SWESEMs utbildningsutskott

Rubrik

Ventilation med mask och blåsa

2013-09-30

Introduktion

Otillräcklig ventilation kan leda till hypoxi och/eller hypercapné. En snabb och i regel effektiv åtgärd är ventilation med mask och blåsa. Åtgärden kan också vara indicerad hos exempelvis en patient som inte orkar/kan tillräckligt kompensera för en metabol acidos, eller där hyperventilation är terapeutisk åtgärd (högt ICP, intox membranstabiliserare). Specialister i akutsjukvård ska behärska denna basala kompetens[1], som dock inte alltid är enkel att genomföra. Akutläkare ska kunna bedöma risk för svårventilerad patient, kunna ventilera patienten ensam eller med hjälp av en assistent och ha en alternativ plan om det inte fungerar. Specialister i akutsjukvård ska också kunna använda pocket mask.

I specialisttentamen

I specialisttentamen ingår att bedöma risk för svår maskventilation och att utföra maskventilation på patienter i alla åldersgrupper.

Indikation[2]
- Otillräcklig ventilation

Kontraindikationer[3]
Det finns inga absoluta kontraindikationer att ventilera en patient som behöver det, men om ventilationen inte fås att fungera får fortsatta försök inte fördröja en fungerande lösning. Främmande kropp i luftvägen och deformerande ansiktsskador är relativa kontraindikationer.

1-Förbereder patienten
- ☐ Optimerar britsens höjd, patientens plats på britsen och huvudets position[4], ev tandproteser lämnas kvar[5]
- ☐ Monitorerar patientens vitala funktioner (pulsoximeter, blodtryck, 3-avl EKG)
- ☐ Bedömer svårighetsgrad för maskventilation enligt MOANS©[11]

2-Förbereder utrustning och team
- ☐ Tar på sig skyddsutrustning (handskar, plastförkläde, vb munskydd, ögonskydd)
- ☐ Kontrollerar och har sug, svalgtub/näskantarell inom räckhåll
- ☐ Mask av rätt storlek[8]
- ☐ Blåsa av rätt storlek[9], kopplad till syrgas[10]
- ☐ Avsiktligt inställt/kunskap om blåsans/ventilernas ventilationstryck och PEEP
- ☐ Informerar teamet att ventilation påbörjas och "plan B": vad som är nästa steg om åtgärden inte fungerar (ex vid behov av assistent vid tvåhandsteknik, larynxmask eller annan luftvägsåtgärd[12]) eller om komplikation uppstår (ex sug vid kräkning)

3-Handgrepp
- ☐ Håller masken tät över näsa och mun[13]: med en- eller tvåhandsteknik
- ☐ Lyfter mandibula anteriort (chin-lift +/- jaw thrust)[13]: med en- eller tvåhandsteknik
- ☐ Ventilerar med adekvat tidalvolym, luftvägstryck och frekvens[14]
- ☐ Optimerar luftvägen med basala luftvägsmanövrar[6] efter situation (se färdighet)

4-Kontroller
- ☐ Inspekterar/palperar bröstkorgsrörelser[15] och kontrollerar ventilation
- ☐ Lyssnar efter luftvägsljud (snarkning/stridor) och läckage av otät mask[15]
- ☐ Kontrollerar resultat på vitalparametrar, eventuellt blodgasanalys (pCO2)
- ☐ Inspekterar/auskulterar om ventrikeln fylls med luft och åtgärdar (teknik, v-sond?)

5-Teknik/Helhetsbedömning
- ☐ Genomför färdigheten på ett ofarligt sätt (avseende halsrygg, luftväg, tryck mot ögon, luftvägstryck, cirkulatoriska effekter av övertrycksventilation, synkront med patientens egenandning när sådan finns, för patienten lämplig minutvolym)
- ☐ Uppvisar förtrogenhet med utrustningen och handgreppen

ANTECKNINGAR

1-Basal, väsentlig men svår färdighet
"Bag-mask ventilation is the cornerstone of basic airway management and is not a skill easily mastered." (Barker 2011)

"Bag-mask ventilation is a crucial airway management skill and one of the most difficult to perform correctly." (Barker 2011)

