Thoughts on the Use of Continuous Positive Airway Pressure in the Field for Ventilatory Assistance

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Sorrento, Italy

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Presented with thanks to the State of Wisconsin Department of Health and Family Services EMS Systems Section and to Dr. George Boussignac

History:

CPAP has been in use for over 50 years, mainly for weaning patients from mechanical ventilation.

For this purpose it was applied by way of an endotracheal tube or full face mask.

History of CPAP

1912 - Maintenance of lung expansion during thoracic surgery (S. Brunnel)

1937 - High altitude flying to prevent hypoxemia. (Barach et al)

1967 - CPPB + IPPV to treat ARDS (Ashbaugh et al)

1971 - Term CPAP introduced, used to treat HMD in neonates (Gregory et al)

1972 - CPAP used to treat ARF *(Respiratory Failure)* (Civetta et al)

1973 - CPAP used to treat COPD (Barach et al)

1981 - Downs generator (Fried et al)

1982 - Modern definition of CPAP (Kielty et al)

History:

In 1981, Sullivan and associates described the use of a nasal mask so that CPAP could be applied more conveniently and comfortably. They first used nasal CPAP to treat obstructive sleep apnea, whereby the air pressure acts as a pneumatic splint to prevent pharyngeal collapse during sleep. Nasal CPAP is now widely used at home for this indication.

1: Am J Cardiol. 1985 Feb 1;55(4):296-300. Related Articles, Link

Click here to read

Continuous positive airway pressure by face mask in acute cardiogenic pulmonary edema.

Rasanen J, Heikkila J, Downs J, Nikki P, Vaisanen I, Viitanen A.

The therapeutic efficacy of continuous positive airway pressure (CPAP) administered by face mask was studied in 40 patients with acute cardiogenic pulmonary edema and respiratory failure. Arterial blood gas values and pH, systemic arterial pressure, heart rate and respiratory rate were measured during administration of 30% oxygen with a high-flow face mask apparatus at ambient airway pressure. Twenty patients were then randomly chosen to continue ambient airway pressure breathing and 20 received 10 cm H_2O of CPAP. The measurements were repeated 10, 60 and 180 minutes after therapy was initiated. During the first 10 minutes of CPAP treatment, arterial blood oxygen partial pressure increased 8 +/- 9 mm Hg (mean +/- 1 standard deviation), (p less than 0.01) and respiratory rate decreased 5 +/- 5 breaths/min (p less than 0.001). Systolic arterial pressure decreased 12 +/- 21 mm Hg (p less than 0.05), and heart rate by 10 +/- 11 beats/min (p less than 0.001). A decrease in respiratory rate by 2 +/- 5 breaths/min (p less than 0.05) was the only change that occurred in the control group. The improvement in arterial blood oxygenation persisted throughout the investigation period (p less than 0.05). Thirteen patients (65%) in the control group and 7 patients (35%) in the CPAP group met our criteria for treatment failure during the study (p = 0.068). Thus, CPAP administered by face mask improves gas exchange, decreases respiratory work, unloads circulatory stress, and may reduce the need for ventilator treatment in acute cardiogenic pulmonary edema.

PMID: 3881920 [PubMed - indexed for MEDLINE]

1985 AJC

- *? Resp Rate*
- *? Oxygenation*
- *Sl.? BP*
- *Small Study*

1: Acad Emerg Med. 2000 Oct;7(10):1165.

EMS transports for difficulty breathing: is there a potential role for CPAP in the prehospital setting?

Kosowsky JM, Gasaway MD, Stephanides SL, Ottaway M, Sayre MR.

University of Cincinnati, Cincinnati, OH.

Mask-applied continuous positive airway pressure (CPAP) has been shown to reduce morbidity among patients with acute respiratory distress in the setting of cardiogenic pulmonary edema. OBJECTIVE: To determine a minimum percentage of patients transported by ALS for difficulty breathing who could potentially benefit from a pre-hospital trial of CPAP. METHODS: Paramedic run sheets were collected from consecutive, adult, ALS transports for a chief complaint of difficulty breathing over a 6 week period in a large urban EMS system. Demographic information, medical history, vital signs, clinical assessments, and transport times were abstracted into a database by trained reviewers. Strict criteria for CPAP were defined in advance as "acute respiratory distress," meaning (1) respiratory rate > 25 and (2) labored or shallow breathing, and "presumed cardiogenic pulmonary edema," meaning (3) a prior history of heart disease and (4) presence of bilateral rales on exam. RESULTS: Data from 240 consecutive run sheets were compiled. Median patient age was 66 years old, with females outnumbering males 168 to 81. A total of 15 spontaneously breathing patients met all 4 criteria for CPAP. Four of these patients were either hypotensive (SBP < 90) or had potential for airway compromise (i.e., obtundation), making CPAP inadvisable. Among the 11 remaining patients (4.4% of all transports for difficult breathing), median transport time was 20 minutes (range 14-31 minutes). CONCLUSIONS: Using very strict criteria, a small but not significant percentage of patients are optimal candidates for a prehospital trial of CPAP. Transport times would appear to justify this type of intervention. A prospective study is currently under way to test the feasibility of administering CPAP to such patients in the prehospital setting.

