A STUDY ON

OUTCOME OF INTUBATION IN EMERGENCY DEPARTMENT, HOSPITAL UNIVERSITI SAINS MALAYSIA.

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List of abbreviation.

HUSM	**:**	**Hospital Universiti Sains Malaysia**
ED	**:**	**Emergency Department**
RSI	**:**	**Rapid Sequence Intubation**
CXR	**:**	**Chest radiograph**
vs	**:**	**Versus**
ETT	**:**	**Endotracheal tube**
BVM	**:**	**Bag Valve Mask**
LMA	**:**	**Laryngeal Mask Airway**

Abstrak:

KAJIAN TENTANG
KESUDAHAN PENGENDALIAN SALURAN PERNAFASAN
DI JABATAN KECEMASAN HOSPITAL UNIVERSITI SAINS MALAYSIA.

Pengenalan:

Bidang perawatan kecemasan di Malaysia merupakan satu bidang yang baru diperkenalkan dan Universiti Sains Malaysia ialah universiti pertama di Malaysia yang menawarkan kursus Pasca Ijazah Perubatan Kecemasan. Tujuan kajian ini untuk mengenalpasti kesudahan pengendalian pengurusan saluran pernafasan di jabatan kecemasan, Hospital Universiti Sains Malaysia (HUSM)..

Objektif:

Mengetahui kadar kejayaan intubasi saluran pernafasan, cara pengendalian sistem saluran pernafasan sukar, mengenalpasti faktor yang mempengaruhi kesukaran intubasi dan mengenalpasti komplikasi intubasi yang dilakukan oleh pengendali saluran pernafasan di jabatan kecemasan, Hospital Universiti Sains Malaysia (HUSM).

Kaedah.:

Ini adalah kajian pemerhatian yang dilakukan di jabatan kecemasan, Hospital Universiti Sains Malaysia **(**HUSM**)** dalam jangka masa 6 bulan. Sampel adalah sebanyak 128. Pesakit yang memenuhi kriteria dimasukkan didalam kajian. Semua maklumat yang diisi di dalam borang yang telah disediakan.

Keputusan:

Sebanyak 138 pesakit diintubasi . Min umur pesakit adalah 50.47 tahun. Kebanyakan kes adalah lelaki, seramai 95 orang (68.84%). 94 (68.12%) adalah kes bukan trauma dan 44 (31.88%) kes trauma. Indikasi utama intubasi adalah saluran pernafasan berisiko (39%). “Rapid sequence intubation (RSI)” adalah cara pengendalian saluran pernafasan yang paling kerap digunakan iaitu sebanyak 110 kes (79.71%). Fentanyl adalah ubat pra rawatan yang selalu digunakan bagi 90 kes (65.2%) manakala untuk sedasi, midazolam digunakan untuk 26.6% kes bukan trauma manakala bagi kes trauman ialah propofol sebanyak 27.5% . Agen paralitik pula ialah succinylcholine yang diberi kepada 100 pesakit (72.5%). 136 pesakit (98.55%) berjaya diintubasi namun sebanyak 2 kes (1.45%) tidak berjaya. 111 kes berjaya diintubasi dengan sekali cubaan (80.43%) . 6 kes cubaan lebih 3 kali (4.35%). 9 kes (6.52%) adalah kes saluran pernafasan sukar dan penyebab utama pernafasan sukar adalah saluran udara ‘anterior’ (44.4%). Cara pengendalian udara sukar adalah dengan menggunakan bougie (44.4%). 57 (43.3%) mendapat komplikasi tekanan darah rendah (49.1%), diikuti dengan renjatan jantung (33.3%). 2 faktor berkaitan dengan kejayaan intubasi iaitu saluran pernafasan sukar dan percubaan berulang . Faktor yang berkaitan dengan pernafasan sukar adalah percubaan berulang dan komplikasi.

