOGRAPHY. Those wanting to use thermography for patient assessment and diagnosis are often frustrated or thwarted by skeptical insurance companies who are unwilling to reimburse for the costly procedure. An easy, patient-friendly, quick and inexpensive pre-test can be done with DermaTherm. By using pairs of DermaTherm, the temperature of an affected pain site, its contralateral site, and the surrounding areas may be compared. The presence or lack of significant temperature difference may either preclude or justify use of thermography.

INVASCULAR, ORTHOPEDIC or PLASTIC and RECONSTRUCTIVE SURGERY. DermaTherm Perfusion Monitors, especially in the soft band form, provide an easy way to verify restoration of blood flow during and after surgery. Changes will be reflected immediately. Post-operatively you will have a continuous monitor, which will indicate possible clotting or blockage immediately.

For monitoring PHLEBITIS patients. By applying a DermaTherm to the affected limb and checking it periodically, you will know when Heparin treatments begin to be effective because you will see the temperature decrease, even before swelling reduces!

For monitoring AMPUTEE patients. DermaTherm is a fast and easy way to check the circulation of a remaining portion of an amputated limb post-operatively, both in the hospital and in the patient's home. Simply apply DermaTherm post-operatively and record the temperature. Subsequent readings should be the same or warmer. Lower temperatures could be early indicators of clotting.

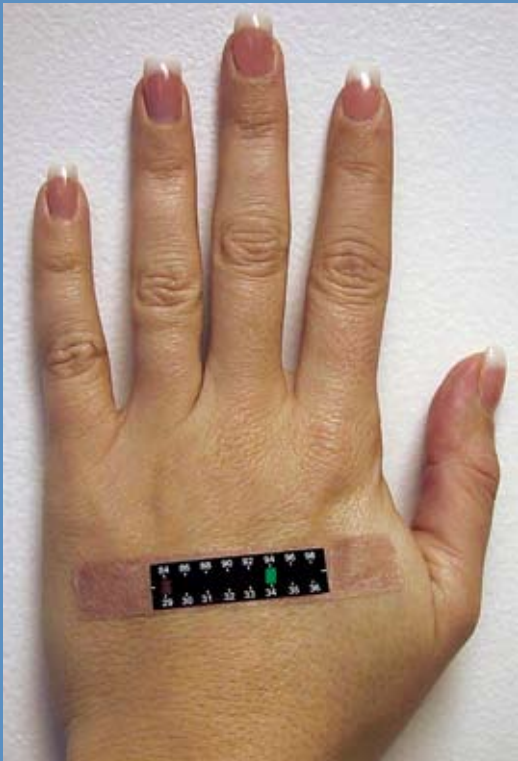
To check for DEEP VEIN THROMBOSIS. If you suspect DVT in one of your patients, a comparison on contralateral limbs or even upper and lower portions of a limb with DermaTherm may show a 1° or greater difference and aid in your diagnosis.



If You've Been Looking For A Better Way To Measure Skin Temperature You're Getting Warmer.

A Measurable Improvement In Pain Management.

Introducing 3 perfusion monitors every pain management specialist and patient can warm up to: DermaTherm™, DermaTherm™ Low Range and Crystalline ST™. You simply place the adhesive strip on the skin and its advanced liquid crystal technology gives you a quick, continuous, quantifiable measurement of skin temperature. For patients with RSD or other sympathetically maintained pain syndromes, it aids in diagnosis and helps quickly assess block effectiveness. DermaTherm™ is so simple, inexpensive and reliable it may soon be indispensable in the practice of pain management. It's also ideal in bio-feedback, skin and vascular grafting, electromyography or any procedure where accurate information on skin temperature or perfusion is critical. Once you try it, you'll see: Your search for a better way to monitor perfusion ends with DermaTherm™.



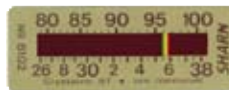
**DermaTherm™ Low Range Brand
1900PBL**



**DermaTherm™ Strip
2200PS**



**DermaTherm™
2100PB**



**Crystalline ST™
6102**

***Call 1-800-325-3671
for ordering information.***

12 Pulse Oximetry

Pulse oximetry is a continuous, non-invasive means to monitor oxygenation of the patient's tissue level. Because information is rapid and continuous, pulse oximeters provide an early indication of many problems such as inadequate oxygen supply, anesthetic overdose, and signs of hypoxia before they become dangerous. Pulse oximetry protects the patient in high-risk situations and provides the patient a sense of safety about his or her condition.

Pulse oximetry is widely adopted for monitoring under anesthesia. Ever since anesthesia was launched in the mid-1840s, a lot of ground has been made in the field of anesthetic monitoring. The great advancements made in the field of anesthetics and the related monitoring has enabled surgeons to carry out surgeries that were considered to be impossible earlier. For example, endotracheal anesthesia has enabled the conducting of operations in the chest with comparatively less risk. Moreover, the use of equipment for noting the content of exhaled gases, in addition to noting the percentage of oxygen and carbon dioxide in the patients' blood, arterial pressure and the finding of ST segment depression has also contributed in a big way making heart operations more safe.

There are two basic principles that pulse oximetry is based on:

- (1) Oxyhemoglobin and deoxyhemoglobin differ in their absorption of red and infrared light (i.e. oxygenated blood is redder).
- (2) The volume of arterial blood in the tissue (and therefore light absorption by that blood) changes during the pulsating cycle of each heartbeat.

A pulse oximeter measures the oxygen saturation of arterial hemoglobin (SaO₂) by passing red and infrared light through arterial perfused tissue.

There are four basic vital signs- temperature, pulse rate, respiratory rate and blood pressure- which are used as critical indicators of patient

status and remain the core of basic objective clinical assessment.

Oxygenation of the blood is an essential component of cardiopulmonary function but is not directly assessed by the standard vital signs. While observing the rate of respiration provides valuable information about general patient condition and difficulty of breathing, it provides only a partial indication of oxygenation of the blood as it passes through the lungs. Similarly, pulse rate and blood pressure monitoring allow estimation of blood flow but give no indications of the amount of oxygen carried in the blood. The addition of blood oxygenation measurement to the standard vital signs significantly expands the value of basic cardiopulmonary assessment. The technology of pulse oximetry allows the measurement of blood oxygen saturation to be made simply and directly. Pulse oximetry may very well be the fifth vital sign.

Various forms of pulse oximeters are in use today. Both disposable and reusable SpO₂ sensors are available. Nearly 85% of the sensors used are the finger-clip style. The Y or ear style sensor may be used on infants, burn patients, patients with poor circulation,

patients with missing digits, and hand surgery patients where the finger sensor would not work.