PMID: 11015253 [PubMed - as supplied by publisher]

2000 AEM

- ***"Small number qualify"***
- ***Only 11 patients***

1: Prehosp Emerg Care. 2003 Apr-Jun;7(2):209-13.

The use of prehospital continuous positive airway pressure treatment in presumed acute severe pulmonary edema.

Kallio T, Kuisma M, Alaspaa A, Rosenberg PH.

Department of Anesthesiology and Intensive Care, Helsinki University Hospital, Helsinki, Finland.

OBJECTIVE: To describe the prehospital use of a continuous positive airway pressure (CPAP) system for the treatment of presumed acute severe pulmonary edema (ASPE). METHODS: The efficacy of prehospital CPAP treatment was analyzed in terms of changes in oxygen saturation, need for intubation or ventilatory support, and possible morbidity associated with the CPAP therapy. This was a retrospective cohort study conducted in the mobile intensive care unit of a university hospital. Participants included all consecutive patients with a clinical picture of ASPE treated by a mobile intensive care unit between January 1, 1998, and December 31, 1999. RESULTS: 121 patients were included in this study. 116 patients received prehospital CPAP therapy. Two patients (1.7%) from the CPAP-treated patients were intubated in the field. A total of six patients required endotracheal intubation before hospital, and six other patients after that. After the beginning of CPAP treatment, there was statistically significant elevation in blood oxygen saturation (mean and standard deviation [SD] before CPAP 77% +/- 11% and after CPAP 90% +/- 7%) (p < 0.0001) as well as reductions in the respiratory rate (mean and SD before CPAP 34 +/- 8 breaths/min and after CPAP 28 +/- 8 breaths/min) (p < 0.0001), systolic blood pressure (mean and SD before CPAP 173 +/- 39 mm Hg and after CPAP 166 +/- 37 mm Hg) (p = 0.0002), and heart rate (mean and SD before CPAP 108 +/- 25 beats/min and after CPAP 100 +/- 20 beats/min) (p = 0.0017). The main reason for in-hospital death (8%) was myocardial infarction. No technical problems or complications occurred during CPAP treatment. CONCLUSIONS: Prehospital CPAP treatment in patients with ASPE improved oxygenation significantly and lowered respiratory rate, heart rate, and systolic blood pressure. Because of the retrospective nature of this study, the hemodynamic effects of nitroglycerine and morphine cannot be excluded. The mortality rate was low, which needs to be confirmed in a controlled, prospective study.

PMID: 12710780 [PubMed - indexed for MEDLINE]

2003 PEC

- *116 CPAP Patients*
- *2 intubated in field*
- *? Resp Rate 34 ? 28*
- *? Oxygenation, Sl.? Pulse*

1: Prehosp Emerg Care. 2001 Apr-Jun;5(2):190-6. Related Articles, Links

Click here to read

Prehospital use of continuous positive airway pressure (CPAP) for presumed pulmonary edema: a preliminary case series.

Kosowsky JM, Stephanides SL, Branson RD, Sayre MR.

Department of Emergency Medicine, Brigham and Women's Hospital, Boston, Massachusetts 02115, USA.

OBJECTIVE: To describe the prehospital use of a continuous positive airway pressure (CPAP) system for the treatment of acute respiratory failure presumed to be due to cardiogenic pulmonary edema. METHODS: Prospective case-series analysis. Paramedics administered CPAP via face mask at 10 cm H2O to patients believed to be in cardiogenic pulmonary edema and in imminent need of endotracheal intubation (ETI). Data from run sheets and hospital records were analyzed for treatment intervals, vital signs, complications, admitting diagnoses, need for ETI, and mortality. RESULTS: Nineteen patients received prehospital CPAP therapy. Mean duration of therapy was 15.5 minutes. Pre- and post-therapy pulse oximetry was available for 15 patients and demonstrated an increase from a mean of 83.3% to a mean of 95.4%. None of the patients were intubated in the field. Two patients who did not tolerate the CPAP mask required ETI upon arrival in the emergency department (ED); an additional five patients required ETI within 24 hours. There was one death in the series and two additional adverse events (one aspiration pneumonia, one pneumothorax); none of these were attributable to the use of CPAP. The diagnosis of cardiogenic pulmonary edema was corroborated by the ED or in-hospital physician in 13 patients (68%). Paramedics reported no technical difficulties with the CPAP system. CONCLUSION: For patients with acute respiratory failure and presumed pulmonary edema, the prehospital use of CPAP is feasible and may avert the need for ETI. Future controlled studies are needed to assess the utility and cost-effectiveness of prehospital CPAP systems.

