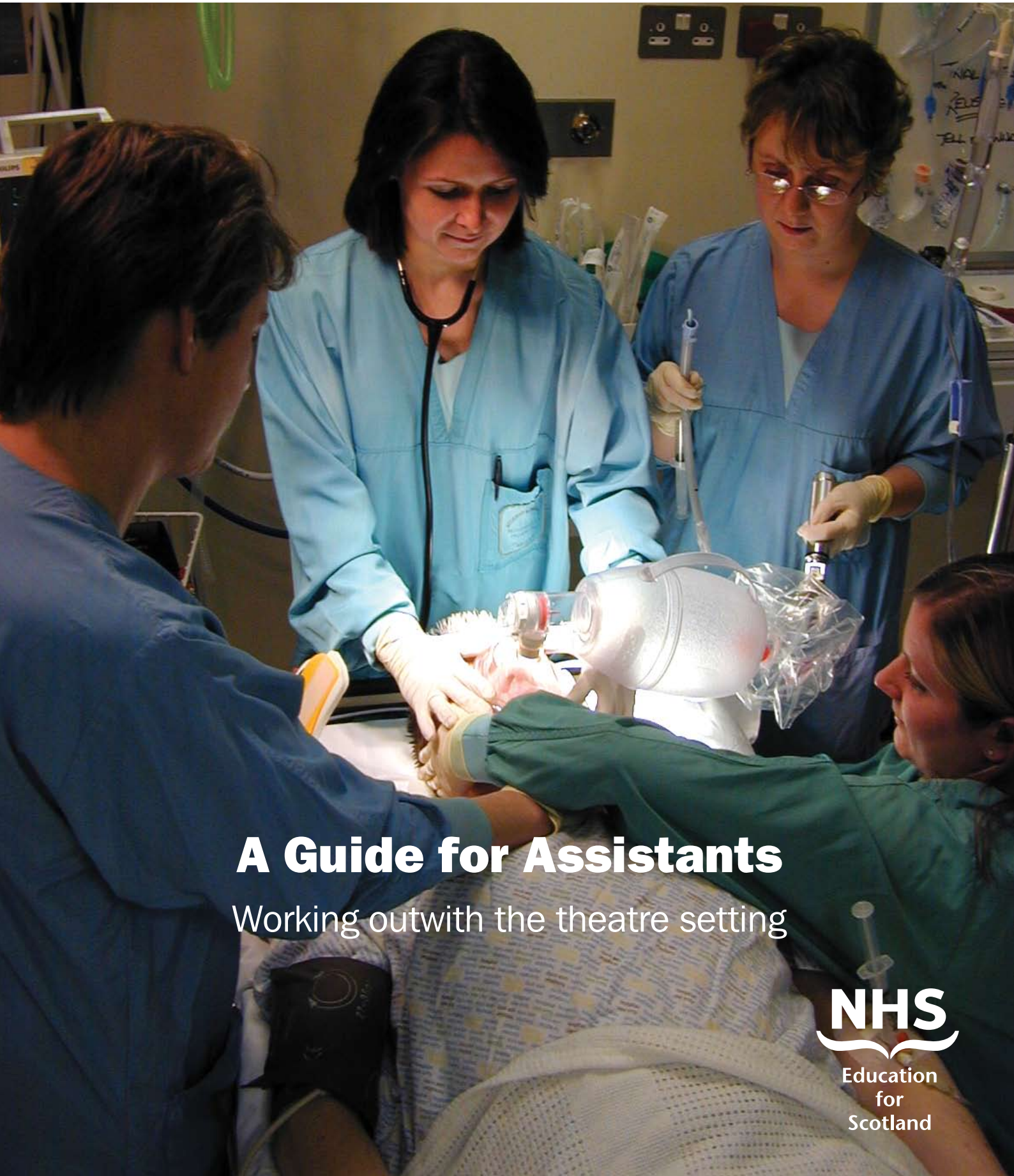
Rapid Sequence Intubation



A Guide for Assistants

Working outwith the theatre setting

NHS
Education
for
Scotland

Contents

Course Aim

By imparting and improving upon the pertinent knowledge and practical skills required of an assistant during the Rapid Sequence Intubation (RSI) procedure this short course aims to increase the confidence and performance of the nurse assisting. This will ensure that competent and safe care is wholly delivered and that a cohesive multidisciplinary approach is achieved.