Inaccuracies do occur when using pulse oximeters. The most common causes are low patient perfusion at the sensor site and patient motion. Ambient light may interfere with the function of the sensor. Failures may result in false alarms, inaccurate readings and interruptions in continuous pulse oximetry data.

Fluorescent and especially xenon operating room lights may cause false-normal and high readings. By covering the probe with opaque material has been shown to minimize these effects of ambient fluorescent light. Other sources of inaccuracy include the presence of finger nail polish, intravenous dyes, carboxyhemoglobin and methemoglobin.

Conventional pulse oximetry has served clinicians well in the years since it was commercialized, giving important oxygen status information in the majority of cases. Pulse oximetry has evolved very rapidly over the past four years. There have been promising clinical results from some of the latest generation of devices, achieving low rates of missed events and false alarms, as well as sensitivities of nearly 100% and specificities of greater than 90%, even under the difficult conditions of low perfusion or motion.

Reusable Blood Pressure Cuffs

Order #	Range/Size
BPR-0814-*	8-14cm range, Infant
BPR-1320-*	13-20cm range, Child
BPR-1826-*	18-26cm range, Small Adult
BPR-2635-*	26-35cm range, Adult
BPR-2938-*	29-38cm range, Long Adult
BPR-3242-*	32-42cm range, Large Adult
BPR-4250-*	42-50cm range, Thigh

*Please indicate which connector you need. If you don't see your fitting, please ask!



DM Dinamap style Screw Fitting	HP HP Style Bayonet Fitting	FL Female Luer Fitting	ML Male Luer Fitting	MQ Female Marquette Style Twist-lock Fitting (slightly higher price)	MMQ Male Marquette Style Twist-lock Fitting
Single Tube: (DM) Welch Allyn: Vital Signs / Atlas (before 7/00) Double Tube: (2DM) Criticare: 507; Critikon: Dinamap; Invivo; MDE; Nihon-Kohden: Lifescope L; Spacelabs	Single Tube: (HP) Agilent / HP / Phillip s; Criticare: 508; Datascop: 507E, Accutorr Plus & Passport 2; Siemens; Spacelabs Double Tube: (2HP) Various	Single Tube: (FL) BCI; Colin; Datascop: Passport XG & Expert; Nihon Kohden: Lifescope 9 & 12; Welch Allyn: Vital Signs/Atlas (mfg after 7/00) Double Tube: (2FL) Various	Single Tube: (ML) Various Double Tube: (2ML) Various	Single Tube: (MQ) Welch-Allyn: Protocol Propaq Double Tube: (2MQ) GE Medical/Marquette: Eagle 4000, Dash, Tram 100/200/300, Tramscope Star Double Tube: (2MQMF) Datex-Ohmeda (1 male and 1 female fitting)	Single Tube: (MMQ) Nihon-Kohden: Procyon & iPro Double Tube: (2MMQ) Various

- Wide range of sizes
- **Latex Free**
- Available in single and double tube
- Bladderless cuff
- Fittings for compatibility with virtually all NIBP monitors

Disposable Blood Pressure Cuffs

Order #	Range/Size
BPD-0306NN	3-6cm range, Neonatal
BPD-0408NN	4-8cm range, Neonatal
BPD-0611NN	6-11cm range, Neonatal
BPD-0714NN	7-14cm range, Neonatal
BPD-0815NN	8-15cm range, Neonatal

All neonatal ship with tapered male luer. Available in Single tube (NN) and Double tube (2NN).

Order #	Range/Size
BPD-0814-*	8-14cm range, Infant
BPD-1320-*	13-20cm range, Child
BPD-1826-*	18-26cm range, Small Adult
BPD-2635-*	26-35cm range, Adult
BPD-2938-*	29-38cm range, Long Adult
BPD-3242-*	32-42cm range, Large Adult
BPD-3544-*	35-44cm range, Long Lg Adult
BPD-4250-*	42-50cm range Thigh

*See diagram above for 2 letter code that indicates correct cuff connector.



- Wide range of sizes
- **Latex Free**
- Available in single and double tube
- Color Coded
- Indexed on both sides for accurate fit, artery indexed

13 Surgical Instrument Care

SURGICAL INSTRUMENT CARE¹

The quality and integrity of surgical instruments have an important impact on the quality of surgical care. Instruments will last much longer if they are cleaned with an appropriate solution immediately after surgery and regularly sharpened, lubricated, and sterilized.

Surgical Residues

Blood, tissue, and surgical residue are the primary cause of pitting, staining, and discoloration of surgical instruments. If left unattended for any extended period, an instrument will become marked and stained, especially if the residues are allowed to dry. The worst-case scenario is when surgical instruments with dried-on debris are autoclaved. The autoclave will literally bake the stains onto the instruments.

Remember: An autoclave does not clean – it will only sterilize dirt. Every instrument must therefore always be cleaned and dried within 15 minutes after use.

Clean Immediately After Surgery

The washing process should begin within 10 minutes after surgery, even if sterilization will take place much later. Washing the instruments within a few minutes of surgery is the best defense against corrosion, pitting, and staining.

It is occasionally impossible to tend to surgical instruments immediately after surgery. In such cases, keep contaminated instruments moist so that blood, tissue, and other residue do not dry on them. The best way to keep instruments moist is to place a wet towel over them.

Sterilize, Sterilize, Sterilize

Sterilize instruments with their jaws open to allow better steam penetration. If a pan or tray is to be used, the perforated varieties enable better steam penetration and promote better drying. It is a good idea to put heavy instruments at the

bottom of the autoclave and lighter, more delicate instruments on top.

When sterilizing equipment in paper or plastic pouches, never stack the pouches on top of one another. Standing the pouches up in a spiral metal letter holder will permit proper steam flow.

Clean Autoclaves Regularly

Taking proper care of the autoclave will not only optimize performance, it will also extend the life of the surgical instruments that are sterilized in the autoclave. The first thing to keep in mind is to use only distilled water in the autoclave's reservoir. Tap water will cause mineral deposits that will stain the instruments and build up in the autoclave. Second, it is important to clean the autoclave's filter regularly, using the manufacturer's recommendations as a minimum guideline. The inside of the autoclave chamber should be cleaned once a week to prevent the buildup of scale and allow the sterilizer to operate efficiently.

Cleaning and Sterilization²

Cleaning equipment means removal of foreign matter without special attempts to kill microorganisms. Equipment should be pre-rinsed as soon as possible after use to prevent drying of organic material; then soaked, removal of soil, rinsing and drying.