PMID: 11339731 [PubMed - indexed for MEDLINE]

2001 PEC

- *No technical problems*
- *“Prehospital use feasible”*
- *? Resp Rate*
- *? Oxygenation 83% ? 95%*
- *1/3 Intubated within 24 hours*

1: Prehosp Emerg Care. 2003 Apr-Jun;7(2):209-13. Related Articles, Links

Click here to read

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PMID: 12710780 [PubMed - indexed for MEDLINE]

2003 PEC

- *? Resp Rate (34 ? 28)*
- *? Oxygenation (77 ? 90)*
- *Sl.? BP (173 ? 166)*
- *Bigger Study (116 pts.)*
- *12 ultimately intubated*

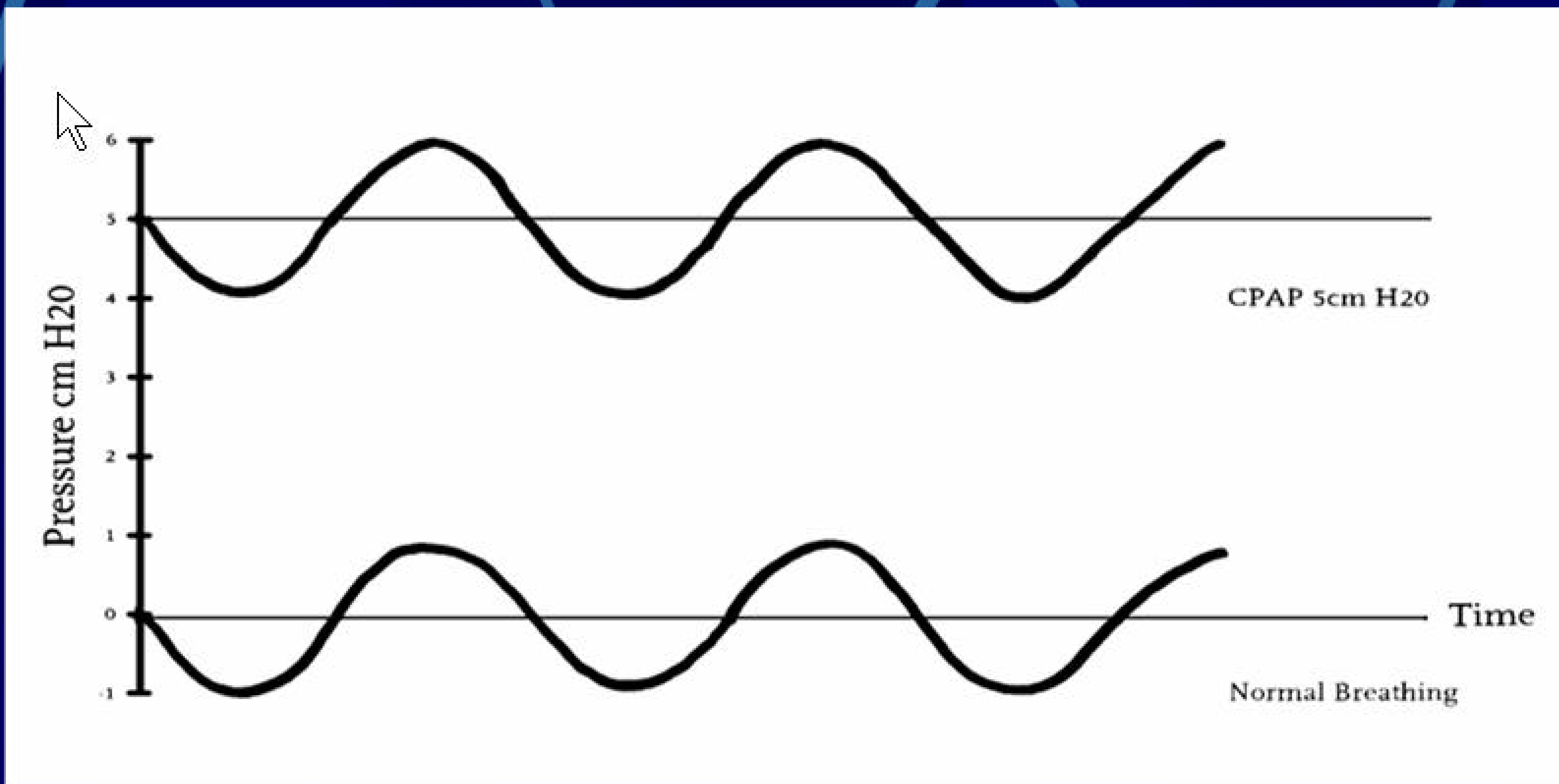
?

CPAP is oxygen therapy in its most efficient form.