"Bag-mask ventilation is the single most important technique for emergency airway management. Bag-mask devices are widely available and are standard equipment in all patient care settings. Although the bag-mask method of ventilation appears to be simple, it can be difficult to perform correctly. Having good bag-mask ventilation skills is a prerequisite to more advanced methods of emergency airway management. Manually opening the airway, properly positioning the head and neck, placing an oropharyngeal airway device, and achieving a tight face mask seal are the keys to good bag-mask ventilation." (Reardon 2009)

2-Indikation
"Face-mask ventilation is used in patients who have respiratory failure but are still breathing spontaneously and in patients with complete apnea. Face-mask ventilation can be indicated in any situation in which spontaneous breathing is failing or has ceased, including cardiopulmonary arrest." (Ortega 2007)

"Bag-mask ventilation . . . is most often needed because of inadequate ventilation, which can result from impaired respiratory effort or airway obstruction. Basic airway interventions may also be needed to manage the patient with inadequate oxygenation and during cardiopulmonary resuscitation." (Barker 2011)

"Regardless of the care taken by the intubator and the detailed assessment of the patient before intubation, some intubations are simply unsuccessful or impossible. In most circumstances when intubation is not possible, BMV or ventilation using an EGD provides adequate ventilation and oxygenation until a rescue airway can be established." (Walls 2009)

"Bag-mask ventilation is the most common initial technique for ventilation of apneic patients and for rescue ventilation after failed intubation." (Reardon 2009)

"Bag-mask ventilation may be the best method of prehospital airway support in trauma patients and in children. Murray and coworkers performed a large retrospective study suggesting that patients with severe head injury had a higher risk of mortality if they were intubated in the prehospital setting. In the same year, Gausche and associates reported that neurologic outcome and ultimate survival rates of prehospital pediatric resuscitations by emergency medical service (EMS) providers with bag-mask ventilation were as good as with tracheal intubation." (Reardon 2009)

"Properly performed bag-mask ventilation enables clinicians to provide adequate ventilation and oxygenation to a patient requiring airway support. This in turn gives the clinician sufficient time to pursue a controlled, well-planned approach to definitive airway management, such as endotracheal (ET) intubation." (Barker 2011)

“Due to a higher metabolic rate, oxygen consumption is increased in children, especially in infants. Infants and children have an increased relative cardiac output and minute ventilation to match the increased metabolic demand. However, children are vulnerable to rapid desaturation when oxygenation or ventilation is reduced. Children have relatively small volume lungs with small functional residual capacities. This translates into a reduced oxygen reservoir, which decreases the effectiveness of preoxygenation and makes optimal preoxygenation more difficult. Therefore, be prepared to support oxygenation with bag-mask ventilation, often before an intubation attempt, while awaiting the onset of induction and paralysis. Attempts at intubation may need to stop once oxygen saturation drops below 90% to allow for bag-mask ventilation before the next attempt. Below an oxygen saturation of 90%, desaturation is particularly rapid. The vast majority of children are easily bag ventilated when the proper technique is used, even when partial obstruction is present. The key is anticipation and early use of good bag-mask ventilation.” (Tintinalli 2011 Chapter 28)

3-Kontraindikationer

“Face-mask ventilation is rarely contraindicated. However, caution is advised in patients with severe facial trauma and eye injuries. In addition, foreign material (e.g., gastric contents) in the airway may lead to aspiration pneumonitis. In these circumstances, alternative approaches, including endotracheal intubation, may be necessary.” (Ortega 2007)

“Many authors note that bag-mask ventilation is relatively contraindicated in patients with a full stomach, those who are in cardiac arrest, and those who are undergoing RSI. These patients have a high risk of stomach inflation and subsequent aspiration. Unfortunately, these are the patients for whom ED providers most commonly use bag-mask ventilation. In ED situations, the need for ventilation and oxygenation always takes priority over potential aspiration.