Sterilization

Moist Heat Methods

- Pasteurization (less than 100°C) disinfects but doesn't sterilize (destroys many but not all organisms).
- Boiling kills all forms of bacteria, most spores, practically all viruses if boiled at least 30 minutes.
- Autoclaving (steam sterilization under pressure) kills all bacteria, spores, and viruses.

Liquid Sterilization

Useful for heat-sensitive equipment, but recontamination possible during drying and re-wrapping. Of several agents (chlorhexidine Hibitane, phenolic compounds, hexachlorophene, ethyl or isopropyl alcohol's), **glutaraldehyde** is the only one effective against both tubercule bacillus and viruses.

The Steris system uses peracetic acid in a low-temperature, 30-minute cycle to sterilize objects such as laryngoscope blades and fiber optic laryngoscopes.

Chemical Gas Sterilization

Ethylene oxide (ETO) is a synthetic gas widely used, especially for heat or moisture-sensitive items like rubber and plastic. Kills bacteria, spores, fungi, and larger viruses. Can be various patient reactions if not aerated (in wrapper) sufficiently after ETO exposure. The gas is also explosive and toxic.

Other Means

Gamma radiation kills all bacteria, spores, and viruses. Used for sterilization of disposable equipment – not practical for everyday needs of hospitals.

Care of Specific Equipment

- **Carts & Gas Machine** – Wipe top, front, sides with detergent/germicide (D/G) daily and place a clean covering on top; clean entire cart inside and out weekly or after contaminated cases.
- Breathing Circuits, ETT, Face Masks, Airways, Resuscitation Bags - Generally single use, or follow department policy and manufacturer's guidelines.
- Absorber, Unidirectional Valves, Relief Valve, Bellows – follow manufacturer's instructions, use disposable components or filters on the circle system for known infected cases.
- **Blades, Magills** – Cleanse, glutaraldehyde (or Steris) sterilization, store clean.
- **Headstraps, BP Cuffs** – Items in contact with intact skin need periodic cleansing, or should be cleansed if soiled.

1 Rick Schultz, BA, "*The Ten Commandments of Surgical Instruments Care*", Veterinary Technician, November 1998

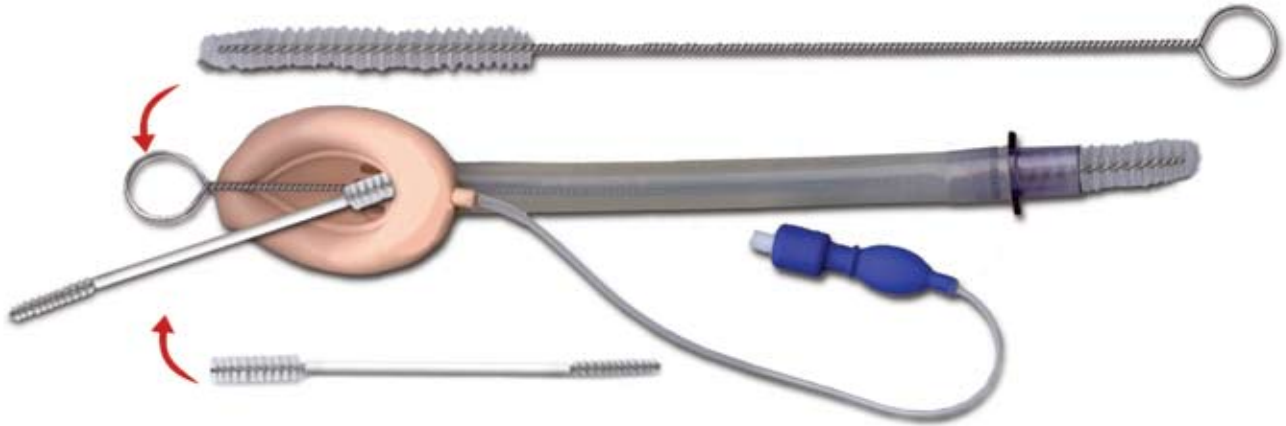
2 Michael P. Dosch CRNA MS, University of Detroit Mercy Graduate Program in Nurse Anesthesiology, Pontiac MI, "*The Anesthesia Gas Machine, Vaporizers, Compressed Gases, Safety: Avoiding the Pitfalls - Part 2*," June 2000

ABOUT THE AUTHOR

Mr. Schultz is President of Spectrum Surgical Instruments, Inc., in Stow OH., which supplies and maintains surgical instruments for hospitals and private practices.

LMA Cleaning Kits

This product is not endorsed by LMA North America™, Inc. .



Each brush ordered includes one Double Ended Brush.

Order #	Mask Size	Dimensions
45-846	Size 1	5.25 mm, 8" length
45-847	Size 1.5	6.1 mm, 8" length
45-848	Size 2	7 mm, 10" length
45-852	Size 2.5	8.4 mm, 10" length
45-850	Size 3-4	10 mm, 13"
45-853	Size 5-6	11.5 mm, 13"

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14 Temperature Monitoring

TEMPERATURE MONITORING¹

Temperature trends, rather than tenths-of-a-degree readings, are important when used with other vital signs to assess a patient's condition.

What is normal temperature?

In the mid-1800s, researchers agreed that 98.6° Fahrenheit was the average temperature of healthy humans. A 1992 study suggests that the standard should be revised to 98.2°F.

In actuality, everyone's temperature varies by several degrees through the day, with 96-99°F considered the usual range. Body temperature follows a circadian rhythm. Age and gender may affect temperature. Simply digesting a meal raises body temperature by up to one degree. Running a marathon can raise it six degrees.

All of these variations occur daily without the hypothalamus resetting the body's temperature.

Problems in Determining Absolutes in Body Temperatures

As stated above, an individual's body temperature is constantly changing, up to 3°F every 24 hours.

There is no method of measurement or body site offering a specific or absolute temperature, with the possible exception of an indwelling catheter. In several studies, physicians have found that temperature readings can vary widely, depending on the placement of the temperature-measuring device. The temperature in different parts of the esophagus can vary up to almost 6°C. Oral temperature can vary by almost 3°F, depending on where the thermometer is placed in the mouth.

Events in surgery (using cold fluids/gases, opening the body cavity, etc.) will change the body temperature significantly. Furthermore, there are inaccuracies in all forms of temperature monitoring. The leading probe manufacturer, YSI, claims no better accuracy than + 0.2°F in the 400 Series and + 0.4°F in the 700 Series.

The fact that an electronic monitoring device can deliver a digital tenth-of-a-degree readout does not guarantee that the readout accurately reflects core body temperature.