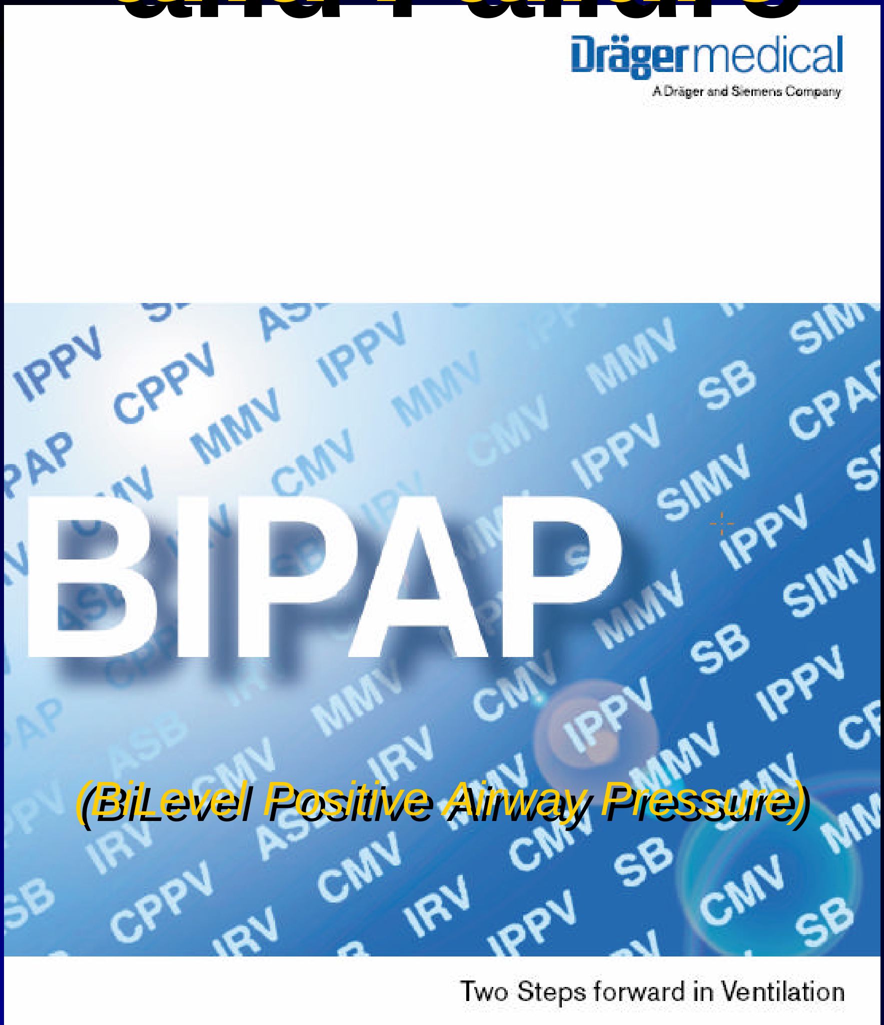
- Simple Masks
- Venturi Masks
- Humidifiers
- CPAP

CPAP and Patient Airway Pressure

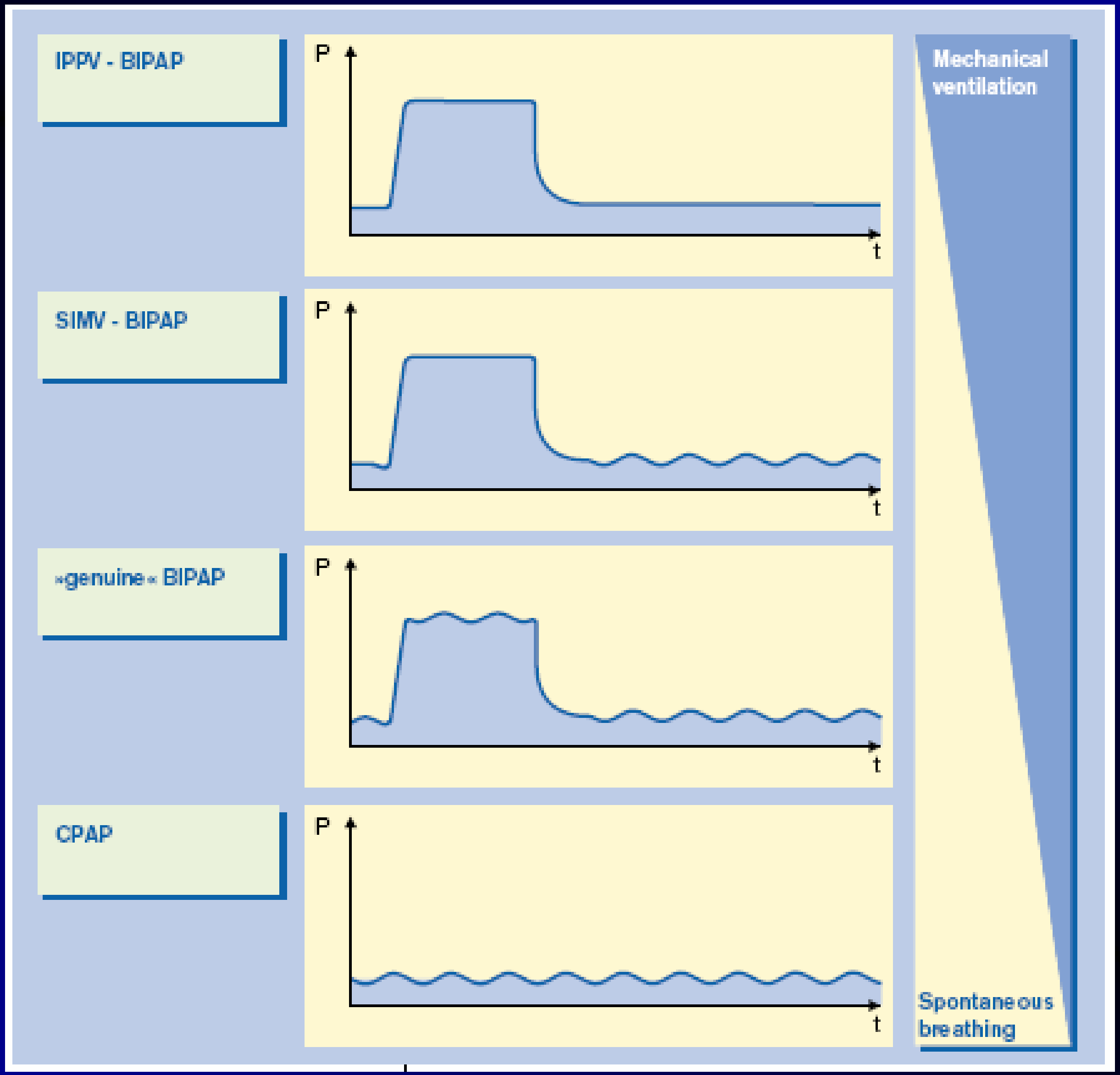
‘The application of positive airway pressure throughout the whole respiratory cycle to spontaneously breathing patients.