The only contraindication to attempting bag-mask ventilation is when application of a face mask is impossible. It is often impossible to achieve an effective face mask seal on patients with significant deforming facial trauma and those with thick beards. An intermediate ventilation device, such as a laryngeal mask airway (LMA), is a better choice for initial ventilation in such patients.” (Reardon 2009)

4-Huvudet i rätt position

“Because of the relatively large occiput, elevation of the head is usually not required, and in infants, a supine position may cause flexion of the neck, occasionally requiring a roll under the shoulders to prevent flexion. Optimal alignment of the oral, pharyngeal, and tracheal axes can then be achieved with extension at the atlanto-occipital junction, known as the *sniffing position*. In a well-positioned airway, a horizontal line extending from the external auditory canal will lie just anterior to the shoulder.” (Tintinalli 2011 Chapter 29)

5-Lösa tänder/tandproteser

“The difficulty with BMV of the edentulous patient is the basis of the adage: “Remove dentures to intubate, leave them in to bag-mask ventilate.” The wisdom of this approach recently was validated yet again.” (Walls 2009)

“Generally, well-fitting intact dentures should be left in place to help ensure a better seal with the mask.” (Reardon 2009)

“Dentures facilitate BVM ventilation.” (Tintinalli 2011 Chapter 30)

6-Näskantarell eller svalgtub
"Placement of an oral or nasal airway further facilitates airflow." (Tintinalli 2011 Chapter 28)

"Appropriately sized oral airways (measured from the mandibular angle to the lip) should always be placed in the unconscious child and can assist with displacement of the relatively large pediatric tongue." (Tintinalli 2011 Chapter 29)

"Successful bag-mask ventilation depends on three things: a patent airway, an adequate mask seal, and proper ventilation (ie, proper volume, rate, and cadence). Airway patency is obtained using airway maneuvers and adjuncts." (Barker 2011)

"airway adjuncts (ie, nasopharyngeal and oropharyngeal airways): verify that airway adjuncts are being utilized and in proper position" (Barker 2011)

8-Maskstorlek
"Correctly sized bags and masks are essential to good ventilation, regardless of the provider's skill." (Tintinalli 2011 Chapter 29) Rätt mask storlek hos barn täcker näsan och munnen men skadar inte ögonen. Se Figure 29-3 (Tintinalli 2011 Chapter 29)

"A variety of mask configurations are available to facilitate a tight seal. The most common mask used in ED situations is a transparent disposable plastic mask with a high-volume, low-pressure cuff. This type of mask eliminates the need for an anatomically formed mask and can be used for a wide variety of patients with differing facial features. Various mask sizes are available." (Reardon 2009)

9-Blåsstorlek och typ
"Correctly sized bags and masks are essential to good ventilation, regardless of the provider's skill." (Tintinalli 2011 Chapter 29)

"A significant problem with the bag-mask method is the low percentage of O_2 achieved with some reservoirs. The amount of delivered O_2 is dependent on the ventilatory rate, the volumes delivered during each breath, the O_2 flow rate into the ventilating bag, the filling time for reservoir bags, and the type of reservoir used. A 2500-mL bag reservoir and a demand valve are preferred for O_2 supplementation during bag-mask ventilation." (Reardon 2009)

"Pediatric bag-mask devices should have a minimum volume of 450 mL. Pediatric and larger bags may be used for ventilation of infants with the proper mask size, but be careful to administer only the volume necessary to effectively ventilate the infant. Avoid pop-off valves because airway pressure under emergency conditions may often exceed the pressure of the valve." (Reardon 2009)

10-Koppla syrgas
"All bag-mask devices should be attached to a supplemental O_2 source (with a flow rate of 15 L/min) to avoid hypoxia." (Reardon 2009)

APLS rekommenderar följande vid användning av pocket mask:
"Attach oxygen to the face mask if possible." (APLS 5th ed)

11-Bedömning av svårighetsgrad

“Before any attempt at airway management, assess potential difficulties for BVM ventilation and intubation.” (Tintinalli 2011 Chapter 30)

“The presence of two of the following five factors is predictive of difficult BVM: facial hair, obesity, edentulous patient, advanced age, and snoring. An inability to adequately ventilate with a BVM is usually solved by better positioning, jaw thrust, a tighter seal with two-person bagging, and the use of oral and nasal airways. A poor seal due to a beard may be improved with a lubricant applied to facial hair.” (Tintinalli 2011 Chapter 30)