Different Sites during the Same Procedure

Before, during, and after surgery, patient temperatures are often measured using different devices, yielding readings that may not be comparable. It is not unusual for a surgical patient to have three different sites used to monitor his/her temperature. If oral is used in the Pre-Op holding area, esophageal is used in the surgical site, and axillary is used in the PACU, the "normal" variation from site to site could provide a wide range in temperature measurement.²

Continuous Temperature Monitoring

One of the most important benefits of liquid crystal devices, such as the Crystalline[®] Indicator, is that they provide continuous temperature monitoring.

ASA Guidelines for Temperature Monitoring³

Temperature is a key vital sign that should be measured routinely in the perioperative period, and except where hypothermia is specifically required, every attempt should be made to maintain normothermia.

Forehead skin temperature is an acceptable method, and if this is not available, then axillary temperature is acceptable in most cases. The patient's temperature can give you clues to interpreting other thermal and metabolic changes that are taking place during anesthesia.

Temperature aberrations are remarkably common in the perioperative period, and management begins with accurate body temperature measurement. Anesthesia produces significant changes in body temperature, which can reduce

patients' immunocompetence and predispose them to myocardial ischemia and blood loss, and produce patient discomfort. For these reasons and others, body temperature should be measured during all general anesthetics lasting more than about 20 minutes and during major conduction anesthesia. Monitoring temperature can also provide an early clue to the diagnosis of malignant hyperthermia.

In a recent study in volunteers, Sessler and colleagues found good clinical correlation between core and skin temperature.⁴ Seven un-anesthetized volunteers participated in this portion of the study. Their legs were cooled sufficiently with forced air and circulating water to maintain arteriovenous shunt vasoconstriction (gradient $>0^{\circ}\text{C}$) during the protocol. The upper chest, neck, and head were covered with a cardboard and plastic canopy, and air circulated at a typical intraoperative flow rate near 5 cm/s). Air temperature within the canopy was randomly set to 18, 20, 22, 24, and 26°C . Each air temperature was maintained for 30 minutes.

Flows and core and skin temperatures were recorded at 5-minute intervals for 30 minutes at each ambient temperature. All values were averaged first within and then among the volunteers. Changes in core-to-skin temperature differences induced by manipulating ambient temperature were evaluated using linear and second-order regressions.

Skin-surface temperatures were similar when evaluated using thermocouples or (uncorrected) liquid crystals. Consequently, only liquid-crystal cutaneous temperatures were reported.

Inspection of the raw data indicated that manipulation of ambient temperature altered skin-surface temperature within minutes, and that skin temperature subsequently remained constant for the duration of each 30-minute trial.

Major reasons for monitoring intraoperative core temperature include detection of (1) fever (e.g., from mismatched blood transfusions, blood in the fourth cerebral ventricle, allergic reactions, or infection, (2) malignant hyperthermia

and hyperthermia from other causes (i.e., excessive patient heating), and (3) inadvertent hypothermia. Hypothermia is by far the most common among these thermal disturbances, and reductions in core temperature of only 2°C are associated with adverse outcomes including prolonged post-anesthetic recovery, increased bleeding and transfusion requirement, ventricular tachycardia and morbid cardiac events, and reduced resistance to surgical wound infections and prolonged hospitalization. Conversely, mild hypothermia may be induced therapeutically because in animals it may protect against cerebral ischemia and malignant hyperthermia.

Estimates of core temperature obtained from the forehead are superior to those from the neck. Forehead temperature is clearly better linked to the thermal core than the neck is.

Usual intraoperative alterations in ambient temperature are unlikely to produce clinically important bias.

Aside from estimating core temperature, there are several other reasons anesthesiologists may wish to measure skin-surface temperatures:

1. Average skin temperature is an important thermal input to the central thermoregulatory system.
2. Local skin temperature can indicate the extent of sympathetic blockade during regional anesthesia.
3. Skin-temperature gradients are a simple method to quantify peripheral thermoregulatory vasoconstriction.
4. Skin temperature monitoring can prevent burns during active external re-warming.

Monitoring for each purpose has a place in clinical practice.

SHARN ANESTHESIA CASH BACK PROGRAM

SHARN, Inc. is the leading supplier of liquid crystal temperature trend indicators in the U.S. Our products have been used in over 35 million surgical procedures across the nation.

Now our preferred customers can save even more by participating in a new program that helps offset the cost of temperature monitoring by providing cash back directly to the Anesthesia Department.

Benefits

- Hospital is reimbursed for their commitment to the program – you determine how you want to receive the cash back.
- Guarantees current price of temperature indicator for the length of the agreement.
- Automatic shipments reduce cost of cutting multiple purchase orders.
- Shipping schedule of indicators may be adjusted to meet changing usage patterns and needs of the hospital.

How the program works

1. Commit to purchase our temperature indicators at the same average volume as you have in the past. The number of indicators used each month and the total \$ value of the agreement determines the amount of cash back your facility will receive.
2. Program is written for 12 or 24 months -- the longer the commitment, the higher the amount of cash savings.
3. Complete an agreement form.
4. Issue a single blanket purchase order to cover the agreement total, time frame, and guaranteed pricing (blanket PO requirement is negotiable).
5. Fax or mail to SHARN, Inc.

Options for receiving cash savings

- Receive reimbursement at time of signing up for the program.
- Receive reimbursement in two equal installments: First installment payable halfway through the program, with the balance at program end.
- Applied to the cost of the temperature indicator to reduce current hospital pricing.

Save your hospital money on products they already use – sign up today!

1" *The SHARN Crystalline Indicator and Its Use As A Temperature Trend Indicator for the Surgical Patient,*" October 1992

2 Sladen RN, " *Thermal Regulation in Anesthesia and Surgery,*" Philadelphia PA, JB Lippencott, p.172

3 Linda Pembroke, " *ASA Guidelines for Temperature Monitoring Inadequate, Out of Date,*" Anesthesia News, June 1999, Based on a report at the 52nd annual Postgraduate Assembly of the New York State Society of Anesthesiologists, present by Dr. Henry aProfessor of Anesthesiology, Jefferson Medical College of Thomas Jefferson University, Philadelphia.

4 Takehiko Ikeda MD, Daniel I. Sessler MD, Danielle Marder BA, Junyu Xiong MD, " *Influence of Thermoregulatory Vasomotion and Ambient Temperature Variation on the Accuracy of Core-temperature Estimates by Cutaneous Liquid-crystal Thermometers,*" Anesthesiology, Vol. 86, No. 3, March 1997, p. 603-612

15 Topical Anesthetic in the OR

Topical Anesthetic use in the operating room

Tim Wolfe, MD

Why do anesthesiologists give topical anesthetics to some patients prior to and during surgery?