Kesimpulan :

Jabatan kecemasan, Hospital Universiti Sains Malaysia (HUSM) mempunyai kadar kejayaan yang tinggi dalam intubasi. Indikasi yang selalu digunakan adalah saluran pernafasan berisiko. Cara pengendalian saluran pernafasan yang selalu digunakan adalah “rapid sequence intubation (RSI)”. Kadar saluran pernafasan sukar adalah rendah dan factor yang mempengaruhi kesukaran intubasi adalah kekerapan cubaan intubasi dan komplikasi intubasi.

Abstract:

A STUDY ON

OUTCOME OF INTUBATION IN EMERGENCY DEPARTMENT,

HOSPITAL UNIVERSITI SAINS MALAYSIA.

Introduction.

In Malaysia, Emergency Medicine is a new specialty without any less important role in health care delivery. Universiti Sains Malaysia is the first university in Malaysia offering postgraduate study in Emergency Medicine. Aims of this study were to observe the outcome of intubations, the success rate of intubations, method of intubations , presence of difficult airway and complication after intubations in emergency department, Hospital Universiti Sains Malaysia (HUSM).

Objectives:

To determine the success rate of intubations, method of airway management, predictors of difficult intubation and complications of intubation performed by airway personal in emergency department, Hospital Universiti Sains Malaysia (HUSM).

Methodology:

This was a cross sectional observational study done in emergency department, Hospital Universiti Sains Malaysia **(**HUSM) in six months. Sample size were 128. Patients fulfill the inclusion criteria were included in this study. Results were documented in pre prepared data entry sheet.

Results:

138 patient intubated during this study. Mean age of patient is 50.47 years. Majority were male , 95(68.84%). 94 case (68.12%) were due to non trauma case and 44

(31.88%) were trauma case. Most frequent indication ware airway at risk with percentage of 39% . Rapid sequence intubation (RSI) were the most frequent method of airway management 110 case (79.71%). Fentanyl was the commonest pretreatment agents used in 65.2% of case. For sedation, 26.6% of non trauma patients were given midazolam while for trauma, propofol were used. Most common paralytic agent given were succinylcholine, 72.5%. 98.55% were intubated successfully and only 2 cases (1.45%) failed intubation. 111 case intubated in single attempt (80.43%). 6 cases intubated with more then 3 attempts (4.35%). 9 cases (6.52%) noted to have difficult intubation and most common cause of difficult intubation were anterior cord position (44.4%). The most frequent intervention for difficult airway was by using bougie in 4 cases (44.4%). 57 case (43.3%) develop complication which were hypotension 49.1%, and cardiac arrest 33.3%. 2 factors showed significant association with successful intubation which were difficult airway and multiple attempts. Factor associated with difficult intubation were number of attempts during intubation and the presence of complication.

Conclusion:

Emergency department, Hospital Universiti Sains Malaysia (HUSM) have a very high success rate of intubation. The most common indications was airway at risk and common method of intubation done was rapid sequence intubation (RSI). Agent commonly use for pretreatment were fentanyl, while induction agent used were propofol and midazolam. For paralytic agent succinylcholine were used in most intubations. Complication rate were fairly high since due to most cases referred were severely or critically ill. There were low incidence of difficult intubation. Predictors of difficult intubations were multiple intubation attempts and development of complications.

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

In Malaysia, Emergency Medicine is a rather new specialty without any less important role in health care delivery . Universiti Sains Malaysia (USM) is the first university in Malaysia offering postgraduate study in Emergency Medicine i.e. Master in Medicine (Emergency Medicine). It had been introduced in 1997 and in 2003, the Emergency Unit, Hospital Universiti Sains Malaysia (HUSM) was upgraded to a department status in 2003, in parallel with the recognition of Emergency Medicine as a specialty on its own.

Emergency department, Hospital Universiti Sains Malaysia (HUSM) received about 48,000 patients per year. It serves as an excellent place for learning and gaining experience and plays an important role in training future doctors and Emergency Physicians in dealing with critical and non critical cases who arrived in Emergency Department.

Emergency department Hospital Universiti Sains Malaysia (HUSM) is a primary care department that provides initial treatment to patient with a broad spectrum of illnesses and injury. Some which may be life threatening and requires medical attention.

