

MEDICATION ADMINISTRATION • CHAPTER 21

Part 1

Foundations of Safe Administration

Percutaneous • Pulmonary • Enteral Routes



Part 1

Foundations and the Non-Parenteral Routes

1 General principles & the eight rights

2 Standard precautions & asepsis

3 Documentation

4 Percutaneous routes

5 Pulmonary routes

6 Enteral routes

Drugs, Medications and Your Licence

What you are actually doing when you push a drug

Drug vs. medication

A drug is any foreign substance put into the human body. A medication is a drug used for a medical purpose.

The distinction is not academic — it is the difference between a poisoning and a treatment, and sometimes the only difference is dose.

Why we carry them

To correct or prevent an immediately life-threatening situation — naloxone, epinephrine, dextrose.

And to stabilise or comfort a patient in distress — analgesia, antiemetics, bronchodilators. Both purposes are legitimate.

You are the last check

Nobody downstream verifies your work before it reaches the patient. There is no pharmacist, no second nurse, no barcode scanner.

The system's entire safety margin between the box and the vein is you.

Extension of the physician

Pharmacological therapy permits you to function as an extension of your medical director.

That authority is delegated, not inherent. It is also revocable, which is why protocol compliance is a licensing matter and not a preference.

Your responsibility

Correct and timely administration

You are responsible for both halves of that phrase. The right drug given twenty minutes late has failed the patient just as surely as the wrong drug given quickly.

Ready for use before the call

You must ensure that all emergency medications are in place and ready for use. Checking the drug box is not busywork at shift change — it is the only time you can fix a problem calmly.

If the use or dose of a medication is ever in question, contact medical direction immediately. There is no penalty for asking and no defence for guessing.

The Eight Rights

The verification sequence — every drug, every time, no exceptions for familiarity

The five you already know

1 Right patient

Confirm identity, and in a multi-patient scene confirm it out loud. Allergies are part of this check, not a separate one.

2 Right medication

Read the label at the moment you draw it, not from memory of where it lives in the box. Look-alike packaging is the classic trap.

3 Right dose

Concentration $\times$ volume. Check the vial concentration every time — the SOP prints that warning in capitals beside midazolam for a reason.

4 Right route

The same drug by a different route can be a different dose entirely, and some drugs are lethal by the wrong route.

The three that get skipped

5 Right time

Timing relative to onset, to repeat-dose intervals, and to the other drugs already on board. Note the clock, not your impression of it.

6 Right documentation

If it is not written down it did not happen — and if it is written down wrong, it happened wrong. Document at the time, not at the hospital.

7 Right reason

Can you state the indication in one sentence? If the only reason is “it is in the protocol,” stop and think again.

8 Right response

Reassess. Did it do what you expected? Vitals and mental status before and after — both the desired effect and the adverse one.

Repeat back every medication order issued by on-line medical direction — drug, dose, route and rate. The read-back is where wrong orders die.

Medical Direction and Standing Orders

Where your authority to give a drug actually comes from

The medical director owns the practice

Paramedics operate under the licence of a medical director who is responsible for all of the paramedic's actions.

The medical director — or the EMS system — determines which medications you carry and the routes by which you may deliver them. Neither is your decision to make on scene.

Standing order or contact first?

Knowing your administration protocols is essential, and the part students under-learn is which medications are standing orders and which require authorisation.

In Region X that boundary is printed in the protocol itself — for example, further doses of midazolam for a seizure that continues or recurs require contact with on-line medical control.

Two forms of medical direction

1 Off-line

The written SOP, standing orders, protocols and training. It is in force before the call is dispatched and it is the form you use most.

2 On-line

A real-time order from a physician by radio or phone. Used for doses beyond protocol, unusual presentations, and refusals.

3 Read it back

Every order repeated verbatim before you draw anything. Drug, dose, route, rate. Document who gave it and when.

4 When in doubt

If use or dosage is ever in question, contact medical direction immediately. Uncertainty is a reason to call, not a reason to improvise.

Standard Precautions

Formerly body substance isolation — assume every patient, every time



Figure 21-1 Standard precautions on every patient encounter.

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What the term means

Measures taken during medication administration to decrease your risk of exposure to blood or body fluids. The name changed from BSI; the principle did not.