Course Objectives

The key learning points which will be achieved through pre-course reading material, lectures, demonstrations and scenarios are as follows:

- Gaining a comprehensive understanding of the RSI procedure and of the assistant's role.
- Recognising situations where RSI becomes appropriate.
- Utilising knowledge of the RSI procedure so that it can be applied efficiently in clinical practice.
- Developing an understanding of the pharmacological agents involved, their actions, preparation and their administration.
- Acquiring, developing and demonstrating the motor skills involved in assisting RSI.
- Acquiring knowledge and skills that consider strategies for post-intubation care and/or failed and difficult intubations.

The development of this course has been supported by an educational grant from NHS Education Scotland.

Basic Airway Care and Oxygenation

Basic airway care and oxygenation are essential to resuscitation. RSI allows the provision of a definitive airway but this is impossible to achieve safely without prior maintenance of the airway and oxygenation. Some patients may maintain and protect their own airway but others may need assistance if not full support during RSI preparation.

Basic airway care begins with assessment. Airway obstruction is best recognised by a look, listen and feel approach. Patients often have obstructed airways secondary to a decreased conscious level. Reduced muscle tone allows the tongue and surrounding soft tissues to occlude the airway. This may be partial with 'snoring' noises or complete with see-saw breathing.

This obstruction is relieved with simple positioning of the airway, using head tilt and chin lift, or if neck movement is contraindicated, jaw thrust. Foreign body obstructions to the airway may be removed if visible with forceps or suction. Airway adjuncts such as an oropharyngeal airway (OPA) or a nasopharyngeal airway (NPA) are often used to good effect to maintain a patent conduit for the passage of gas between the face and the pharynx.

Supplemental oxygen is provided to all critically ill patients for a number of reasons. In the preparation for RSI this is to improve oxygenation of the patient and provide a reservoir of oxygen to limit desaturation during drug-induced apnoea for intubation.

It is always necessary to pre-oxygenate a patient for an RSI and a bag-valve-mask (BVM) or anaesthetic C-circuit should be used for this purpose. If used correctly, these provide high concentrations of oxygen for the patient to breathe. These pieces of equipment are also used to ventilate the apnoeic patient.

Knowledge and skills of basic airway care, airway adjuncts and manual ventilation techniques are core to any airway intervention and are the fall back position in failed intubation.

Rapid Sequence Intubation

Definition

Rapid sequence intubation is the administration of a potent induction agent (anaesthetic) followed by a rapidly acting neuromuscular blocking agent (usually suxamethonium) to induce unconsciousness and motor paralysis for tracheal intubation. It is assumed that the patient has a full stomach, and is therefore at risk of aspiration of gastric contents. The aim is to render the patient unconscious and paralysed so that they can be intubated.

Maintenance of oxygenation throughout the process is mandatory.

The Sequence

First of all the decision to intubate should be based on **three fundamental assessments**:

1. Is there a failure of airway maintenance or protection?
2. Is there a failure of ventilation or oxygenation?
3. What is the anticipated clinical course?

Having decided to intubate the patient, the person performing the procedure will assess the patient to anticipate a potentially difficult intubation. Whilst this is happening, preparation for the procedure should begin. Staff should work as a team to allow the procedure to progress smoothly. During RSI the team has a number of roles, these include:

- Airway assistant
- Drug preparation
- Circulation and monitoring assistant
- Drug administration: anaesthetic and emergency drugs
- Cricoid pressure
- Intubator
- In-line immobilisation where necessary

Appendix – Securing an ET tube

There are a set series of steps forming the basis of RSI, these are the **seven Ps**.

1. **P**reparation
2. **P**reoxygenation
3. **P**re-treatment
4. **P**aralysis and induction
5. **P**rotection and positioning
6. **P**lacement with proof
7. **P**ost-intubation management

Of these seven steps, nursing staff are particularly involved in **preparation, protection/positioning and post-intubation management**. It is these that we will concentrate on in the following text.