One of the most important skills in treating life threatening condition for the emergency resident is the airway management. Safe effective airway

management in critically ill or injured patients is the cornerstone of resuscitation because failure to secure an adequate airway can quickly lead to death or disability. (Butler, 2001)

Airway emergencies present in different fashion, the emergency resident must be proficient in multiple techniques to protect and maintain the airway, and must be prepared with all the necessary equipment to perform alternative procedures should the initial plan fails.

Emergency department Hospital Universiti Saains Malaysia (HUSM) is staffed by a group of emergency physicians, emergency medicine master student and medical officers of varying training experiences. Training in airway management was mandatory in the Emergency Medicine (M.Med) curriculum. Experience in airway management is acquired through daily exposure to patients requiring airway management and rotational posting for 6 months in Anesthesiology. **Emergency resident with the above experience is known in this study as an 'Airway Personal'.**

When a critically ill patient presented at the emergency department, the airway was first assessed by the emergency resident. If there is an indication for intubations , the emergency resident will secure the airway using various method of intubations. Study showed that the most common method used by emergency resident is rapid sequence intubations (RSI), except for cases with respiratory or

cardiac arrest where crash intubations method were applied (Wong E, 2004). When the attempt failed or if the airway was deemed to be difficult on initial assessment, the anesthetist was then called.

One observational study was done in Hospital Selayang in 2001 regarding airway management in General Hospital in Malaysia. It conclude that, most patient who came to Emergency Department that need airway intervention was intubated by emergency resident. The percentage was 98.47 % from 261 patient intubated in their emergency department and the most common method of intubations are rapid sequence induction which were about 84.7%. Even though the success rate is high, the study did not mention the detail percentage of how many attempts of intubations were attempted and what is the factor contributing the multiple attempt of intubations. With the background of General Hospital, most of the emergency resident are young doctors who did not have any experience in airway management and during the study period, Selayang Hospital was a very new hospital without any Emergency Physician and this may contribute 1.53 % failure rate of intubations. Again the study did not comment the intervention that were done due to failure of intubations (Ibrahim, 2002).

For being tertiary and referral centre, emergency department, Hospital Universiti Sains Malaysia (HUSM) currently received about 48,000 patient in 2008 and from this total number of patient about 3600 of patient are categorized as critically ill patient or triage as Red Zone case. Patient that requires early

airway intervention and intubated in emergency department are about 30 to 35 patient per month and roughly about 350 to 400 patients were intubated in 2008. Even though the percentage of intubations for critically ill patient per year was about 10% to 12%, it is considered high since some of the patient that came to emergency department already has been intubated from the primary center.

As a tertiary centre, we need a study in emergency department Hospital Universiti Sains Malaysia (HUSM) regarding the airway management and in future, more study can be done to help improve emergency resident knowledge and skills. It also will be a references to other general hospital in Malaysia in practicing airway management in emergency department.

Since the study of airway management was first done in Hospital Selayang (1st computerized government general hospital), the data only specifically to this new hospital which have very limited emergency resident who have airway management experience and limited used of anesthetic drugs in their emergency department .

The aims of this study were to observe the outcome of intubations in emergency department, Hospital Universiti Sains Malaysia (HUSM), specifically on the success rate of intubations, method of intubations, presence of difficult airway and factors related to it and complication after intubations .

The other data that will be recorded in this study are :-

Indication of airway intervention.

Type of cases.

Pharmacologic agent used.

Incidence of difficult intubation and factors effecting it.

Type of intervention applied after failed intubations.

Finally, the study will also give a basic database of intubations performed in tertiary centers in Malaysia and will be a guidelines and reference future study of emergency airway management in Malaysia.