What you actually wear

Gloves and eye protection for most patient care. A mask is added whenever there is an increased likelihood of splashes or sprays of blood, body fluids or secretions — which includes nebulised medication and intranasal administration.

The simplest one is free

The simplest standard precaution is handwashing. It is also the one most often skipped between patients on a busy shift, and the one that protects the next patient rather than you.

Medical Asepsis and Sharps Safety

Protecting the patient from you, and you from the needle

Medical asepsis

A medical environment free of pathogens. Many paramedic procedures — especially those in this chapter — place the patient at increased risk of infection by creating a route past their defences.

Sterilisation, disinfectants and antiseptics all reduce that risk. Know which of the three you are holding.

Every organisation must have an exposure plan

By law, every medical organisation must have a biological hazard exposure plan. Find yours before your first stick, because the clock on post-exposure prophylaxis starts at the moment of injury and not at the moment you finish the call.

Know now: who you report to, where you go, and what the reporting window is.

Four ways to avoid a needle stick

Minimise the tasks you perform in a moving ambulance.

Dispose of used sharps immediately, at the point of use.

Recap needles only as a last resort — and then only by the one-hand scoop.

Know your service's exposure plan before you need it.

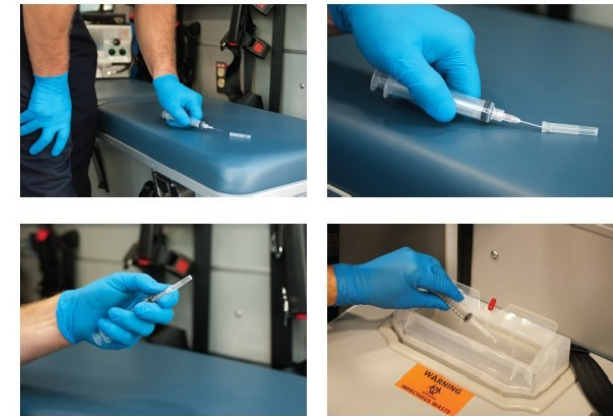


Figure 21-2 The one-hand scoop for recapping a needle.

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Documentation

The four things that must appear in the report for every drug you give

1 Indication

Why this drug, for this patient, now. One sentence that a reviewer who was not there can follow. This is the written form of the right reason.

2 Dose and route

The dose actually given — not the protocol dose — and the route, the concentration, and the time. If you gave less than protocol, say why.

3 Response

The patient's response, both positive and negative. "No change" is a finding and belongs in the record. So does the adverse effect you were watching for.

4 Vitals before and after

The patient's condition and vital signs before and after administration. Without the before, the after proves nothing.

Why this matters more than students think

It is a clinical tool, not a legal chore

The receiving team dose their next intervention off your numbers. A missing administration time turns their decision into a guess, and repeat dosing intervals are measured from a clock time you either wrote down or did not.

It is also the only defence you have

A chart written contemporaneously is evidence. A chart reconstructed at the hospital two hours later is testimony about what you usually do. In a review, those two things are not treated the same way.

Four Route Families, Four Speeds

Route determines onset — and onset determines how much a mistake costs

1 Percutaneous

Through the skin or a mucous membrane. Transdermal is slow and steady; mucous membranes are moderate to rapid because they are thin and highly vascular.

Slow to rapid

2 Pulmonary

Inhaled as an aerosol or instilled down an endotracheal tube. Enormous absorptive surface, so onset is fast and largely local for bronchodilators.

Rapid

3 Enteral

Absorbed through the GI tract — oral, gastric tube, rectal. Cheapest and most common in medicine, slowest and least predictable in an emergency.

Slow

4 Parenteral

Outside the GI tract — IV, IO, IM, SQ, ID. Covered in Parts 2 and 3. Fastest and least forgiving; an IV push cannot be recalled.

Fastest

Three factors that change absorption on any route

Perfusion

A shocked patient absorbs poorly from skin, muscle and gut alike. This is the argument for vascular access in the sick patient.

Surface and vascularity

Thin, well-perfused surfaces win: sublingual, nasal mucosa and alveoli are fast; intact skin is slow by design.

First pass and the liver

Enteral drugs pass through the liver before reaching the circulation. Hepatic condition can reduce effectiveness.