Respiratory Distress and Failure



(BiLevel Positive Airway Pressure)


IPPV - BIPAP
SIMV - BIPAP
»genuine« BIPAP
CPAP
P
t
Mechanical ventilation
Spontaneous breathing

CPAP and Partial Pressure

‘The pressure of a gas mixture is equal to the sum of the partial pressures of its constituents.

This allows oxygen into the blood during inspiration and Carbon Dioxide out during expiration.

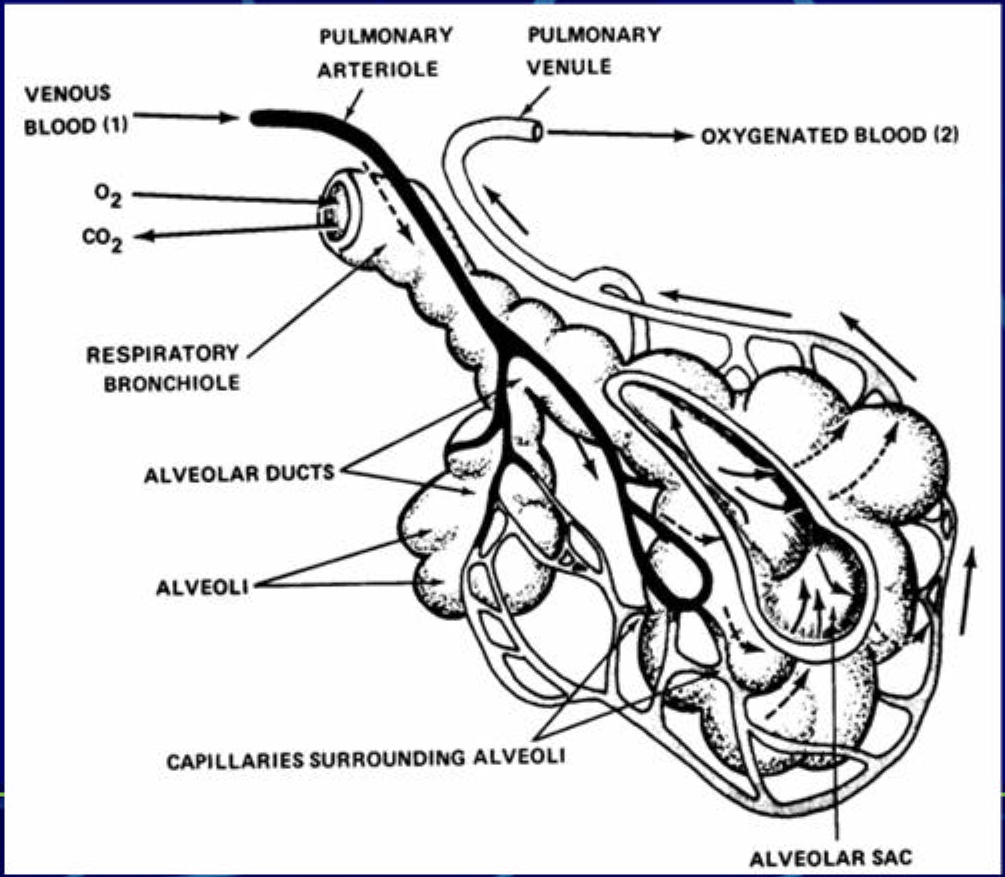
Example : Air at sea level has a pressure of 760mm Hg.
Air is 21% oxygen and 79% nitrogen.

⇧ partial pressure of oxygen is 760 X 21% = 159mm Hg

So why does oxygen pass into the blood?

Pressure Gradient

Deoxygenated blood has a lower partial pressure of oxygen than alveolar air so oxygen transfers from the air into the blood.



CPAP alters the pressure gradient!