CHAPTER 2

LITERITURE

REVIEW

2.0 Literature Review

2.1 History of airway management.

The origin of specific airway technique or tool used in airway management are really impossible to be identify and the existence of airway management were believe as early as 4000 years ago (Szmuk *et al.*, 2008). The earliest record of airway management came from an ancient Hindu book of medicine, '*Rig Veda*' which describe the healing of a throat incision around 2000 BC (GL, 1994). Then 500 years later, the Egyptian wrote the first documented technique resembling tracheostomy to resolve upper respiratory obstruction (CG, 2005). It is also said that Alexander the Great in 356-323 BC, saved a soldier from suffocation from aspirated bone by making a tracheal incision using the tip of his dagger (Szmuk *et al.*, 2008). In 160 AD, the Roman physician Galen wrote "*If you take a dead animal and blow air through its larynx (through a reed), you will fill its bronchi and watch its lungs attain the greatest dimension*". Sadly, the significance of that finding was not appreciated and research on ventilation did not advance any further until a Muslim philosopher and physician Avicenna in 980-1037 AD described intubation of the trachea using "*a cannula of gold or silver*"(Szmuk *et al.*, 2008) .

In the thirteenth century, tracheostomy is termed a "semi slaughter and a scandal of surgery" (JJ Watkinson, 2000) and this description may explain the demise of this procedure during this age. It was not until the Renaissance that thracheostomy reappeared as a viable medical solution.

In 1546, Antonio Brasavola an Italian physician reintroduced tracheostomy in humans by performing the first documented case of successful tracheostomy in a patient with tonsillar obstruction (GL, 1994). In 1620, a book of tracheostomy was publish by Parisian Nicholas Habicot (Szmuk *et al.*, 2008). In October 1667, Robert Hooke demonstrated tracheostomy during Royal Society meeting on a dog and claims he preserved the canine's life by breathing for it by means of a bellows (JJ Watkinson, 2000). However, according to Sitting and Pringnitz, only 50 life saving tracheostomies had been described in the entire medical literature before year 1,800 (E Sitting, 2001). Only when great pioneers such as Trousseau and Trendelenburg refined and popularized the operation and refine the clinical use of the procedure when in 1833 Trousseau reported on his experience with 200 diphtheria patients treated with tracheotomy. In 1871, Trendelenburg performed a tracheotomy to prevent blood inhalation during upper airway surgery (T Ezri, 2005).

During the time when many experience and experimental technique of tracheostomy grew , other consideration of non invasive airway management also were reported as early in 1754 when Benjamin Pugh, an English obstetrician described an air pipe for neonatal resuscitation (Davison, 1965). In 1760, Buchan described the first use of an opening in the patient windpipe during resuscitation. In 1788, Charkes Kite first used endotracheal tube in resuscitation of drowned persons and described their used by either the oral or nasal route (JA Lee, 1973). In late 1700s, Chaussier a gynaecologist in maternity hospital in Paris perform

translaryngeal intubation with self made tube in neonates with obstructed airway and also the first person to deliver oxygen to the newborn (WW Mushin, 1953).

Even with all the evidence and discoveries of advance airway management in late 1700s, the implementation, decision and the practice of performing the airway management among practitioner still erratic. Famous case, for example, in December 1799, three physicians gathered around a dying man who keep shifting his position and gasping for air. They tried to give him gargle but only found out that this man nearly choke to death. They knew this man had severe airway compromise. One physician aware of tracheostomy but was reluctant to do it since that man is a famous person. As a result George Washington died due to preventable suffocation from upper airway obstruction caused by severe bacterial epiglottitis (E Sitting, 2001).

In 1827, Leroy demonstrated vigorous bellow ventilation will cause emphysema and fatal pneumothorax in ventilated drown dog (Chinsky, 2001). Positive pressure ventilation was then banned for more then hundred years (Szmuk *et al.*, 2008). Despite the setback tracheostomy and tracheal intubation continued to be performed and their techniques improved through following decades especially in acute airway management.

In 1880, in Scotland, William Mac Ewen described how to relieve airway obstruction by passing an oral tube into the trachea. He practiced blind, digital

intubation using cadaver models and able to use this technique clinically (Gillespie, 1948). A few years later, in USA, a paediatrician Joseph O'Dwyer, developed a metal tube system that could be passed blindly to relieve airway obstruction in children with diphtheria and needed surgery after witnessing several mutilating effect of nasty tracheostomies. The only problem with O'Dwyer intubation system is that they had to be placed blindly (Gillespie, 1948).