Preparation

This essentially means preparing equipment for the expected intubation and also for the potential complication of a difficult or failed intubation. The following should be considered:

Environment

- Clinical area e.g. resuscitation room
- Monitoring – ECG monitor, BP, SpO_2, capnography
- Intravenous access – preferably two iv lines
- Position on trolley should optimise access for intubation
- Drugs – drawn up in labelled syringes + checked by medical staff

Equipment

- Two functioning laryngoscopes fitted with appropriate blade.
- Endo tracheal tube - test cuff inflation and have smaller sizes ready:
  - Male, size 8 to 9 mm
  - Female, size 7 to 8 mm
- Stylet and Bougie – as adjuncts to help placement of tube
- Suction with Yankauer suction device

The patient must receive high concentration oxygen throughout this time.

Preoxygenation

This is the provision of high concentration oxygen to the patient for ideally 5 minutes prior to the procedure. This builds up a reservoir of oxygen in the lungs to allow a period of apnoea during RSI. If it is not possible to give 5 minutes of preoxygenation then 8 vital capacity breaths (the largest breaths a patient is able to take) should be taken.

This allows the patient with normal lungs to maintain oxygen saturations over 90% for several minutes as shown in the table below:

Type of patient	Amount of time a patient can maintain Sa 0_2 > 90%
Healthy 70 kg adult	8 minutes
Moderately ill adult	5 minutes
10 kg child	4 minutes
Obese adult	3 minutes
Very ill patient	<2 minutes

However, the time taken to **desaturate from 90% to zero** is very short. In the healthy adult it is 120 seconds, and in a child it is only 45 seconds. **Desaturation is much more rapid if the lungs are abnormal**, (eg pulmonary oedema) or if oxygen consumption is increased (eg trauma, burns etc)

Pre-treatment

Some medical staff may wish to administer drugs such as lignocaine, opiates or atropine to mitigate the effects of the procedure. However this is a decision for the individual clinician.

A rapid fluid bolus may be appropriate to limit the hypotensive effect of anaesthesia and positive pressure ventilation.

Paralysis with Induction

Here, a rapidly acting anaesthetic induction agent is given in a dose adequate to produce prompt loss of consciousness. This is followed by the neuromuscular blocking agent such as suxamethonium.

Induction agents

The most commonly used induction agents are summarised below. There is no single “ideal” agent and the choice will vary in accordance with the clinical situation and the familiarity of the doctor with the drug that he/she administers.

Sodium thiopentone

This is an ultra-short acting barbiturate that acts on the GABA receptor complex in the brain. It decreases cerebral metabolic oxygen consumption and reduces cerebral blood flow and intra-cranial hypertension whilst maintaining cerebral perfusion pressure (usually). The recommended dose in an adult is usually 3–5 mg/kg and in a child is 5-8 mg/kg. These doses are halved where hypovolaemia is suspected. The chief side effects are venodilation and myocardial depression which can lead to significant hypotension.

Etomidate

This is the most haemodynamically stable induction agent and hence has gained in popularity. The relative cardiovascular stability of etomidate makes it useful in hypovolaemic shock, anaphylaxis and asthma where a further drop in blood pressure might prove catastrophic. It has similar cerebral effects to thiopentone and so is useful in cases where intra-cranial hypertension is suspected. Its dose is 0.2-0.3 mg/kg.

Propofol

This is an agent which may also be used as an induction agent in emergency RSI. It produces significant venodilation, myocardial depression and can reduce cerebral perfusion pressure. If it is used, dose reduction similar to Thiopentone is required. It is commonly used as an infusion for maintenance sedation after intubation.

Muscle relaxants

Suxamethonium is the most commonly used neuromuscular blocking agent (NMB) for emergency rapid sequence intubation, having a rapid onset and short half-life. The dose in RSI is 1.5 mg/kg. It acts by non-competitively blocking the neuromuscular junction, inducing fasciculation followed by paralysis. It takes

45-60 secs to induce paralysis and takes 8-10 mins to recover life-sustaining breaths. It can produce a rise in serum potassium levels and is contra-indicated in the following circumstances:

- ECG or biochemical evidence of hyperkalaemia
- Patient ≥24 hours post burn
- Patient ≥7 days post crush injury or denervation
- Guillain-Barre syndrome and other neurological conditions associated with denervation (e.g. critical illness polyneuropathy in intensive care patients)

It is also contra-indicated in patients with a personal or family history of malignant hyperthermia.