Rosen’s rekommenderar användning av minneshjälpen MOANS där:
- M står för difficulty for Mask seal
- O står för obstruction or obesity: “obstruction (particularly supraglottic obstruction, but can be present anywhere in the airway) or obesity (because of redundant upper airway tissues, chest wall weight, and resistance of abdominal mass)” (Walls 2009)
- A står för Advanced age (best judged by the physiologic appearance of the patient, but age older than 55 years increases risk)
- N står för edentulousness (“no teeth”), which independently interferes with mask seal
- S står för Stiffness or resistance to ventilation (e.g., asthma, chronic obstructive pulmonary disease, pulmonary edema, restrictive lung disease, term pregnancy) all cause or contribute to increased difficulty with BMV.” (Walls 2009)

“Langeron and colleagues performed a large prospective study of adults undergoing general anesthesia and reported a 5% incidence of difficult mask ventilation. They also identified five independent risk factors for difficult mask ventilation. When mask ventilation is technically difficult, higher peak airway pressure is often required in order to provide an adequate tidal volume. In these situations, gastric inflation is more likely and aspiration may occur.” (Reardon 2009)

Riskfaktorerna var följande:
“Presence of a beard
Body mass index > 26 kg/m2
Lack of teeth
Age > 55 yr
History of snoring” (Reardon 2009)

“Difficult BMV has been studied and the predictors of difficulty are summarized by the mnemonic MOANS©. There is no clear correlation between each of these attributes and the degree of difficulty, but assessment of all the attributes helps to determine whether difficulty with BMV is likely.

M: mask seal — Mask seal requires reasonably normal anatomy, absence of facial hair, lack of interfering substances, such as excessive vomitus or bleeding, and the ability to apply pressure to the face with the mask.
O: Obstruction/Obsesity — Obstruction of the upper airway, although not widely studied, will make BMV more difficult, as increased pressures will be required to ensure that gas flows past the obstruction in both directions. Obesity (BMI>26) is an independent marker of difficult BMV. Redundant upper airway tissue and the combination of chest wall weight and resistance from abdominal contents all impede airflow. Late third trimester pregnancy is a surrogate for obesity with respect to BMV, as it creates many of the same problems. Placing the bed at an angle with the

head higher than the feet (ie, reverse Trendelenburg) may reduce impedance to airflow from abdominal weight.
A: Age — In one study, age >55 years was a marker of difficult BMV [9]. Most likely the general loss of elasticity of tissues and the increased incidence of restrictive or obstructive pulmonary disease make ventilation more difficult. Fifty-five years is not a distinct cut-off, but as patients age, or appear to be physiologically aged, it is reasonable to assume that BMV difficulty will increase.
N: No teeth — Edentulousness creates difficulty with BMV. Teeth provide a framework against which the mask sits and support the cheeks, enhancing mask seal. If a patient has dentures, they should be left in situ during BMV, where they are of benefit, then removed for direct laryngoscopy, where they are detrimental [39].
S: Stiffness — Stiffness is used to connote resistance to ventilation that occurs in conditions that increase the required inspiratory pressure to ventilate the lungs and include asthma, chronic obstructive pulmonary disease (COPD), pulmonary edema, widespread infiltrates, and any other condition that decreases pulmonary compliance." (Walls 2011)

"Difficult mask ventilation is defined as the inability to maintain O2 saturation above 90% despite optimal positioning and airway adjuncts." (Tintinalli 2011 Chapter 30)

12-Utrustning för Plan B
"Once the potential for difficulty is identified, management will vary with not only the type of airway difficulty but also the operator's experience and availability of alternative devices." (Tintinalli 2011 Chapter 30)

13-Mask på, protrusion i käken
"Once the airway is open, the next step is to correctly position the mask on the patient's face. The bag is detached from the mask prior to mask positioning. Having a large, heavy bag pulling on one end of the mask is a common error that unnecessarily complicates proper placement. The nasal portion of the mask should be spread slightly and placed on the bridge of the patient's nose. The body of the mask is then placed onto the patient's face covering the nose and mouth. The three facial landmarks that must be covered by the mask are the bridge of the nose, the two malar eminences, and the mandibular alveolar ridge. Neither the provider's wrists nor the mask cushion should rest on the patient's eyes during bag-mask ventilation as this can cause a vagal response or damage to the eyes." (Barker 2011)