The rule

The faster the route, the less time you have to notice an error — and the more the eight rights are doing real work.

Percutaneous: Transdermal Administration

Through the skin — slow, steady, and easy to get on your own hands

What it is and what it is for

Transdermal medications are given through the skin and promote slow, steady absorption. That profile suits maintenance therapy, not resuscitation.

Forms include lotions, ointments, creams, foams, wet dressings and adhesive-backed applications.

The hazard nobody warns you about

You can dose yourself. Ungloved contact with a nitroglycerin ointment or a fentanyl patch transfers drug across your skin exactly as designed.

Avoid contaminating the medication and inadvertently getting it on your own skin — this is the reason gloves are non-negotiable here.

Technique

1 Standard precautions

Gloves before you open anything. This step protects you at least as much as the patient.

2 Clean and dry the site

Clean and dry your patient's skin at the administration site. Moisture and residue both change absorption.

3 Apply as specified

Apply to the site exactly as the manufacturer specifies. Avoid over- or under-dosing with lotions, ointments, creams and foams — there is no syringe to measure with.

4 Leave it and monitor

Leave the medication in place for the required time and monitor for desirable and adverse effects.

Sublingual and Buccal

Under the tongue and against the cheek — fast, and it bypasses the gut entirely



Figure 21-3 Sublingual administration.

Bledsoe et al., Paramedic Care, 6th ed. © Pearson



Figure 21-4 Buccal administration.

Bledsoe et al., Paramedic Care, 6th ed. © Pearson

Confirm indication, dose, route and expiration date before it goes in the mouth — once it dissolves you cannot take it back.

Why the mouth is fast

The mucous membranes absorb at a moderate to rapid rate, and the sublingual area is extremely vascular.

Delivery through mucous membranes also avoids the digestive tract and the complications that come with it — including first-pass metabolism.

Sublingual technique

Have the patient lift the tongue toward the top and back of the oral cavity. Place the pill or direct the spray between the underside of the tongue and the floor of the mouth. Instruct the patient not to swallow.

Buccal technique

Generally tablets. Place between cheek and gum and allow it to dissolve. Again: the patient must not swallow it — swallowing converts a fast route into a slow one.

Ocular and Aural Administration

Rarely paramedic skills — but you will assist with them, and the technique protects the organ



Figure 21-5 Eyedrop administration.

Bledsoe, Porter & Cherry, Paramedic Care: Principles & Practice, 6th ed. © Pearson Education, Inc.

Aural — technique

Lateral recumbent, affected ear upward. Open the canal manually — adults pull up and back, paediatric patients down and back — then instil the dose and have the patient stay ear-up for 10 minutes.

Ocular — what it is for

Topical medications administered through the mucous membranes of the eye. Typically local: alleviating eye pain, treating infection, decreasing intraocular pressure, or lubricating the eyelid.

Ocular — technique

Have the patient lie supine or tilt the head back and look toward the ceiling.

Pull the lower eyelid downward to expose the conjunctival sac. Never touch the eye.

Place the prescribed dose on the conjunctival sac with a dropper — never directly onto the eye unless specifically instructed. Have the patient hold the eye shut for 1 to 2 minutes.

The one detail worth memorising

Adult ear up and back; child down and back. The difference is anatomical — the paediatric canal runs at a different angle — and it is a favourite examination item.

Nasal and Intranasal Administration

The mucosal route that turned into a core paramedic skill



Figure 21-6 Nasal medication administration.

Bledsoe et al., Paramedic Care, 6th ed. © Pearson



Figure 21-7 Mucosal atomisation device (MAD).

Bledsoe et al., Paramedic Care, 6th ed. © Pearson

Technique

Standard precautions, including a face mask. Have the patient blow the nose and tilt the head backward.

Use a dropper or squeezable nebuliser to administer into the appropriate naris or nares per the manufacturer. Hold the nares shut or tilt the head forward to distribute, then monitor for effect.

Why EMS adopted it

The nasal mucosa is thin, richly vascular and drains straight to the systemic circulation. No needle, no IV, no swallowing reflex required — so it works in the seizing, combative or unconscious patient.

The volume rule your SOP prints

Atomised volume is limited by the surface available to absorb it. Region X specifies rapid push with a maximum of 1 mL in each nostril for both naloxone and midazolam — split the dose, do not force it all into one side.