To answer this question, it is important to understand the body's response to intubation and airway manipulation: Any stimulation of the throat, larynx or upper airway (by an endotracheal tube, an LMA, or some type of surgical instrument) leads to numerous physiologic responses. Local responses include gagging, cough and laryngospasm. Gagging can lead to vomiting and aspiration, coughing causes unwanted elevated pressure in the eyes, brain and abdomen which may cause damage to these organs or may rupture recent suture lines. Laryngospasm makes intubation and/or ventilation difficult, if not impossible. Systemic responses include rises in plasma epinephrine (adrenalin), increases in both heart rate and blood pressure, and increases in eye and brain pressures. These systemic responses may be dangerous in patients who have heart, eye or brain disease.

The application of topical anesthetics can prevent most if not all of these physiologic responses. They work by totally numbing up the nerves of the throat, larynx and trachea, resulting in elimination of the body's ability to "feel" the procedure. Topical anesthetics are commonly applied prior to the start of the case to eliminate the undesirable side effects of airway management. They are occasionally applied later in the case to prevent coughing and gagging at the time of extubation.

In what types of surgical cases would topical anesthetics commonly be employed?

The most common use of topical anesthetics is in situations where the patient does not undergo standard rapid sequence intubation. Examples include awake intubation, fiberoptic intubation, and nasal intubation. Other common procedures where topical airway anesthetics are applied include transesophageal echocardiography (TEE), endoscopy, bronchoscopy and occasionally LMA insertion. Selected high-risk patients may also

be given topical anesthesia prior to airway management. These cases include cardiac, vascular, neurosurgical and ophthalmology cases because the systemic effects of elevated heart rate, blood pressure, intracranial and intraocular pressure could cause injury to these patients. Finally, topical anesthetics may be given in selected vascular, abdominal and head and neck cases prior to extubation to reduce the risk of coughing.

What options are available for topical anesthetic application?

The table lists commonly available options and their advantages and disadvantages for topical airway anesthetic application.

	MADgic™ Mucosal Atomization device	Laryngo-tracheal applicator	Prepackaged Benzocaine spray	Venturi atomizer
Eliminates Cross contamination risk	Yes	Yes	No	No
Exact dosing possible	Yes	Yes	No	No
Atomized spray (best coverage)	Yes	No	No	Yes
Able to topicalize nose, upper airway, vocal cords, larynx and trachea	Yes	No	No	No
Physician selects medications	Yes	No	No	Yes
Works in any position	Yes	Yes	No	No
Flexible stylet allows customized positioning of the applicator	Yes	No	No	No
Fits through other tubular devices (LMA, Nasal trumpet, etc.)	Yes	No	No	No

Q: What is MADgic™

A: MADgic™ is a disposable atomizer that sprays an exact volume of atomized medication onto the mucosal membranes of the nose, throat, larynx or trachea.

Q: Why Atomized medication?

A: Atomization allows the clinician to administer a thin layer of topical medication over a broad surface area resulting in improved surface area coverage with less medication, thereby reducing the risk of toxicity.

Q: What Innovative features does the MADgic® provide?

A: The MADgic® tip is very small (4.3 mm) allowing it to easily pass into the nose or through the vocal cords. This small tip is connected to a 21.6-centimeter malleable stylet that can be bent into any shape. The stylet allows the clinician to direct the medication spray to specific sites in the nose, throat, larynx or trachea. The device is not prefilled with medication. Instead the clinician is able to draw up whatever medication (or mixture of medication) they may wish and apply an exact volume (as little as 0.1 ml) to the mucosa. If more is needed, the syringe can be refilled. Since the device is syringe driven, it will function from any position and still provide an atomized spray.

Q: I use a prefilled syringe with a laryngotracheal applicator. What are the advantages of the MADgic®?

A: The MADgic® advantages over this system are the delivery of an atomized spray rather than a stream of medication, the versatility of medication choices, the ability to refill the MADgic® syringe if additional medication is needed, the unlimited shelf life of the MADgic® and the ability to bend the MADgic® to adapt to the individual anatomic needs of the patient.

Q: I use a prefilled aerosol spray canister. What are the advantages of the MADgic®?

A: The MADgic® advantages over this system are in versatility of medication choices, the ability to deliver an exact dose of medication thereby reducing toxicity risks such as methemoglobinemia and seizures, the ability to bend the MADgic® to adapt to the individual anatomic needs of the patient, the elimination of patient cross-infection risks associated with aerosol canisters¹, the ability to use the MADgic® in any position, and the delivery of an atomized spray rather than a stream of medication.

Q: I use a compressed air Venturi atomizer. What are the advantages of the MADgic®?

A: The MADgic® advantages over this system are the elimination of patient cross-infection risk^{2, 3}, the ability to deliver an exact dose of medication thereby reducing toxicity risks, the ability to use the MADgic® in any position, and the ability

to bend the MADgic® to adapt to the individual anatomic needs of the patient.

1. Williams: Lignocaine spray applicators are a potential source of cross-infection in the anaesthetic room. *Anaesthesia* 1993; 48:61-2.
2. Spraggs: The assessment of the risk of cross-infection with a multi-use nasal atomizer. *J Hosp Infect* 1994; 28:315-21.
3. Southwick: Cluster of tuberculosis cases in North Carolina: possible association with atomizer reuse. *Am J Infect Control* 2001; 29:1-6.

Mucosal Atomization Devices

**New Atomizer delivers drug in 30 micron particles
For immediate absorption and effect!**

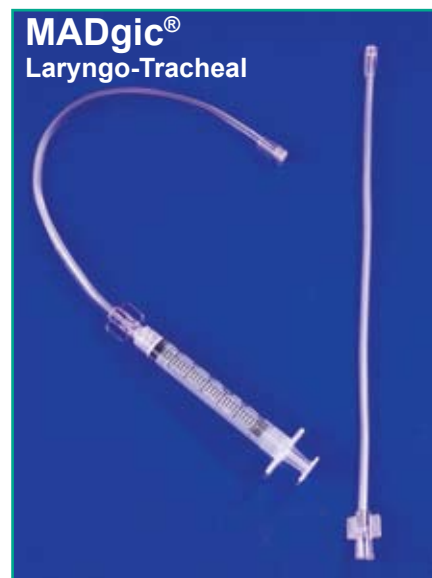


- New Atomizer allows full control of medication to make patient comfortably numb!
- Use prior to intubation.
- Bendable applicator allows accurate delivery. **Latex Free**