"Lower lip placement, in which the caudad end of the face mask is positioned between the lower lip and the alveolar ridge, may improve ventilation in edentulous patients [29]. In one observational study of 49 edentulous patients with a substantial air leak during two-handed bag-mask ventilation performed in the operating room, use of the lower lip technique reduced the median air leak by 95 percent." (Barker 2011)

"ensure that the corners of the mouth and all airway adjuncts are inside the body of the mask, NOT creating a leak by interfering with mask seal." (Barker 2011)

"There are two methods for holding the mask in place: the single-hand (one hand, one person) mask hold and the two-hand (two hand, two person) mask hold. Although the two-hand mask hold is most effective, it requires a second clinician. Therefore, it is important to be comfortable with both techniques. When ventilation using a one hand, one person technique is unsuccessful, despite oral and nasal airway placement, a two hand, two person technique should be used." (Barker 2011)

“Single-hand technique for bag-mask ventilation — One hand is placed on the mask with the web space between the thumb and index finger resting against the mask connector. The web space is placed in the center of the mask, allowing for a more even application of pressure. Force should not be exerted via the palm of the hand because it is off center and more likely to produce an air leak. The other three fingers (ie, middle, ring, and little) are placed along the mandible and pull the mandible up into the mask in a chin-lift maneuver, allowing the airway to open further. Those with larger hands can place the little finger posterior to the angle of the mandible and perform a jaw-thrust, although this is tiring to the hand. The correct technique is to lift the mandible up into the mask with the middle, ring, and little fingers while holding the mask tightly against the patient's face with the thumb and index finger. Clinicians should take care to pull up only on the bony parts of the mandible: pressure to the soft tissues of the neck may occlude the airway.” (Barker 2011)

“Two-hand technique for bag-mask ventilation — The two-hand mask hold requires two providers, but it is the most effective method of opening the patient's airway while maintaining an adequate mask seal and minimizing provider fatigue. With this technique, one provider's sole responsibility is to use both hands to create a good mask seal and to maintain an open airway. Another provider squeezes the bag to ventilate the patient. Proper placement and holding of the mask are essential for a good seal and are the most difficult aspects of bag-mask ventilation. The most experienced airway manager available should therefore control the mask. There are two ways to position the hands. In the more traditional method, both thumbs and index fingers hold pressure along the inferior and superior ridges of the mask (figure 5). The other three fingers on each hand hold the mandible, in a fashion similar to the one-handed mask hold, and perform a simultaneous chin-lift and jaw-thrust maneuver. This position may not be comfortable to maintain for long periods of time. We recommend another method of two-handed mask technique that uses the stronger thenar eminences to hold the mask in place. The thenar eminences are positioned parallel to each other along the long axis of each side of the mask, allowing the four remaining fingers to provide chin-lift and jaw-thrust maneuvers (figure 5). This technique is easier to perform, allows stronger hand muscles to maintain a proper seal, minimizes provider fatigue, and enables four fingers to perform the chin-lift and jaw-thrust. In a crossover randomized trial of 42 elective surgery patients, two-handed bag-mask ventilation provided greater minute ventilation and tidal volumes and fewer episodes of inadequate ventilation compared to a one-handed technique.” (Barker 2011)

“If you are the single operator, after placing the mask on the patient's face, clamp the mask snugly onto the face using your thumb and index finger to grasp the mask, while using the other fingers to grasp the chin and pull it forward. Use the other hand to compress the bag. The most common problem with a one-person operation is air leaks around the mask. A two-person operation allows one person to use two hands to hold the mask flush onto the face and usually produces more effective ventilation because a better seal can be maintained.” (Tintinalli 2011 Chapter 28)

“Another common error is pressing the mask into the face in an attempt to achieve a good seal, which causes flexion of the neck and subsequent airway obstruction.” (Tintinalli 2011 Chapter 29)

“A mask seal can be obtained using a one-handed, "C-grip" or "E-C clamp" technique in smaller children, with the thumb and index finger positioned on the mask and the remaining fingers pulling the mandible up into the mask, while maintaining extension at the atlanto-occipital junction. In larger children a two-handed technique can be used. With either technique, it is important that the airway be pulled up into the mask, rather than pushing the mask down.” (Tintinalli 2011 Chapter 29)

