

# Overview and impact of rapid sequence intubation



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Airway management is fundamental in the care of critically ill and injured patients. Without an adequate supply of oxygen, vital organs such as the brain and heart begin to die. Management of the airway encompasses a spectrum of techniques, including non-invasive methods such as bag-valve-mask (BVM) ventilation, and more advanced methods such as endotracheal intubation (ETI). ETI provides a direct conduit to the lungs to facilitate delivery of oxygen and ensure adequate ventilation. In addition, the endotracheal tube has an inflatable cuff designed to prevent aspiration into the lungs.

Paramedics have performed ETI for over the past years, initially as a strategy to improve oxygenation during cardiac arrest. Until the implementation of ETI protocols, less invasive techniques such as BVM ventilation and the esophageal-obturator airway were employed.

In this assignment the following will be discussed: Overview of Rapid Sequence Intubation (RSI), causes of RSI failure, benefits of RSI to the ill and injured patient's airway, ways of improving RSI outcomes, the Randomised controlled trial (RCT) of prehospital RSI in patient with traumatic brain injury and recommendations by the compiler of this assignment..

## **2. Discussion**

Emergency airway management is a critical skill in the care of the ill and injured patient in general and the patient with severe traumatic brain injury (TBI) in particular. Endotracheal intubation (ETI) is crucial for airway protection as well as the prevention and rapid correction of hypoxemia. The airway should be secured in patients who have severe head injury (Glasgow

Coma Scale [GCS] < 9), the inability to maintain an adequate airway, or hypoxemia not corrected by supplemental oxygen. Endotracheal intubation, if available, is the most effective procedure to maintain the airway.

Although attempting ETI is considered standard of care in the prehospital management of severe TBI, many patients cannot be intubated without neuromuscular blocking agents because of the presence of clenched jaw or other airway protective reflexes. This has generated interest among emergency medical services (EMS) agencies to develop rapid sequence intubation (RSI) protocols to increase intubation success rates.

## **2. 1. Overview of RSI**

RSI is a method of intubating patients who have a gag reflex who would otherwise be difficult to intubate. Intubation is accomplished by sedating and paralyzing the patient, allowing for easier intubation. No new skills are necessary, but decision making is crucial. RSI utilizes a sedative, a short term paralytic, and a long term paralytic when necessary.

RSI is an advanced airway management process that facilitates endotracheal intubation in adults and children. Features of this technique include pre-oxygenation, rapid pharmacological induction of unconsciousness, and neuromuscular blockade to enable the placement of an endotracheal tube. RSI has become widespread as the procedure of choice for definitive airway management by pre- and in-hospital emergency care personnel worldwide. In the emergency setting, RSI is superior to intubation with deep sedation, a technique not incorporating pharmacological paralysis as part of the intubation sequence. For this reason, the implementation of RSI in the

prehospital environment is supported, provided that it is practiced within an appropriate framework of clinical governance.

### **3. RSI failure**

Prehospital setting is different as compared to the more stable hospital setting. It has unique challenges and problems because patients, indication and the extent of the emergency differ to those of the hospital setting. The challenges and the environment of the prehospital settings make performing even a simple skill a difficulty. That is why like any other life saving skill performed in the prehospital setting RSI also has risks. Using neuromuscular blocking agents has potential complications because of the removal of spontaneous respiratory effort and possibly the loss of airway patency under certain circumstances. Nonetheless, the overall benefits of this technique outweigh the risks. There are a number of reasons that can be the cause for RSI failure.

#### **3. 1 Patients**

There are patients that can be predicted prior to intubation that they will be difficult to intubate. There could be a number of reasons for the difficult intubation. These can include morbidity condition, facial trauma, pregnancy, obesity, airway obstruction, bull neck and acromegaly. A number of clinical assessments to help predict the likelihood of difficult intubation have been established over the years. The challenge is, these clinical assessments require time and the patient to co-operate, things of which are hardly possible in the emergency situation. (Carley et al 2001: 111)

An example would a patient who is fully immobilized. This will lead to poor visualization. The rigid collar and head blocks will reduce the chances of visualising the larynx on laryngoscopy. (Carley et al 2001: 111).

### **3. 2. Equipment**

The prehospital setting is less equipped as compared with the hospital setting especially when performing skills such as RSI. The hospital has adequate equipment to ensure a successful RSI and they have all the equipment they need as back up if RSI fails. For instance they have different laryngoscope sizes and alternate airway devices (adjuncts). Most emergency care practitioners do not have enough equipment. (Carley et al 2001: 111)

### **3. 3. Training**

RSI requires a thorough understanding of the physiology of intubation, and of the various drugs used for induction and paralysis in addition to careful patient selection. The standardization of intubation efforts with well-conceived algorithms requires a regimented approach that is similar to that employed for cardiopulmonary resuscitation. The training of critical care physicians requires greater attention to teaching these advanced airway management skills, more collaboration between anesthesiologists and critical care physicians to promote these skills, and careful monitoring for adverse events and outcomes to improve patient selection for the various intubation approaches that are available. (Kovacs et al 2004: 178)

## **4. Benefits of RSI**

Advances in emergency airway management have allowed healthcare practitioners to use intubation techniques that were once the skill only the

anesthesiology performed and were confined to the operating room.