End of the nineteenth century, a German surgeon Franz Kuhn constructed metal tube that he inserted oral with a digital blind technique (Gillespie, 1948). He also described the used of curved tube introducer and publish the first paper of nasal intubation (Gillespie, 1948). He also realize un blunted surgical stimulus may lead to spasm of the larynx and believe that "cocainization" of the larynx was a helpful adjunct for intubation (Gillespie, 1948). This was the first effort of awake intubation under topical anaesthesia.

During World War I, Magill and Rawbotham performed several endotracheal intubation with administration of endotracheal anesthesia and realize reconstructive surgery in mutilated soldiers are more successful when the airway are secured with endotracheal tubes. They also invented the Magill forcep that is usefull for nasal intubation (Thomas, 1978, Condon and Gilchrist, 1986).

The next important development was development of direct laryngoscopy which allowed visualization of the glottic structures. Manual Garcia (1805-1906),

perform autolaryngoscopy through the use of a dental mirror in combination with a second, larger mirror used to direct sunlight into his mouth (Alberti, 1996). This arrangement allowed him to see his larynx and trachea,

In 1940s, Miller and MacIntosh develop laryngoscopes and it use is common clinical use today. In 1941, Robert Miller described his straight laryngoscope blade, while in 1943 Robert MacIntosh described his curved blade (Doyle, 2009). At the same time, in Montreal, Canada in 1942, Harold Griffith introduced curare as a muscle relaxant with a view to facilitating abdominal surgery and other procedures. As a result, tracheal intubation became routine in major surgical procedures (Doyle, 2009).

Finally, any history of airway management would be incomplete without mentioning supraglottic airway devices such as the Laryngeal Mask Airway (LMA) by Dr. Archie Brain, the inventor of the LMA in 1937 (Doyle, 2009).

Landmarks in clinical airway management.

Biblical Times	Death from airway obstruction recognized (trauma, strangulation, leprosy, abscesses)
1842	Crawford Long discovers ether anesthesia
1854	Garcia, a professor of singing, develops indirect laryngoscopy
1878	Chloroform administered through tracheal tube (MacEwen)
1885	O'Dwyer popularizes intubation for diphtheria

1895	Kirstein develops direct laryngoscopy
1900	Kuhn develops a flexometallic tracheal tube
World War I	Many casualties requiring head and neck surgery adds impetus to widespread use of intubation in military hospitals; Magill introduces tracheal tube with inflatable cuff
1920	Chevalier Jackson designs improved laryngoscope
1920s	Magill develops blind nasal intubation
1942	Griffiths introduces curare into clinical practice
1946	Mendelson describes aspiration pneumonitis
1950s	Popularization of the use of tracheal tubes for general anesthesia
1960s	Advent of electronic patient monitoring
1962	Sellick maneuver and rapid-sequence induction developed
1940s-1970s	Continuing improvements in laryngoscope and tube designs; use of plastic
1970s	Development of implant-tested low-irritation, low-cuff pressure disposable tracheal tubes
1980s	Popularization of fiberoptic intubation. Introduction of pulse oximetry and capnography as non-invasive means of assessing oxygenation and ventilation
1990 s	Popularization of laryngeal mask airway, rigid fiberoptic laryngoscopes (Bullard, Wu, etc.,) and ASA Practice Guidelines for Management of the Difficult Airway. Increased awareness of the special challenges of the «difficult extubation» patient.

1995 Founding of the Society for Airway Management (www.samhq.com)

2000s Introduction of video laryngoscopes (GlideScope, McGrath, etc.)

2.2 Anatomy and physiology of the upper airway.

Anatomically, the upper airway consists of the pharynx and nasal cavities. However, functionally, the larynx and trachea may be included, and the oral cavity provides an alternate entrance to the respiratory passages (Morris, 1988).