Order #	Description	Qty
MAD-L6-25	Atomizer with 3 ml syringe	25
MAD-L6-100	Atomizer with 3 ml syringe	100
MAD-L7 -25	Atomizer without syringe	25
MAD-L7-100	Atomizer without syringe	100

- Nasal Atomizer allows full control of medication, dosage, volume and target.
- No needlestick risk.
- Less fear for children. **Latex Free**

Order #	Description	Qty
MAD-N1-25	Atomizer with 3 ml syringe	25
MAD-N1-100	Atomizer with 3 ml syringe	100
MAD-N3-25	Atomizer without syringe	25
MAD-N3-100	Atomizer without syringe	100



- Pulmonary drug delivery.
- Medicate directly into the lungs without interrupting ventilation.
- Atomizes drugs directly into the lungs at the distal end of ET tube.
- Sterile **Latex Free**

Order #	Description	Qty
MAD-ETT-71	Endotracheal Tube Atomizer	40

16 Vaporizers

Operating Principles of Variable Bypass Vaporizers

Total fresh gas flow (FGF) enters and splits into carrier gas (much less than 20%, which becomes enriched – saturated, actually – with vapor) and bypass gas (more than 80%). These two flows rejoin at the vaporizer outlet. The splitting ratio of these two flows depends on the ratio of resistances to the flow, which is controlled by the concentration control dial, and the automatic temperature compensation valve.

How to Fill Vaporizers

For either funnel or keyed filler types, fill the vaporizer only to the top etched line within the sight glass. Do not hold the bottle up on a keyed filler until it stops bubbling (this will overfill the chamber, particularly if the concentration control dial is “on”, or if leaks are present). The only current vaporizer which can be filled while it is operating is the Tec 6 (Desflurane).

How Much Liquid Agent Does a Vaporizer Use Per Hour?

Typically, 1 mL of liquid volatile agent yields about 200 mL vapor. This is why tipping is so hazardous – it discharges liquid agent into the control mechanisms or distal to the outlet. And minute amounts of liquid agent discharged distal to the vaporizer outlet result in a large bolus of saturated vapor delivered to the patient instantaneously.

Hazards and Safety Features of Contemporary Vaporizers

Hazards

Incorrect agent

Tipping

- If tipped more than 45° from the vertical, liquid agent can obstruct valves.
- Treatment: Flush for 20-30 minutes at high-flow rates and with high concentration set on dial. Please note that this is the recommended

treatment for the Tec 4 vaporizer. The correct approach for other models differs, so their individual operating manuals must be consulted.

Simultaneous inhaled agent administration

- If removing the central vaporizer from a group of three on an Ohmeda machine, move the remaining two so that they are adjacent. On models which were manufactured prior to 1995, removing the center vaporizer of three defeats the interlock and allows the outer two vaporizers to be turned on simultaneously.

Reliance on breath by breath gas analysis rather than preventive maintenance

- Problem: Failure of temperature compensation device may result in a rapid onset, high output failure of the vaporizer.
- Failure of renewable components, such as seals and O-rings, may have the same effect.

Safety Features

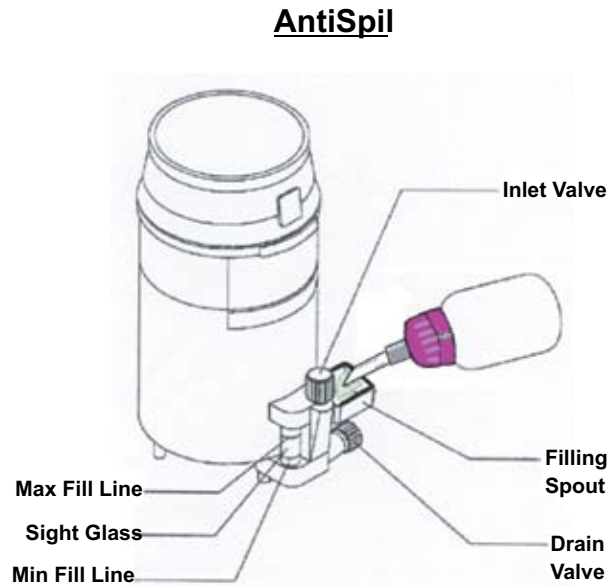
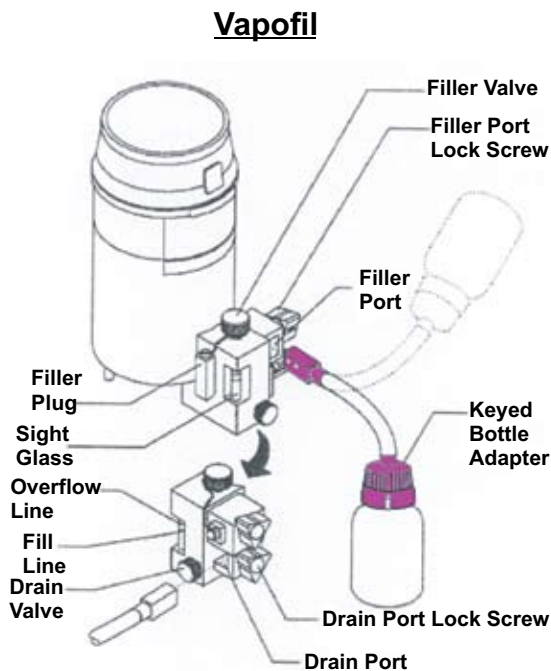
Important safety features include:

- Keyed fillers
- Low filling port
- Secured vaporizers (less ability to move them about minimizes tipping)
- Interlocks
- Concentration dial increases output in all when rotated counterclockwise (as seen from above)

VAPORIZERS 2

Classification	<i>Datex -Ohmeda Tec 4, Tec 5, and Aladin (AS/3 ADU); Drager Vapor 19.n</i>	<i>Copper Kettle, Vernitrol</i>	<i>Datex -Ohmeda Tec 6 (Desflurane)</i>
Splitting Ratio (carrier gas flow)	<u>Variable -bypass</u> (vaporizer determines carrier gas split)	<u>Measured -flow</u> (operator determines carrier gas split)	<u>Dual -circuit</u> (carrier gas is not split)
Method of Vaporization	Flow -over	Bubble -through	Gas/vapor blender (heat produces vapor, which is injected into fresh gas flow)
Temperature Compensation	Automatic temperature compensation mechanism	Manual (i.e., by changes in carrier gas flow)	Electrically heated to a constant temperature (39°C thermostatically controlled)
Calibration	Calibrated, agent - specific	None; multiple -agent	Calibrated, agent - specific
Position	Out of circuit	Out of circuit	Out of circuit
Capacity	Tec 4 – 125 mL Tec 5 – 300 mL Vapor 19.n – 200 mL Aladin – 250 mL	200 -600 mL (no longer manufactured)	390 mL

VAPOFIL



Vaporizer Filler Tubes

AntiSpil™

Stop wasteful spills by using AntiSpil to fill your funnel-filled vaporizers. The curved tip and flow meter let you pour the agent with less risk of spills. Color-coded keys are agent specific for your funnel-filled vaporizers.