Pulmonary: The Small-Volume Nebulizer

Pressurised gas turns a liquid into a mist the alveoli can absorb



Figure 21-9 Typical small-volume nebuliser (SVN) setup.

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What it does

A nebulizer uses pressurised oxygen or air to disperse a liquid into a fine aerosol spray or mist. Also called a handheld nebulizer (HHN).

The drug reaches the airway directly, so the dose is small and the systemic load is low.

Preparing the medication

Put the medication in the reservoir. If it is not already diluted, combine it with 3 to 5 mL of sterile saline — there must be enough volume for the gas flow to aerosolize.

What your system stocks

Region X supplies albuterol as 2.5 mg in 3 mL and ipratropium as 0.5 mg in 2.5 mL — both already at nebulizable volume, so no dilution is needed.

Nebulizer Technique: The Numbers

Flow rate, breathing pattern, and knowing when the treatment is finished

Set the regulator to 5–8 litres per minute — and know why the window has two edges

Below 5 L/min

Less than 5 litres per minute will not provide enough pressure to aerosolise the medication. The drug sits in the reservoir as a liquid and the patient inhales humidified oxygen.

Above 8 L/min

More than 8 litres per minute provides too much pressure to nebulise the medication accurately, and drives the dose past the airway rather than into it.

Coaching the patient — this is where the dose is won or lost

1 Seal the lips

Place the mouthpiece in the mouth. Instruct the patient to exhale, then seal the lips around it.

2 Slow, deep inhalation

Have the patient hold the nebuliser and inhale as slowly and deeply as possible — fast shallow breaths deposit drug in the mouth.

3 Hold 1–2 seconds

On maximum inhalation, hold the medication in for 1 to 2 seconds before exhaling. This is what gets it distally.

4 Continue 3–5 minutes

Continue until the medication is gone — typically 3 to 5 minutes. Tapping the reservoir recovers the last of it.

A mouthpiece delivers more drug to the lungs than a mask. Use a mask only when the patient cannot maintain a seal — the very young, the very dyspnoeic, the obtunded.

Nebulizing Through Other Circuits

The patient who needs the drug most often already has a device on their face



Figure 21-11 Nebulised medication through a CPAP mask.

Bledsoe, Porter & Cherry, Paramedic Care: Principles & Practice, 6th ed. © Pearson Education, Inc.



Figure 21-12 In-line nebulisation.

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Through CPAP

Nebulized medication can be delivered through most CPAP masks, so you do not have to choose between positive pressure and a bronchodilator.

Removing CPAP to give a treatment can cost more than the treatment gains.

In-line, intubated

A nebulizer can be placed in the ventilator circuit of an intubated patient, keeping the circuit closed.

Breaking the circuit costs PEEP, recruitment and time.

The principle behind both: deliver the drug without interrupting the therapy that is keeping the patient alive.

Metered Dose Inhalers

The patient's own device — and the coordination problem that makes it fail



Figure 21-13 Metered dose inhaler.

Bledsoe, Porter & Cherry, Paramedic Care: Principles & Practice, 6th ed. © Pearson Education, Inc.

The step that decides everything

Actuation must coincide with inhalation. Press too early and the dose coats the back of the throat; too late and it is exhaled. This coordination is why MDI technique fails so often in the field.

Assess before you assist

Ask when the last dose was taken and how many. A patient who has emptied an inhaler before your arrival is telling you the severity of the attack — and how much beta agonist is already on board.

Assisting a patient with an MDI

1

Assemble and check

Insert the canister into the plastic shell and remove the cap from the mouthpiece. Make sure the cap and mouthpiece are clean — they live in pockets and bags.

2

Shake 2–5 seconds

Gently shake the MDI for 2 to 5 seconds. The drug is a suspension; unshaken, the first puff is propellant.

3

Exhale, seal, actuate

Instruct the patient to exhale maximally, place the mouthpiece in the mouth and form a seal with the lips. Press the canister down as the patient inhales.

4

Hold, then wait

Have the patient hold the breath for several seconds, then breathe slowly. If a second dose is needed, wait the manufacturer's interval before repeating.

