ER BASICS · ONE-PAGER

Equipment, Gas Supply and Patient Data

Cylinders, meters, blenders, analyzers, reprocessing and blood gas QC; chest films, bedside findings, oximetry limits, MIP and stress index

75 sources + more detail
erbasics.com/sheets/rt-equipment-patient-data.html
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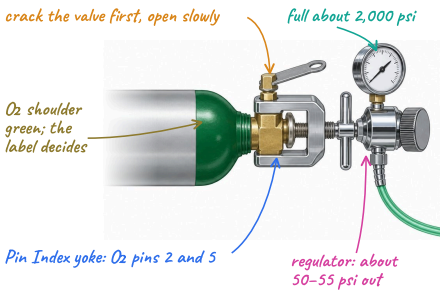
DEVICE Cylinder and regulator



1 Cylinders and connections

POINT	RULE
What is in it	The label decides. US shoulders: O_2 green, air yellow, He brown, N_2O blue, CO_2 gray, N_2 black
Label unreadable	Do not use, whatever the color or fit
Small cylinder valve	Pin Index (PISS) yoke; oxygen pins 2 and 5; one seal only
Wall outlets	DISS: thread diameter differs by gas
Pressure	Full cylinder about 2,000 psi; the regulator drops it to about 50 to 55 psi
Duration	Minutes = psi × cylinder factor ÷ L/min (E factor 0.28; others on PFTs and Oxygen Delivery)

⚠ SAFETY Regulator fires: crack the valve first, new crush gasket (or reusable metal-bound washer), no oil or grease, hand-tighten, open slowly. Hissing at the yoke: close the valve, then reseat or replace the seal.

- A connector that will not fit is a warning: check the label, never swap or adapt the fitting.
- MRI: a steel cylinder becomes a projectile. Use MRI-labeled (aluminum) cylinders and ventilators.

2 Flowmeters and blenders

DEVICE	HOW IT READS	TRAP
Thorpe tube, compensated	Float in a tapered tube; must be upright	Accurate despite a kinked line
Thorpe tube, uncompensated	Calibrated with outlet open	Back pressure: reads low
Bourdon gauge	Pressure gauge read as flow; any position (transport)	Kink: reads high while flow falls
Air-O_2 blender	Mixes 50-psi air and O_2	Alarm when the two supplies differ (one design: 20 psi) or one fails

A blender may not alarm if both supplies fall together, or at 21% when O_2 fails: analyze FiO_2.

3 Oxygen sources and analyzers

SOURCE	FACTS	FAILURE
Bulk liquid O_2	1 L liquid gives about 861 L gas	Pipeline fails: ventilated patients to cylinders or bag, verify FiO_2
Concentrator	Zeolite sieve removes N_2; about 92–96% O_2 when working	Purity alarm (one spec: under 82%) or power cut: backup cylinder, call provider
Galvanic analyzer	Self-powered; anode is used up; about 20 s response	Calibrate at 21% and 100%; replace a cell that fails
Polarographic analyzer	Clark electrode; needs the battery	Same two-point calibration

4 Reprocessing and sharps

SPAULDING CLASS	EXAMPLES	MINIMUM
Critical: sterile tissue or blood	Biopsy forceps, vascular catheters	Sterilization
Semicritical: mucous membranes	Bronchoscopes, laryngoscope blades, respiratory and anesthesia equipment	High-level disinfection
Noncritical: intact skin	Blood pressure cuffs	Low-level disinfection

- After high-level disinfection rinse with sterile water; if not feasible, tap or filtered water, then an alcohol rinse and forced-air drying.
- Leak-test a flexible scope before immersion; one that fails goes for repair, not into the soak.
- Needles: no bending or two-handed recapping; use a safety device and drop it in a sharps container at the point of use.

5 Blood gas analyzer QC

RULE	MEANING	POINTS TO
1-2s	One control beyond 2 SD	Warning: check the other rules
1-3s, R-4s	One beyond 3 SD; or in one run, one above +2 SD and one below −2 SD	Reject; random error
2-2s, 4-1s, 10x	Two in a row beyond the same 2 SD; four beyond the same 1 SD; ten on one side of the mean	Reject; systematic error

- CLIA: a control every 8 h of testing, low and high each day, plus one per patient run unless the analyzer self-verifies at least every 30 min.
- Failed QC: fix, rerun, then review patient results since the last good run. Proficiency samples run like patient samples.

6 Chest radiograph in words

LOOK AT	EXPECT OR SUSPECT
Quality	Clavicle heads equidistant from spinous processes (else rotated); about 10 posterior ribs; AP film enlarges the heart
ETT	3–5 cm above the carina; neck flexion pushes it toward the carina
Central line	Tip at the cavoatrial junction
PA catheter	Tip not beyond the hilum
Pneumothorax	Pleural line with no markings beyond; supine: deep sulcus sign
Effusion	Upright: blunted angle and meniscus; massive: shift away
Collapse	Opacity with volume loss pulling the trachea toward it (plug, right-mainstem tube)

7 Bedside findings

FINDING	CONSOLIDATION	EFFUSION	PNEUMOTHORAX
Percussion	Dull	Dull	Hyperresonant
Tactile fremitus	Increased	Decreased	Decreased
Breath sounds	Bronchial	Decreased	Decreased
Egophony	Present	At the upper edge	Not a feature

- Modified Allen test: color back in 5–15 s is normal; slower, use the other radial.
- Sputum: over 25 neutrophils and under 10 squamous cells per ×100 field, or recollect.
- Clubbing: nail profile angle over 180°; new clubbing in a smoker suggests lung cancer.
- Cyanosis needs about 5 g/dL unsaturated hemoglobin, so severe anemia hides it; blue fingers with a pink tongue = low flow.

8 Pulse oximetry and capnography limits

- Close to SaO_2 (bias under 2%) at 90% and above; less reliable below.
- Dark skin: readings run high. Occult hypoxemia (SaO_2 under 88% with SpO_2 92–96%) was about 3 times as common in Black patients.
- Low perfusion, cold, pressors, motion: poor pleth. Try a forehead sensor; draw a gas.
- CO: SpO_2 reads falsely normal and SpCO cannot rule poisoning out; send blood CO-oximetry.
- Also nail polish, light, dyes. Capnography limits: see Capnography.

EXAM TIP Number and patient disagree: assess the patient, check waveform and site, confirm with arterial CO-oximetry.

9 Muscle strength and stress index

TEST	HOW	READ
MIP	Exhale to RV, pull 1–2 s; repeat until efforts agree; record the best	Lower limit about −60 (women), −80 (men) cm H_2O
MEP	From TLC, push 1–2 s	Lower limit about 120 (women), 150 (men)
MIP, cannot cooperate	One-way valve: exhale only; about 25 s; best value near 15–20 s	A short occlusion underreads
Stress index	Volume control, constant flow, passive patient	Under 1: tidal recruitment; over 1: overdistension, lower PEEP or VT

MORE Medical gas identity and connections

Federal labeling rules (21 CFR 201.328) require high-pressure medical gas cylinders to be colored on the shoulder so the color shows from above, and portable cryogenic containers to carry a 360-degree wraparound label naming the gas. Color helps recognition but does not state a mixture, and colors differ by country (one Indian review describes oxygen cylinders with a black body and white shoulder). The label is what identifies the contents, so a cylinder with a torn or unreadable label is set aside and reported, even if the shoulder colors and the regulator fit look right.

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