The nose is a pyramidal structure composed of bone and cartilage attached to the facial skeleton, and is divided by a midline septum into the two nasal cavities. Kiesslbach's plexus (Little area) located at the anterior aspect of each nostril and easily traumatized during the insertion of nasotracheal tube. This will lead to severe epistaxis and known to be the most common complication during insertion of nasotracheal intubation (Redden, 2000). In addition, softening the endotracheal tube in warm water or saline have been demonstrated to reduce the complication rate particularly epistaxis (Lu *et al.*, 1998).

The paranasal sinuses drain into the nasal cavities and this nasal cavities also continuous with the nasopharynx posteriorly (Ron M. Walls, 2008). The adenoids are located just posteriorly and partially surround a depression in the mucosal membrane. During insertion, the tube often enters into this depression and resistance is encountered (Walls, 2008). Continued aggressive insertion can

cause the tube to penetrate the mucosa and may go deeper and cause complication.

The nose functions as a heater and humidifier of inspired gas, a voice resonator, and houses the olfactory receptors (Morris, 1988).

The mouth opens posteriorly into the oropharynx and forms the entrance to the digestive tract as well as an alternate pathway for respiration. It is also involved in phonation (Morris, 1988). Orotracheal intubation can be used as an alternative to nasal intubation to achieve airway protection and ventilation when necessary, however, variations in upper airway anatomy may make this technique difficult. In supine unconscious persons, backward movement of the tongue and lower jaw may cause airway obstruction.

The pharynx is a U-shaped fibromuscular tube extending from the base of the skull to the cricoid cartilage at the entrance to the esophagus. Anteriorly it opens into the nasal cavity, the mouth, and the larynx, which divide it into the naso-, oro- and laryngopharynx, respectively. The pharynx thus forms a common aerodigestive tract and is intimately involved with the act of swallowing.

The larynx consists of a framework of cartilages and fibroelastic membranes covered by a sheet of muscles and lined with mucous membrane. It evolved as a protective valve mechanism at the upper end of the lower airway

necessitated by an unusual crossover between the airway and alimentary canal. It functions as an open valve in respiration, a partially closed valve in phonation, and as a closed valve protecting against aspiration during swallowing. The larynx extends from its oblique entrance formed by the aryepiglottic folds, the tip of the epiglottis, and the posterior commissure to the lower border of the cricoid cartilage and bulges posteriorly into the laryngopharynx. The larynx is the most heavily innervated sensory structure in the body. Stimulation of the unanesthetized larynx during intubation cause tremendous reflex sympathetic activation and this may lead to elevation of intracranial pressure and may aggravate myocardial ischemia (Ron M. Walls, 2008).

The trachea extends from the lower edge of the cricoid cartilage to the carina where it divides into the mainstem bronchi. It is formed by U-shaped cartilaginous rings anteriorly and is closed posteriorly by the trachealis muscle. A properly placed endotracheal tube should have its tip at about midtracheal level.

Anyone who perform airway management need to familiarize with anatomy of the airway and understood the physiology effect of laryngoscopy and intubation of the upper airway. Attention of the anatomy in relation to technique will often mean the difference between success and failure in managing airway, particularly difficult airway (Walls and F.Murphy, 2008).

2.3 Emergency airway management.

Airway management is the single most important skill of the emergency physician and emergency airway management is one of the defining domains of the speciality of emergency medicine. Without a secure airway and adequate oxygenation and ventilation, other resuscitative measures are doomed to failure except of the immediate defibrillation of the cardiac arrest patient.

Emergence of new technology, such as various methods of video and fiberoptic laryngoscopy is changing the fundamental approach to airway decision making, particularly with respect to difficult intubation (Ron M. Walls, 2008). Nevertheless, airway management still comprises a definable series of complex actions and each need to be master by anybody who perform it. The sequence of event include:

- Rapid assessment of the need for intubation and the urgency of the situation.
- Determination of the best method of airway management
- Decide which pharmachological agent need to be use which depends on the case and the indication, in what order and dosage.
- The use of airway devices proficiently while minimizing the likelihood of hypoxemia, hypercarbia and aspiration.
- Recognize and planned alternative technique for airway management if initial airway intervention failed.