“For the single rescuer, only one hand can be used to achieve the seal because the other must squeeze the bag. The rescuer must apply pressure anteriorly while simultaneously lifting the jaw forward. The thumb and index finger provide anterior pressure while the fifth and fourth fingers lift the jaw. The E-C clamp technique is often the most effective: The thumb and index finger form a “C” providing anterior pressure over the mask; while the third, fourth, and fifth fingers form an “E” to lift the jaw.” (Reardon 2009)

“One-handed bag-mask ventilation technique can be difficult to perform efficiently. The thumb and index finger control the mask, while the third to fifth fingers lift the mandible up into the mask. It may be possible to place the little finger behind the angle of the mandible to perform a jaw-thrust maneuver.” (Reardon 2009)

“It has been suggested that effective bag-mask ventilation during CPR requires two hands and, therefore, two rescuers. We suggest using the two-rescuer technique whenever it is practical.” (Reardon 2009)

“With the easier two-handed bag-mask ventilation technique, the mask is controlled by the thenar eminences and thumbs, while the second through fifth fingers perform a jaw thrust and lift the mandible up into the mask. One operator controls the mask, the other the bag.” (Reardon 2009)

“Whenever possible, a two-handed technique is preferred for bag-mask ventilation.” (Barker 2011)

APLS rekommenderar följande vid användning av pocket mask:
“1 Apply the mask to the face, using a jaw thrust grip, with the thumbs holding the mask. If using a shaped mask, it should be the right way up in children, or upside down in infants.
2 Ensure an adequate seal.” (APLS 5th ed)

APLS rekommenderar följande vid användning av mask och blåsa:
“1 Apply the mask to the face, using a jaw thrust grip. The fourth and fifth fingers should perform a jaw thrust and the other fingers hold the mask tightly in place (Figure 20.9).
2 Ensure an adequate seal. . . .
If a two - person technique is used, one rescuer maintains the mask seal with both hands, while the second person squeezes the self - inflating bag. This is to be recommended.” (APLS 5th ed)

14-Ventilation och observation av bröstkorgen
Vid manuell ventilation är målet att uppnå en ventilation som motsvarar patientens behov. Exempelvis kan en patient med metabol acidos behöva hyperventileras för att behålla sin respiratoriska kompensation, men en vuxen patient med hjärtstopp och HLR har så låg hjärtminutvolym att endast lite syrgas tas upp ur alveolerna och mindre minutventilation behövs. För en patient med egenandning som stödventileras bör denna synkroniseras med patientens andning, även om extra andetags ges emellan.

“A common error in pediatric bag-mask ventilation is the tendency to bag too rapidly, rather than match the rate and volume appropriate for the child's age. On occasion, the rate or volume will need to be adjusted for the disease state. For example, lower volumes and longer expiratory times are often needed in asthma.” (Tintinalli 2011 Chapter 29) Parametrar finns i Table 29-5 (Tintinalli 2011 Chapter 29)

APLS rekommenderar följande vid ventilation med mask och blåsa:
"Ventilate at an initial 12 – 20 breaths/min, depending on the age of the child, if the child is apnoeic or is hypoventilating. If using the bag and mask for CPR then use two ventilations to 15 chest compressions." (APLS 5th ed)

APLS rekommenderar följande vid ventilation med pocket:
"3 Blow into the mouth port, observing the resulting chest movement.
4 Ventilate at an initial 12 – 20 breaths/min, depending on the age of the child, if the child is apnoeic or is hypoventilating. If using the mask for cardiopulmonary resuscitation (CPR) then use two ventilations to 15 compressions." (APLS 5th ed)

"Achieving adequate tidal volumes with bag-mask ventilation requires a tight mask seal and appropriate compression of the bag. However, overaggressive bag-mask ventilation causes stomach inflation and increases the risk of aspiration. The goal is to achieve adequate gas exchange while keeping the peak airway pressures low. Squeezing the bag forcefully and abruptly creates a high peak airway pressure and is more likely to inflate the stomach. Several studies show that increased tidal volume is associated with higher peak airway pressures and increased gastric inflation. Data also show that decreased inspiratory time increases peak airway pressure and increases gastric inflation. Therefore, it appears that the best method of bag-mask ventilation is to provide a tidal volume of about 500 mL delivered over 1 to 1.5 seconds." (Reardon 2009)