7.5cm H_20 CPAP

1cm H_2O is equal to 0.735mm Hg.

7.5cm H_2O CPAP increases the partial pressure of the alveolar air by approximately 1%.

This increase in partial pressure ‘forces’ more oxygen into the blood.

Even this comparatively small change is enough to make a clinical difference.

The Requirements Of CPAP

- The real requirement is for Continuous CONSTANT Positive Airway Pressure
- A stable airway pressure as prescribed in order to reduce work of breathing (WOB)

Important Aim Of CPAP Is To Increase Functional Residual Capacity (FRC)

- Volume of gas remaining in lungs at end-expiration
- CPAP distends alveoli preventing collapse on expiration
- Greater surface area improves gas exchange

Physiological Effects Of CPAP

- Increases P_{SO_2} *(Surface oxygen)*
- Increases FRC
- Reduces work of breathing

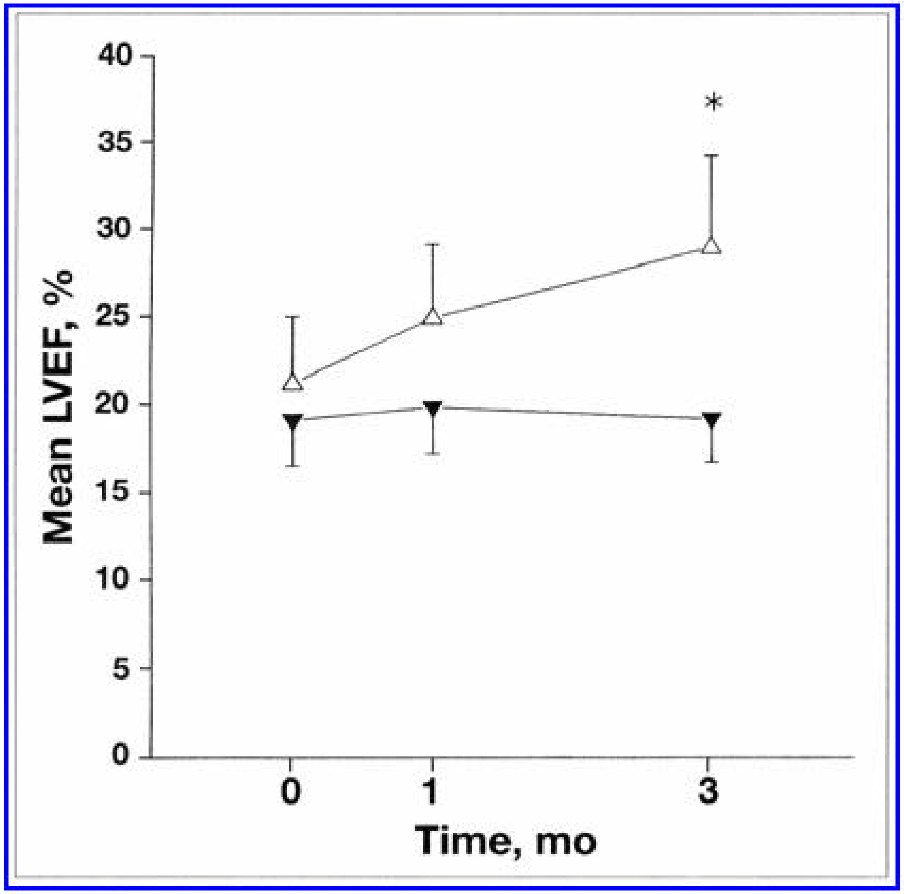


Fig. 2: Effect of CPAP on left ventricular ejection fraction (LVEF) in patients with congestive heart failure and central sleep apnea. Values shown are means and standard errors of the mean. After 3 months, LVEF was significantly greater in treatment group (△) than in control group (▼) (*$p = 0.019$). Reproduced from Naughton et al,[3] with permission. © American Lung Association

Current Uses of CPAP

1. Ambulance/Emergency Room
2. Pre-Operative (Anesthesia)
3. Intensive Care
4. Recovery Room
5. General Ward

Clinical Applications of CPAP

Condition	Area for Treatment
ARDS	Emergency
Pulmonary edema	Emergency
Acute Respiratory Failure	Emergency
CHF/COPD	Emergency
Anesthesia	Pre Operative
Atelectasis	ICU/General Ward
Alternative to Mechanical Ventilation	ICU/General Ward
Weaning from Mechanical Ventilation	ICU/General Ward

Also:

- Left Ventricular Failure
- Renal Failure
- Sleep Apnea

Adult Respiratory Distress Syndrome (ARDS)

- Characteristics
  - Hypoxemia
  - Reduced compliance
  - Large intrapulmonary shunt
- CPAP in early stages may
  - Correct hypoxemia
  - Improve compliance
  - Reduce intrapulmonary shunt