Emergency physician responsible for airway management must be proficient with rapid sequence intubation, which requires thorough knowledge of the pharmachology and effects of neuromuscular blocking agent, sedative or induction agents (Kuhn, 2004).

Indication For Intubation.

The decision to intubate should be base on three fundamental clinical assessments (Walls RM, 2008d):

Is there a failure of airway maintenance or protection?

A patent airway is essential for adequate oxygenation and ventilation, and also give airway protection against aspiration of gastric content. The ability of the patient to phonate with a clear, unobstructed voice is a strong evidence of both airway patency and protection. The patient's ability to swallow spontaneously and to handle normal oropharyngeal secretions is probably a better measure of the patients ability to protect the airway.

The presence of a gag reflex has not been demonstrated to ensure the presence of airway protection. In a study of 111 patients requiring neurological observation in emergency department, Moulten et al (Moulton *et al.*, 1991) found no correlation between the Glasgow Coma Scale (GCS) and the presence or

absence of a gag reflex. The gag reflex was noted to be variably present across the range of GCS from 6 to 15, independent of the patient's perceived need for intubation (Moulton *et al.*, 1991).

The gag reflex is not involved in laryngeal closure or protection of the airway. Bleach (Bleach, 1993) found an absent gag reflex in 27% of fully conscious patient who had undergone speech therapy and videofluoroscopy to assess for possible aspiration after neurological events. There is no correlation between aspiration and the presence (or absence) of the gag reflex (Bleach, 1993). Chan et al. (Chan *et al.*, 1993) studied 414 patients with acute poisoning and noted absence of the gag reflex to be only 70% sensitive in identifying patient who required intubation. Absence of gag reflex was 100% specific in identifying patients requiring intubation : the use of GCS score of 8 or less outperformed the gag reflex, and evaluation of the gag reflex added nothing to the assessment of the GCS score alone (Eizadi-Mood *et al.*, 2009, Chan *et al.*, 1993).

Is there a failure of ventilation or oxygenation?

If the patient is unable to ventilate adequately, or if adequate oxygenation cannot be achieved despite the use of supplemental oxygen, then intubation is indicated. Example in case of severe asthma or severe adult respiratory distress syndrome which they can maintain the airway patency and oxygenation but due to fatigability will lead to ventilatory failure resulting in hypoxemia and respiratory arrest (Walls RM, 2008d).

What's the anticipated clinical course.

These are the patients whose conditions, and airway, are predicted to deteriorate, either because of dynamic and progressive changes related to the presenting condition or because the work of breathing will become overwhelming in the face of catastrophic illness or injury (Walls RM, 2008d).

This might include patients with oropharyngeal burns from a house fire, facial trauma or facial abscesses. Airway compromise in these conditions is a real possibility and airway management often becomes increasingly difficult as time passes. If there is an anatomical distortion that will make intubation more difficult as time goes on, it is the wise physician who will recognize the problem and provide simple protection before the process progresses(Kuhn, 2004).

Considerations for early intubation in polytrauma patient with hypotension and multiple severe injuries, including chest trauma. Patients shock state causes inadequate tissue perfusion and increasing metabolic debt. This debt significantly affect the muscles of respiration, and progressive respiratory fatigue. Intubation improves tissue oxygenation during shock and help reduce the increasing metabolic debt burden (Walls RM, 2008d).

Approach To The Airway In Emergency Department.

There are several questions the emergency physician must ask in approaching airway of patient in emergency department. How much time do I have? Is this a critical airway and a crash situation? Do I need to intubate now or do I have a few minutes to prepare? If in a crash situation like a full cardiopulmonary arrest, orotracheal intubation must be prepare without further delay. If there is time to prepare, then the physician must predict which airway intervention is best and most likely to succeed. Evaluation on whether it will be a difficult airway to intubate and if it is a difficult airway and the first attempt at intubation fails, can the patient be ventilated with a bag-valve-mask (Kuhn, 2004).