"Pediatric and larger bags may be used for ventilation of infants with the proper mask size, but be careful to administer only the volume necessary to effectively ventilate the infant." (Reardon 2009)

"Once an open airway and a good mask seal are present, the clinician connects the bag to the mask and ventilates the patient. Three critical errors should be avoided:
- Giving excessive tidal volumes
- Forcing air too quickly
- Ventilating too rapidly

A volume just large enough to cause chest rise (no more than 8 to 10 cc/kg) should be used. During cardiopulmonary resuscitation (CPR), even smaller tidal volumes are adequate (5 to 6 cc/kg) due to the reduced cardiac output of such patients. The bag should not be squeezed explosively. It should be squeezed steadily over approximately one full second. This technique, in addition to producing smaller tidal volumes, reduces the likelihood of creating sufficient pressure to open the gastroesophageal sphincter, which leads to gastric inflation. The ventilatory rate should not exceed 10 to 12 breaths per minute.
These important concepts are based on multiple randomized controlled studies in animals and observational studies in humans showing that the use of larger tidal volumes and ventilation rates is associated with increased intrathoracic pressures, which compromise both coronary and cerebral perfusion pressures." (Barker 2011)

15-Kontroller och eventuella åtgärder
"Effective ventilation and oxygenation should be judged by chest rise, breath sounds, SpO, and exhaled CO monitoring." (Readon 2009)

"The clinician performing bag-mask ventilation must carefully monitor the adequacy of his or her technique at all times." (Barker 2011)

“Inadequate mask seal: patients with facial hair may need KY jelly or water applied to improve the seal; edentulous patients should have their false teeth reinserted [28] or their cheeks expanded with 4 x 4 gauze.” (Barker 2011)

V-sond?
“Children can develop gastric distention from air swallowing during distress as well as insufflation during bag-mask ventilation. Gastric distention can further compromise functional residual capacity, tidal volume, and ventilation. Early placement of an orogastric or nasogastric tube may remedy this.” (Tintinalli 2011 Chapter 28)

“The main complications of the bag-mask technique are inability to ventilate and gastric inflation. . . . Be vigilant to recognize complications early and take corrective action. Even when bag-mask ventilation is easy and good technique is used, some gastric dilatation will usually occur. Minor gastric distention should not be considered substandard in the setting of prolonged bag-mask ventilation.” (Reardon 2009)

Cricoidtryck?
“Consider applying cricoid pressure during bag-mask ventilation. Cricoid pressure is often referred to as Sellick's maneuver, because of Sellick's classic article in 1961.[120] The purpose of the technique is to apply external force to the anterior cricoid ring to push the trachea posteriorly, compressing the esophagus against the cervical vertebrae. In theory, cricoid pressure compresses the distensible upper esophagus but not the airway, because the cricoid ring is fairly rigid. Some data suggest that cricoid pressure prevents gastric inflation and subsequent vomiting/regurgitation during bag-mask ventilation and intubation. However, there are also conflicting reports and some controversy about whether cricoid pressure is really effective. Nevertheless, cricoid pressure is currently recommended and should be performed when possible during resuscitation and all RSIs.

Be aware that excessive or incorrectly applied cricoid pressure can interfere with bag-mask ventilation, direct laryngoscopy, and insertion of the LMAs. When faced with difficult or failed ventilation or intubation, or when using LMAs, consider relaxation of cricoid pressure. Also, be very careful when applying cricoid pressure in infants and young children, whose airways are more pliable and subject to obstruction with excessive cricoid pressure. The proper technique for applying cricoid pressure (Sellick's maneuver) is to place the thumb and middle finger on either side of the cricoid cartilage with the index finger in the center anteriorly. Apply about 30 N of force to the cricoid cartilage in the posterior direction. As a reference, about 40 N of digital force on the bridge of the nose will usually cause pain.” (Reardon 2009)

“Sellick's maneuver (ie, firm cricoid pressure) may reduce gastric insufflation during bag-mask ventilation, and it is reasonable to apply it during BMV if adequate personnel are available.” (Barker 2011)

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