Rocuronium is the main alternative if suxamethonium is contraindicated and in certain cases may be the drug of choice. The dose is 1 mg/kg. It has a comparable time to paralysis but a longer recovery time of 20-25 minutes. It will not produce the fasciculations seen with suxamethonium.

Protection and Positioning

Cricoid Pressure

Shortly after the administration of the induction agent, the patient will stop breathing and lose the reflexes that ordinarily protect the airway. During this phase it is vitally important to help prevent regurgitation of gastric contents with the application of **cricoid pressure**. Here, firm pressure (about 10 pounds) is applied to the cricoid cartilage.

The correct pressure applied to the cricoid cartilage would be approximately that which is uncomfortable when pressing on the bridge of the nose.

Cricoid pressure is applied from the moment the patient loses consciousness and maintained throughout the entire intubation sequence until the endotracheal tube has been correctly placed, position verified and the cuff inflated. Only when instructed by the intubator should cricoid pressure be released.

B.U.R.P The intubator may ask you to perform Backwards, Upwards, Rightwards Pressure on the larynx to improve their view of the cords.

In-line Stabilisation

The best position for intubation may not be possible if cervical spine injury is suspected. Here an assistant may be called upon to maintain in-line stabilisation. This allows the cervical collar to be opened giving better access. The head and neck are maintained in the neutral position. If trauma is not suspected, a small pillow can be placed under the head flexing the lower cervical spine and extending the head on the neck; the so-called “sniffing position”.

Placement and Proof

Intubation should be performed carefully and gently. The larynx is visualised and the endotracheal tube placed. The stylet, if used, is then removed and the cuff inflated.

Tube position is confirmed by a combination of:

- visualising the passage of the ET tube between the cords
- listening to both sides of the chest and over the stomach
- end-tidal CO_2 measurement which is the most reliable method

Cricoid pressure can be discontinued on instruction from the intubator. If intubation cannot be achieved, oxygenation will be maintained with basic airway manoeuvres and bag mask ventilation. Further attempts at intubation can then be made safely.

In failed intubation a return to basic airway management with bag-mask-valve ventilation using 100% oxygen will gain time until a definitive airway can be secured.

Difficult and failed airway

Difficult airway

This is when preintubation examination has identified factors that are more likely to make Bag-Valve-Mask ventilation (BVM), laryngoscopy, intubation or surgical airway management difficult. The incidence of difficult airway in the Emergency Department setting is estimated to be 20% in some centres.

How do we predict which patients are likely to be difficult?

The factors listed below may all contribute to difficult BVM, laryngoscopy, intubation and surgical airway management. Identification of these factors may make the intubator decide that RSI should not be attempted and that other methods of securing the airway should be used. The team should always discuss and understand the plan for a difficult intubation and have appropriate equipment prepared.

Look externally

These factors may make BVM or intubation difficult and include the following:

Body habitus, head and neck anatomy (short neck), mouth (small opening, loose teeth or prominent teeth, macroglossia), jaw abnormalities (micrognathia, significant malocclusion), beards.

Obstruction

Upper airway obstruction should always make you aware that airway management is likely to be difficult. This may present as stridor, inability to swallow secretions or alteration in voice quality. Causes of upper airway obstruction include epiglottitis, abscess, foreign body, thermal injury, tumour, and trauma.

Neck mobility

The ability to position the head and neck is vital to give an optimum view of the larynx. Neck mobility can be significantly reduced in patients with trauma (cervical collar) or in the elderly and in those with arthritis.

Failed airway

A ‘failed airway’ is distinct from a ‘difficult airway’ and is defined as:

1. Failure of an intubation attempt in a patient where oxygenation cannot be maintained (‘Can’t intubate, Can’t oxygenate’)

2. Three unsuccessful intubation attempts by an experienced operator

This situation is uncommon in emergency department RSI. The incidence of intubation failure is approximately 0.5 – 2.5% (Walls *et al* – NEAR data).