Walls in his text book on airway management in emergency department, recommend the use of a "Universal Algorithm" for emergent airway management along with several more specific algorithm for consideration, example: 'Difficult Airway Algorithm', 'Crash Airway Algorithm', 'Failed Airway Algorithm' (Walls RM, 2008d). These guidelines represent a more appropriate application of principles and constrains to airway management in the emergency department setting (Ibrahim, 2002). Unfortunately, there are no systemic data supporting the algorithm approach and the algorithm mainly result from careful review of the American Society of Anesthesiology and composite knowledge an experience of the writers as an expert panel in this.

While most situation requiring definitive airway control are relatively easy to handle, the unusual difficult airway can turn into clinical disaster. The most important aspect of advance airway management is being able to anticipate the difficult airway in specific patients and having plan of action on how to approach complicated deteriorating patients. Several steps can be taken to minimize the potential for failure which is airway management should be approach in control setting, proper positioning of the airway and proper use of basic technique especially the usage of bag valve mask ventilation.

2.4 **Basic Technique**

Bag valve mask ventilation is the cornerstone of airway management. This is the most important skill and the most difficult to perform correctly. In fact, its appear importance as it buy time as one works through potential solution in managing difficult or failed airway.

Successful bag valve mask ventilation depends on patent airway, an adequate mask seal and proper ventilation. Technique in producing patent airway include head extension, chin lift, and jaw thrust maneuvers. Adequate mask seal requires understanding the design of the mask use and the anatomy of the face itself. Appropriate volume, rate and appropriate force also must be given correctly during ventilation

Opening the airway should be done before placing the mask on the face. Two manoeuvres that commonly used are head tilt chin lift in non trauma case and jaw thrust manoeuvres in trauma patient which both aim is to moves the tongue anteriorly and relive the airway obstruction (Uzun *et al.*, 2005, Guildner, 1976). Adjunct of the above technique is by inserting oropharyngeal and nasopharyngeal airway.

Proper seal mask must be achieved by practicing multiple way of handling the mask according to the type of the mask, patient facial anatomy and also the size of the performer. The goal of effective ventilation is to deliver 1-12 reduced tidal volume breath (500cc) per minute (Davis *et al.*, 1995, Wolcke *et al.*, 2000). The primary goal also is oxygenation without gastric inflation. This is best accomplished by focusing on avoiding high airway pressure during bag mask ventilation (Wolcke *et al.*, 2000, Petito and Russell, 1988).

Proper application of cricoid pressure does appear to reduce the amount of air entering the stomach when bag mask valve is performed with low to moderate pressure (Petito and Russell, 1988). There is also literature demonstrated that Sellick's manoeuvre may not occlude the oesophagus (Smith *et al.*, 2003) and impair ventilation by partially obstructing the upper airway (Hartsilver and Vanner, 2000). There also study that describe application of Sellick's manoeuvre may improve (Levitan *et al.*, 2006) and worsen (Snider *et al.*, 2005) during introducing endotracheal tube during intubation.

2.5 Endotracheal intubation

Direct laryngoscopy is the centrepiece of endotracheal intubation. This requires both dexterity and creativity to align oral, pharyngeal, and laryngeal axes of the airway so that the person who perform the endotracheal intubation provided the best view of the glottis. Best attempt of laryngoscopy has few component :

2.5.1 Well experience airway personal .

The decision to intubate implies that the airway personal has formulated a primary airway and back up if initial plan failed. Before starting the intubation attempts, the airway personal need to ensure all the equipment and drugs that needed in each airway plan prepared. Intubation also need to have adequate suction and trained assistance that is positioned on the right side of the patient and be trained and prepared to pass equipment to airway manager, able to hold the head in position, can perform Sellick's maneuver application, laryngeal manipulation and hold open the corner of the mouth during intubation and remain in position until excused by the airway personal. One person also must be designated for monitoring all vital sign and records the number of attempts and required for each attempts.

Equipment also need to be checked before intubation attempts. Endotracheal tube (ETT) be must check for balloon patency with 10cc syringe and put it near to the patient for easy assess. Apply small amount of lubricant to