Appropriate rapid-sequence intubation (RSI) with the use of neuromuscular blocking agents, induction drugs, and adjunctive medications in a standardized approach improves clinical outcomes for select patients who require intubation. (Reynolds et al 2005: 1399)

Advanced airway management requires the selection of appropriate drugs for a particular clinical situation. Proper drug selection facilitates laryngoscopy, improves the likelihood of successful intubation, attenuates the physiologic response to intubation, and reduces the risk of aspiration and other complications of intubation by a factor of 50 to 70%. (Sivilotti et al 2003: 616)

Stimulation of the airway with a laryngoscope and endotracheal tube presents an extremely noxious stimulus, which is associated with an intense sympathetic discharge resulting in hypertension and tachycardia (called the pressor response). Sivilotti (2003: 618) suggest that physiologic consequences of this pressor response are well-tolerated by healthy persons undergoing elective intubation. A hypertensive response, however, may induce myocardial and cerebrovascular injury in critically ill patients with limited reserves for adequate tissue oxygenation.

Moreover, critically ill patients who require emergent intubation experience hypoxia, hypercarbia, and acidosis, which induce an extreme sympathetic outflow that is associated with tachycardia, labile blood pressure (BP), and an increased myocardial contractility. Attenuation of these physiologic stresses after the placement of an airway may unmask relative hypovolemia

and/or vasodilation, which result in postintubation hypotension. Endotracheal intubation also can provoke bronchospasm and coughing that may aggravate underlying conditions, such as asthma, intraocular hypertension, and intracranial hypertension. Patients who are at risk for adverse events from airway manipulation benefit from the use of preinduction drugs, which include opioids, lidocaine,  $\beta$ -adrenergic antagonists, and non-depolarizing neuromuscular blockers. (Sivilotti et al 2003: 618)

The use of RSI was introduced to the pre-hospital environment in hope of improving patient outcome by enhancing early definitive airway management. Paramedics working in ground EMS are often confronted with difficult airway situations that have the potential to be mitigated by RSI. Some EMS providers may be transporting patients long distances, in which case airway management becomes even more important. (LAH et al 2010: 35)

Prehospital RSI has many benefits, including improved oxygenation and ventilation, aspiration protection, protection of the decompensating airway and spinal protection through sedation and paralysis. The procedure also has the potential of decreasing failed endotracheal intubations in certain situations. Wang et al indicated a set of factors that were associated with ETI failure in the prehospital setting. Factors reported that could theoretically be corrected by RSI included inability to pass the endotracheal tube through the vocal cords and intact gag reflex.

## **4. 1. Randomised controlled trial (RCT) of prehospital RSI**

A study was done to determine whether paramedic rapid sequence intubation in patients with severe traumatic brain injury (TBI) improves neurologic outcomes at 6 months compared with intubation in the hospital. Severe TBI is associated with a high rate of mortality and long-term morbidity.

Comatose patients with TBI routinely undergo endotracheal intubation to protect the airway, prevent hypoxia, and control ventilation. In many places, paramedics perform intubation prior to hospital arrival.

A total of 312 patients with severe TBI were randomly assigned to paramedic rapid sequence intubation or hospital intubation. ( Bernard et al 2011: 162)

The success rate for paramedic intubation was 97%. At 6 months. The proportion of patients with favorable outcome was 80 of 157 patients (51%) in the paramedic intubation group compared with 56 of 142 patients (39%) in the hospital intubation group. There were no differences in intensive care or hospital length of stay, or in survival to hospital discharge. A conclusion was then reached by the study researchers that in adults with severe TBI, prehospital rapid sequence intubation by paramedics increases the rate of favorable neurologic outcome at 6 months compared with intubation in the hospital. ( Bernard et al 2011: 163)

## **5. Improved RSI outcomes**

Several factors underlie the improved outcomes with RSI. Preoxygenation reduces the need for face-mask ventilation in preparation for intubation, and thereby decreases the risks for gastric insufflation and the aspiration of

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stomach contents. The use of a potent induction agent with a neuromuscular blocking drug allows the airway to be rapidly controlled, further reducing the risk of aspiration. The use of adjunctive medications in appropriate clinical settings can reduce the pressor response and other physiologic consequences of laryngoscopy and tracheal intubation. (Reynolds et al 2005: 1404)

## **6. Recommendations**

The induction of anaesthesia in the pre-hospital environment carries more risks than the same procedure undertaken in hospital. Skilled anaesthetic assistance may not be available and both environmental and patient factors increase the risks associated with tracheal intubation and induction of anaesthesia.

RSI can be a harmful procedure, especially in difficult airway cases because of limited knowledge of drug kinetics and pharmacodynamics. Therefore, the value of rapid sequence induction for intubation does depend on each EMS design and their ability to establish personnel requirements and ongoing training expertise in airway management skills, medical direction and supervision. (Stein et al 2011: 163)

Quality assurance and quality control and benefits from multi-disciplinary input should be utilized to govern the clinical aspects. These must at least include a clinical protocol, appropriate equipment and system requirements. There must be real-time overseeing and advice by experienced senior personnel who must be available at all times. Keeping of clinical record review involving every RSI case in a given emergency medical service must

be done and there must be routine collection and review of statistics on pre-hospital RSI performance, complications and outcomes. (Stein et al 2011: 163).

Lack of resources may be the reason why Pre-hospital RSI may not be implementable in all emergency medical services in South Africa because. Apart from personnel requirements, services wishing to implement pre-hospital RSI must be properly prepared, including providing ECPs with the prescribed minimum training, systems requirements and robust clinical governance. (Stein et al 2011: 163)

## **7. Conclusion**

Rapid Sequence Intubation is a crucial skill in the prehospital emergency setting in managing the ill and injured patient. It has its own risks but with sufficient training, competency, quality assurance and proper monitoring they can be minimized. There is not enough research published on RSI. More studies, research and literature review should be done and published. This will help point out shortcomings, gaps and need for retraining on RSI.

Emergency care providers whose scope of practice permits them to perform RSI should make it their priority and mission to stay current as far as RSI is concerned. They can do this through retraining and attending CPD events. This will help minimize even human errors. It is the duty of the emergency care practitioner to know and understand the RSI guidelines and protocol.