In a failed airway situation the immediate priority is to OXYGENATE the patient sufficiently to prevent hypoxic brain injury.

Priorities in the failed airway situation

1. Call for the most senior assistance available (Consultant in A&E, ICU, Anaesthetics, ENT +/- difficult airway trolley)
2. Assess whether oxygenation is adequate:
   - If able to oxygenate and maintain saturation >90% with BVM then may be able to buy sufficient time to use alternative techniques e.g. fibreoptic scope
   - If unable to maintain saturation >90% then go back to GOOD basics while more help arrives/preparation for a surgical airway is occurring
     - High flow oxygen via anaesthetic circuit or BVM
     - Suction
     - OPA and NPA
     - Head positioning +/- pillow
     - 2 person ventilation technique
     - Consider the use of an LMA

As an assistant it is important to predict what sequence of events will occur in the failed airway situation and what items of equipment may be required.

Providing high concentration oxygen and going back to GOOD basic airway opening manoeuvres with the use of assistance and adjuncts will frequently allow some improvement in the patient's condition.

If good basic care improves matters and the oxygen saturation is greater than 90% then an expert may wish to try a further intubation attempt. The items of equipment and technique should be carefully considered, e.g. using a different laryngoscope blade, stylet or bougie, different size of ETT, rescue medication, altering amount of cricoid pressure, altering patient's head position, considering the BURP (Backwards, Upwards, Rightwards Pressure on the larynx) manouevre etc.

If the oxygen saturation still remains less than 90% despite optimum basic airway management it is likely that a surgical airway will be performed. This can be a needle or surgical cricothyroidotomy. It is vital to familiarise yourself with the equipment for this, where it is kept and how to be a good assistant when a surgical airway is performed.

REMEMBER: Patients do not die from a failure to intubate. They die from HYPOXIA due to failure to stop trying to intubate.

Post-Intubation Management

After tube placement is confirmed, the ET tube can be tied or taped in place. Blood pressure should be measured and reported to the team leader. Mechanical ventilation can now be initiated. A chest X-ray should be obtained to confirm ET tube position and assess the lungs.

Standard Post Intubation Care:

- **ECG**
- **SpO_2**
- **NIBP / A-Line**
- **Capnograph**
- **Naso / Oro Gastric tube**
- **Urinary Catheter**
- **CXR**
- **Arterial Blood Gas**
- **Maintenance sedation and NMB**

Maintenance sedation and NMB

Benzodiazepines

Midazolam has the quickest onset and offset times of all the benzodiazepines. They promote amnesia and sedation but have a longer time to onset than induction agents. They are commonly used to maintain sedation in a patient who has been intubated and may be delivered as an infusion in this context.

Propofol

This is an agent which may also be used as an induction agent in emergency RSI. It produces significant venodilation, myocardial depression and can reduce cerebral perfusion pressure. It is commonly used as an infusion for maintenance sedation after intubation.

Vecuronium and Atracurium

These are longer acting NMBs used to maintain paralysis in the intubated patient. The bolus doses are 0.1mg/kg and 0.5-1 mg/kg respectively.

Finally a nasogastric or orogastric tube should be inserted to prevent any gastric distension.

Ventilator Settings

Check for adequate chest movement and that inflation pressures are not too high (>25-30cm H_2O). Standard initial setting would be 10 ml/Kg tidal volume at 10-12 breaths per min. However, this may vary with clinical situation and is a decision for the team leader.

Considerations before transfer

The following points should be checked:

- Destination agreed
- Ensure adequate oxygen, fluids and emergency drugs
- Documentation complete and copied
- Results and X-rays to accompany patient
- Inform receiving area

Relatives

It is important that a member of the team keeps relatives as fully informed of events as possible.

Make a loop, place both ends of tape through, pull ends in opposite directions and tie round patients head.

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Thanks also to Ian Ballard and Alison Neilands,
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and to Dorothy Armstrong, Professional Officer, NES
and to all the participants in the discussions about, and ‘dry runs’ of, the course.