The Endotracheal Route

Historically taught, now a last resort — and the reason why matters

What the text says

Although rarely used for medication delivery, the endotracheal tube provides a pulmonary route for medication administration.

The operative word is rarely.

It underperformed

It is not as effective as it was once thought. Absorption from the tracheobronchial tree turned out to be erratic and dependent on pulmonary blood flow — which in cardiac arrest is close to nothing.

The dose changes

Conventional doses must typically be increased two to two and a half times when given by this route — an immediate red flag that absorption is unreliable.

Technique

Administer via the tube and then ventilate several times to ensure the drug is deposited across pulmonary tissue rather than pooling in the tube.

Why this route has all but disappeared from practice

Intraosseous access replaced it

The clinical problem the ET route solved was “cardiac arrest, no IV.” IO access solves that problem far better and in well under a minute, which is why resuscitation guidance now treats IO as the fallback and the ET route as a distant last resort.

Know it anyway

You will read it in older protocols, hear it from experienced providers, and may be examined on it. Know the multiplier, know the technique, and know why it fell out of favour — that last part is the actual competence.

Enteral: The Gastrointestinal Route

The most common route in all of medicine — and the least useful in an emergency

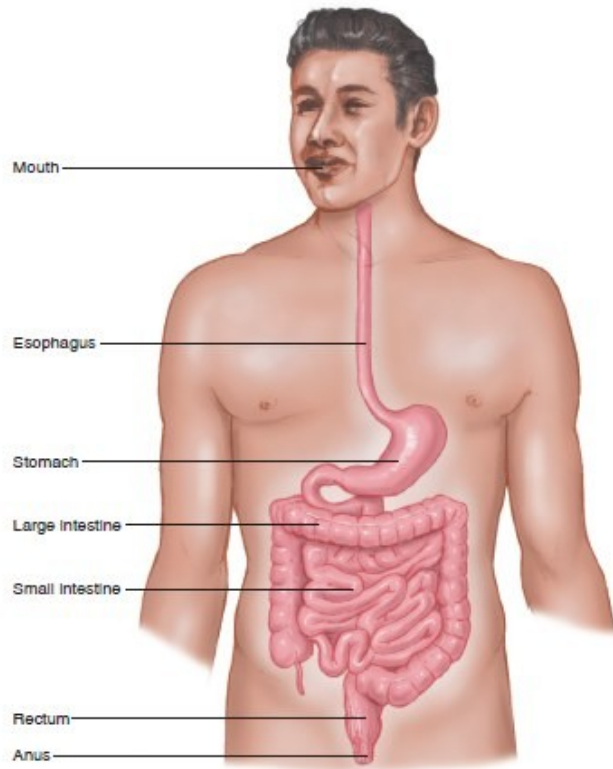


Figure 21-14 Gastrointestinal tract.

Bledsoe et al., Paramedic Care, 6th ed. © Pearson

Why medicine loves it

Delivery of medication to be absorbed through the GI tract.

It is the most common route in medicine, convenient and easy to use, and the least expensive route for medication delivery. Almost every drug your patients take at home arrives this way.

What that means at the bedside

Compliance is a clinical finding

A patient prescribed a drug is not a patient taking it. Ask when the last dose actually was, not whether it is on the list — the answer routinely explains the call you are on.

Why EMS mostly does not

Absorption is slow and it is affected by physical activity, emotions and food.

The condition of the liver can reduce a medication's effectiveness. And the patient must be compliant with self-administration — three things you cannot control on scene.

Food and the liver change the dose

Food alters absorption rate for many drugs, and hepatic disease alters how much survives first pass. The same prescription produces different plasma levels in different patients.

Enteral drugs pass through the liver before reaching the systemic circulation — first-pass metabolism — which is why an oral dose is usually far larger than the intravenous dose of the same drug.

Oral Medications

Swallowed and absorbed through the GI tract — provided the patient can protect their airway

The forms you will see — and the one that must never be crushed

Solids

Capsules and tablets. The default form, and the one most often found in a patient's pill organiser.

Modified release

Enteric-coated and time-release capsules and tablets. Engineered to dissolve somewhere specific or slowly.

Liquids

Elixirs, emulsions, suspensions and syrups. Suspensions must be mixed before they are measured.