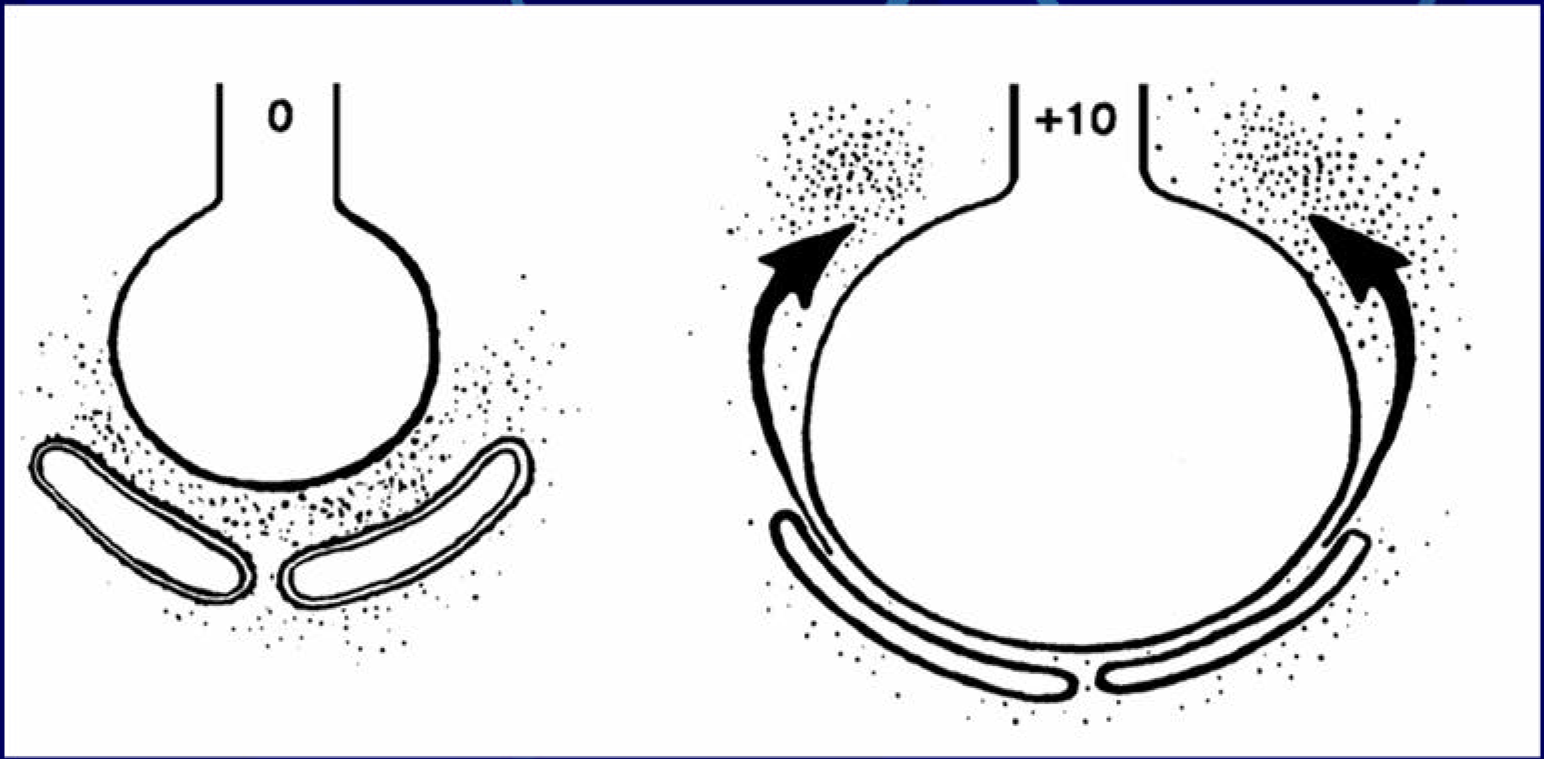
(Schmidt 1975)

CPAP And Pulmonary Edema

- Severe pulmonary edema is a frequent cause of respiratory failure
- CPAP increases functional residual capacity
- CPAP increases transpulmonary pressure
- CPAP improves lung compliance
- CPAP improves arterial blood oxygenation
- CPAP redistributes extravascular lung water

(Rasanen 1985)

Redistribution Of Extravascular Lung Water With CPAP



CPAP And Acute Respiratory Failure

- CPAP overcomes inspiratory work imposed by auto-peep
- CPAP prevents airway collapse during exhalation
- CPAP improves arterial blood gas values
- CPAP may avoid intubation and mechanical ventilation

(Miro 1993)

When Not To Use Mask CPAP

- Hypercapnia
- Pneumothorax
- Hypovolemia
- Severe facial injuries
- Patients at risk of vomiting

Common Complications With CPAP

- Pressure sores
- Gastric distension
- Pulmonary barotrauma
- Reduced cardiac output
- Hypoventilation
- Fluid retention