Vaporizer	Order #	Price
● Forane®/Isoflurane	9010-F	\$25.00
● Halothane®/Fluothane	9010-H	\$25.00
● Ethrane®/Enflurane	9010-E	\$25.00



Vapofil™

Stop fighting with your filler keys. Vapofil is designed with 2 inner tubes, one to let the air escape and the other to let the agent flow into the vaporizer. Vapofil prevents vapor-lock. Color-coded Vapofils are drug specific for your pin index vaporizers.

Vaporizer	Order #	Price
● Forane®/Isoflurane	8907-F	\$79.00
● Halothane®/Fluothane	8907-H	\$79.00
● Ethrane®/Enflurane	8907-E	\$79.00
● Ultane®/Sevoflurane	8907-S	\$79.00
● Sevoflurane	V0507-S	\$99.00 NEW!
● Forane®	V0507-F	\$99.00 NEW!

NEW Stainless Steel Block!



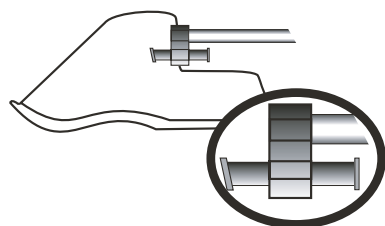
If you prefer a corrugated tube with a stainless block.

Capnoxygen™

The Capnoxygen Mask is a consistent means to monitor breathing of a non-intubated patient, allowing sampling of exhaled carbon dioxide from both the mouth and nose while at the same time administering oxygen. It is made from Clear Medical Grade Resin that is **Latex Free**. The mask is soft and allows form-fitting comfort for the face. The tubing is non-kinkable (star lumen). The design makes it simple and fast to hook up to oxygen. Can be used in any area equipped for Sidestream Monitoring.

- Post Anesthesia Care Units
- Intensive Care Units
- Pain Clinics
- Endoscopy Units
- Operating Rooms
- Sleep Apnea Clinics
- Cardiac Catheter Labs
- Labor and Delivery Units

Order #	Description	Qty
C02-01	Adult Mask	25 units per case
C02-03	Ophthalmic Mask	25 units per case



Monitor Patient While Administering Oxygen

17 Ventilator Problems and Hazards

VENTILATOR PROBLEMS & HAZARDS

1

Disconnection

Most common site is Y piece. The most common preventable equipment-related cause of mishaps. Direct your vigilance here by: precordial ALWAYS; if you turn the vent off, keep your finger on the switch, use apnea alarms, and don't silence them.

The biggest problem with ventilators is the failure to initiate ventilation, or resume it after it is paused.

Be extremely careful just after initiating ventilation – or whenever ventilation is interrupted: observe and listen to the chest for a few breathing cycles. Never take for granted that flipping the switches will cause ventilation to occur, or that you will always remember to turn the ventilator back on after an X-ray.

Monitors for Disconnection

Precordial monitor (the most important because its "alarms" can't be inactivated)

Capnography

Other monitors for disconnection

- Ascending bellows
- Observe chest excursion and epigastrium
- Airway Pressure monitors
- Exhaled Volume monitors

Occlusion / Obstruction of Breathing Circuit

Beside inability to ventilate, obstruction may also lead to barotrauma. Obstruction may be related to:

Tracheal tube (kinked, biting down, plugged, or cuff balloon herniation). "All that wheezes is not bronchospasm."

Incorrect insertion of flow-direction-sensitive components (PEEP valves which are added on between the absorber head and corrugated breathing hoses).

Excess inflow to breathing circuit (flushing during ventilator inspiratory cycle)

Bellows leaks

Ventilator relief valve (spill valve) malfunction
APL valve too tight during mask ventilation or not fully open during pre-oxygenation

Misconnection

Much less of a problem, since breathing circuit and scavenger tubing sizes have been standardized.

Failure of Emergency Oxygen Supply

May be due to failure to check cylinder contents, or driving a ventilator with cylinders when the pipeline is unavailable. This leads to their rapid depletion, perhaps in as little as an hour, since you need approximately a VT of driving gas per breath, substantially more if airway resistance (RAW) is increased.

Infection

Clean the bellows after any patient with diseases, which may be spread through airborne droplets, or don't use the mechanical ventilator, or use bacterial filters, or use disposable soda lime assembly, or use a Bain.

AIRWAY MANAGEMENT 2

Equipment and Devices for Aiding in Airway Management

LMAs (Laryngeal Mask Airways)

Devices that are designed to aid in endotracheal tube placement. The LMA consists of a tube connected to an elliptical mask with an inflatable rim, which sits over the larynx. The patient can usually breathe spontaneously using this airway device but, to be safe, some doctors like to put patients on a ventilator while using the LMA. The biggest advantage of the LMA is that it stays outside the larynx, so that you don't need to manipulate the vocal cords, which is the deepest point of airway stimulation.

COPAs (Cuffed Oropharyngeal Airways)

Oral airways with a cuff that produces a seal around the larynx. The COPA works via a different concept than the LMA. You cannot intubate a patient using a COPA; rather it is designed to help the patient breathe spontaneously through it (or in combination with a ventilator). The COPA is positioned against the base of the tongue and is placed in the pharynx, where the inflatable low-pressure cuff helps to block the oropharynx and thereby enables you to ventilate the patient. Like the LMA, the COPA is designed to avoid tracheal and laryngeal stimulation.

Oropharyngeal and Nasopharyngeal Airways

Short plastic devices, which are placed in the oral cavity and the pharynx to help prevent respiratory obstruction, such as when the tongue falls back. The oral airway alone can't help you manage the airway. They are primarily used in conjunction with mask ventilation. The nasopharyngeal airway works the same way, except that it is placed through the nasopharynx.

Combitubes

A combination between tube airways and cuffed devices. It can be blindly placed in the mouth; you don't need a laryngoscope.