Dissolving

Lozenges. Absorbed slowly through oral mucosa as they dissolve rather than being swallowed whole.

Technique

1 Food status

Note whether the medication is to be given with food or on an empty stomach — it changes both absorption and tolerance.

2 Prepare

Gather equipment and prepare the medication: mix liquids and suspensions, or otherwise prepare as needed before it reaches the patient.

3 Sit the patient upright

Have the patient sit upright unless contraindicated. This is an aspiration precaution, not a courtesy.

4 Give and follow with fluid

Place the medication in the mouth, allowing self-administration where possible. Follow with 4 to 8 ounces of water or other liquid.

5 Confirm swallowed

Ensure the patient has swallowed it and that it is not hidden in the mouth — check, do not assume.

The absolute prerequisite: an adequate level of consciousness. A patient who cannot protect their airway cannot take an oral medication, and no clinical urgency changes that.

Gastric Tube Administration

For the patient who cannot swallow — confirm placement, then irrigate, then give

1

Confirm placement

Disconnect from drainage or suction and clamp it. Attach a cone-tipped syringe, inject air while auscultating over the stomach, then withdraw the plunger and look for gastric fluid or contents. Leave it disconnected from suction.

2

Irrigate the tube

Draw 50–100 mL of normal saline into a cone-tipped syringe. With the tip pointed at the floor, gently inject. If you meet resistance, look for kinking, roll the patient onto the left side and retry — and if it still resists, reattach to suction and call medical direction.

3

Prepare the medication

Crush and add to 30 mL of warm water, ensuring all particles are small enough not to occlude the tube. Liquid medications need no further preparation.

4

Administer

Draw the medication into a 30–50 mL cone-tipped syringe, place the tip in the open tube and give it gently. Force is how tubes get displaced.

5

Flush and clamp

Flush with 50–100 mL of warm saline — repeated flushes may be needed. Then clamp the distal tube for about 30 minutes. Do not reattach it to suction.

Who this is for

A patient with difficulty swallowing or poor nutritional status who already has a properly placed orogastric or nasogastric tube. You are using a tube, not placing one.

Three beats: confirm, clear, deliver

Confirm the tube is where it should be, clear it so the drug can travel, then deliver and chase the dose so it arrives in the stomach.

If you reattach the tube to suction after giving a medication, you have just removed the dose you administered. This is the single most common error on this route.

Rectal Administration

Extremely vascular, rapid absorption, and available when nothing else is

Why it works and when it is used

The rectum's extreme vascularity promotes rapid medication absorption. Typically used for sedation and control of seizure activity in the absence of an IV, and also for sedatives, antiemetics and other specially prepared medications.



Figure 21-15 Catheter placement.

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Figure 21-16 Syringe on ET tube.

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Outside the emergency setting, suppositories and enemas are the common methods for this route.

1 Draw the dose

Standard precautions. Confirm the indication and dose, and draw the correct quantity into a syringe.

2 Build the delivery device

Place the hub of a 14-gauge Teflon catheter on the end of a needleless syringe. A small endotracheal tube is the alternative.

3 Instil low in the rectum

Insert the catheter and inject, keeping the medication in the lower part of the rectum — depth changes which veins absorb it.

4 Withdraw and hold

Withdraw the catheter and hold the buttocks together so the dose stays where you put it.

Part 1 — Key Takeaways

1 You are the last check.

There is no pharmacist and no second nurse between the drug box and your patient. Every safety layer that exists in a hospital has to be reproduced by you.

2 Eight rights, every time.

The dangerous drug is not the unfamiliar one. It is the fifteenth albuterol of the month, given from memory, at speed.

3 Check the concentration, not just the dose.

Milligrams become millilitres only through concentration. Region X stocks midazolam in two strengths and prints the warning in capitals.

4 Route determines speed.

Transdermal is hours, oral is slow and unpredictable, mucosal and inhaled are minutes, parenteral is immediate and irreversible.

5 The mucosal routes are the field workhorses.

Sublingual nitroglycerin and intranasal naloxone, midazolam and fentanyl all reach effect fast with no needle and no cooperation required.

6 Match the flow, coach the breath.

A nebuliser below 5 L/min delivers no drug and above 8 delivers an uncertain dose. Slow deep breaths with a 1–2 second hold win the treatment.