Bullard Laryngoscopes

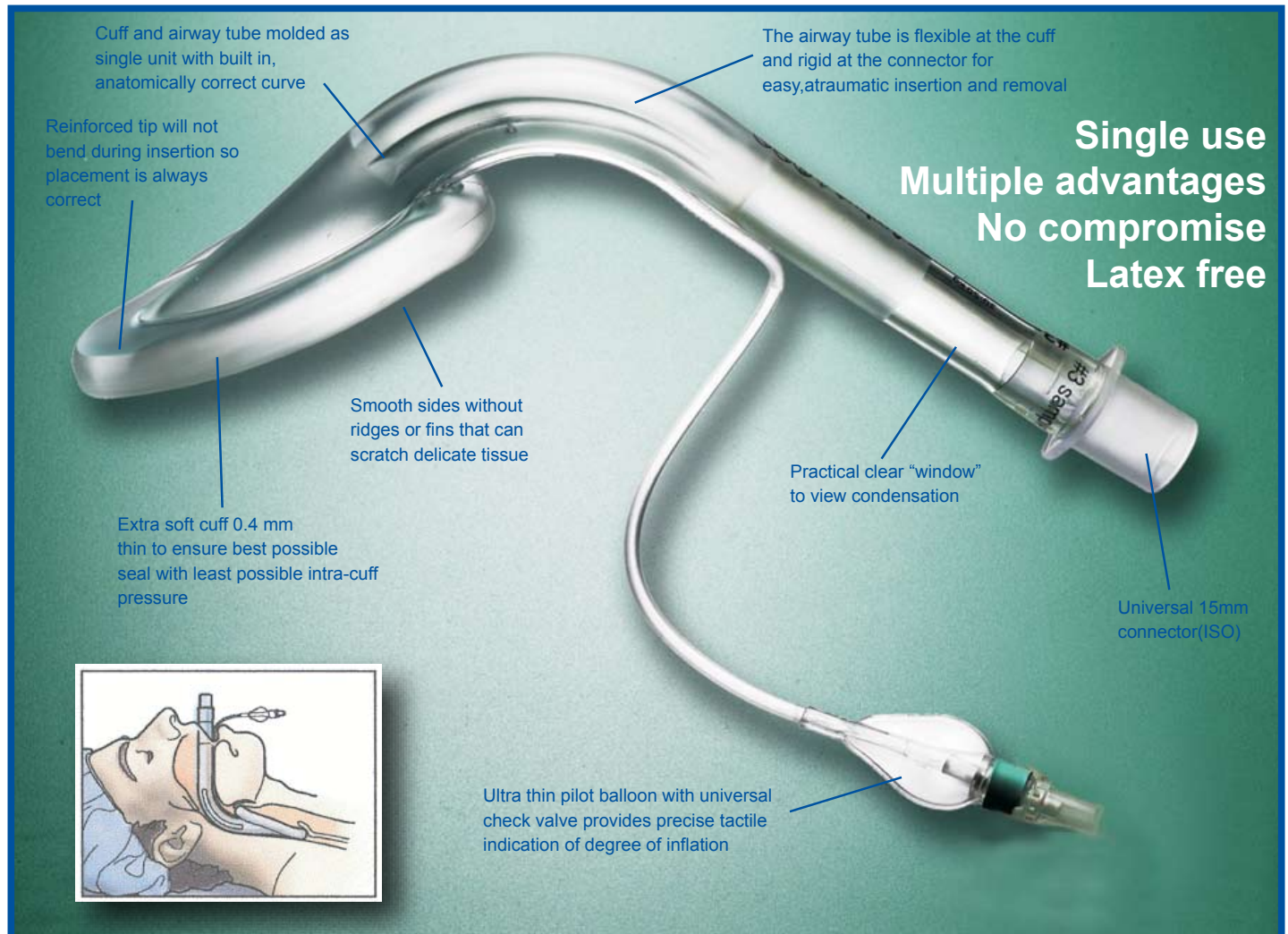
Rigid instruments that function as sort of an indirect fiberoptic laryngoscope. They have a unique blade (the "Bullard blade") attachment that is designed to make the exposure of the vocal cords better. The blade portion is designed to match the body's anatomical airway. This feature negates the need to manipulate the patient's head and neck to visualize the larynx. The Bullard scopes are primarily used as an option for difficult airway cases, particularly in patients with cervical-spine pathology. The reason that they are not used more often is that they require much more setup to use than a typical laryngoscope.

Protocol for Mechanical Ventilator Failure

1. If the ventilator fails, manually ventilate with the circle system.
2. If #1 is not possible, then bag with oxygen (if a portable cylinder is available) or room air.
3. If #2 is not possible, then try to pass suction catheter through the tracheal tube.
4. If #3 is not possible, then visualize the hypopharynx and cords, or re-intubate (?).

Don't delay re-establishing ventilation to diagnose a problem. Proceed expeditiously from one approach to another.

Disposable Laryngeal Mask



The introduction of the Ambu® Laryngeal Mask has dramatically improved a well-known and well-tested concept. As a sterile, single-use product, this innovative mask significantly reduces the risk of cross-contamination and other hazards, yet is also remarkably cost-effective in use. This Laryngeal Mask features a special curve that carefully replicates natural human anatomy. The curve is molded directly into the tube so that insertion is easy, without abrading the upper airway. Moreover, the curve ensures that the

patient's head remains in a natural, supine position when the mask is in use. Internal ribs built into the curve give the airway tube the flexibility needed to adapt to individual anatomical variances and a wide range of head positions. An extra soft 0.4mm cuff means the seal more readily conforms to the shape of the airway with significantly less internal pressure. Although the cuff is flexible, the tip itself is thicker. This helps prevent folds during insertion that can cause improper positioning and possible airway trauma.

Product #	Size	Patient's Weight	Max. Cuff Inflation Volume	Max. Intra-cuff Pressure	Connector (ISO male)	Material	Type
LM321-100	1	< 5 kg	4 ml	60cm H ₂ O	15mm	PVC	Single-Use
LM321-150	1 1/2	5-10 kg	7 ml	60cm H ₂ O	15mm	PVC	Single-Use
LM321-200	2	10-20 kg	10 ml	60cm H ₂ O	15mm	PVC	Single-Use
LM321-250	2 1/2	20-30 kg	14 ml	60cm H ₂ O	15mm	PVC	Single-Use
LM321-300	3	30-50 kg	20 ml	60cm H ₂ O	15mm	PVC	Single-Use
LM321-400	4	50-70 kg	30 ml	60cm H ₂ O	15mm	PVC	Single-Use
LM321-500	5	> 70kg	40 ml	60cm H ₂ O	15mm	PVC	Single-Use

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