Essential Components Of A CPAP System

1. Flow generator

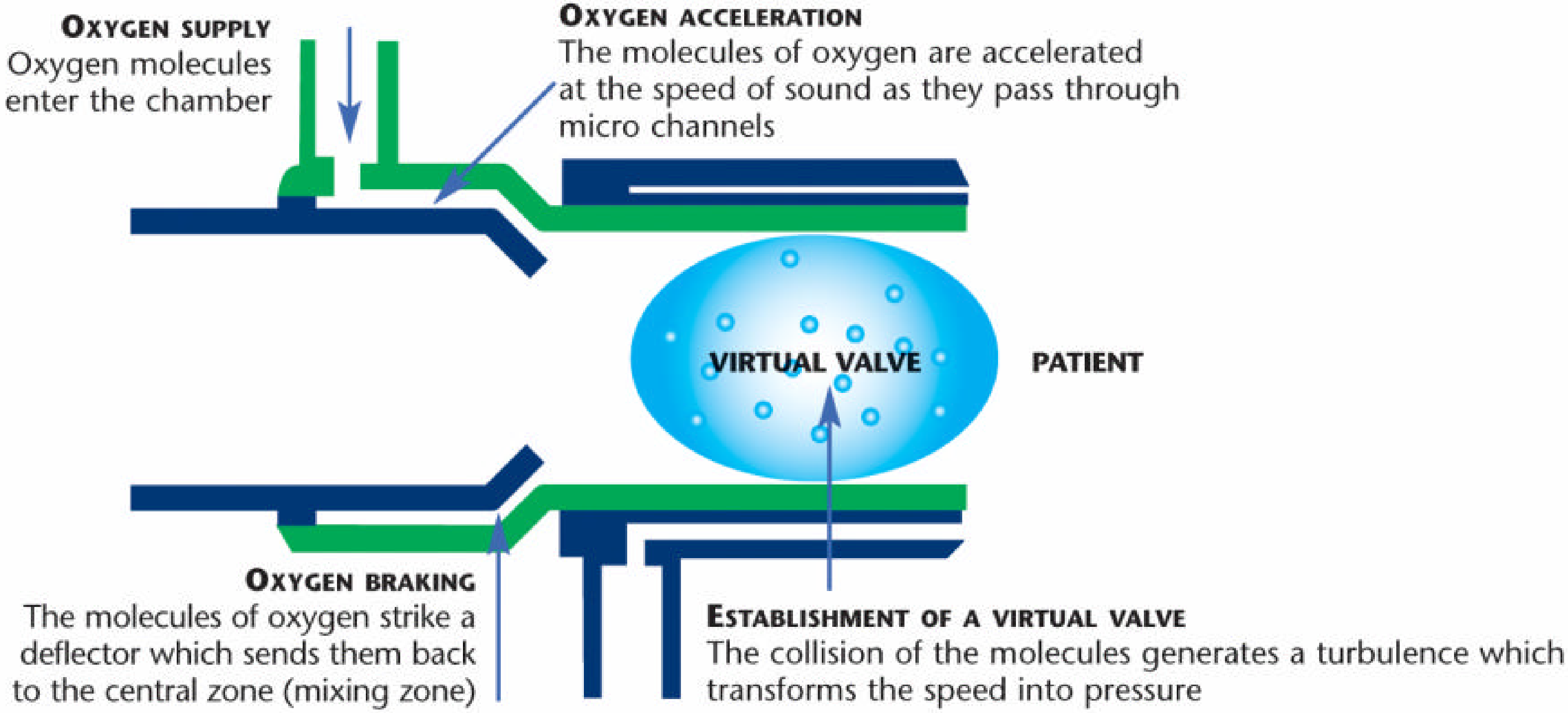
2. CPAP valve

Whisperflow Flow Generators

PortOVent
Emergent Technologies

Caradyne Isobaric CPAP Valve

Boussignac CPAP works the same way as the turbines of a jet engine.



Boussignac continuous positive airway pressure device in the emergency care of acute cardiogenic pulmonary oedema: a randomized pilot study.
European Journal of Emergency Medicine. 10(3):204-208, September 2003.
Moritz, Fabienne a; Benichou, Jacques c; Vanheste, Marc a; Richard, Jean-Christophe b; Line, Sebastien a; Hellot, Marie-France c; Bonmarchand, Guy b;

2003 EJEM

Boussignac vs. Standard Oxygen

30 patients randomly assigned

9.3 cm H_2O

? Resp. Rate after 30 minutes

? Work of Breathing

effects were reported. Continuous positive pressure delivered using the Boussignac-CPAP device is feasible in an emergency care setting. It can quickly improve respiratory distress in acute cardiogenic pulmonary oedema patients. A larger trial should be initiated in such an emergency care setting to demonstrate the effectiveness of the Boussignac-CPAP device.

'Boussignac' continuous positive airway pressure system: practical use in a prehospital medical care unit.

European Journal of Emergency Medicine. 10(2):87-93, June 2003.

2003 EJEM

Prehospital Study, Pulmonary Edema

9 cm H_2O

Sl.? Resp. Rate

57 patients, 7 “excluded”

10 intubated within an hour

including flexibility and pressure monitoring, lower oxygen consumption, and ease of use. These should allow this technique to be used more widely by prehospital teams.

Operation of the device is straightforward:

Attach the hose to a regular oxygen port capable of 10–25 L/minute (LPM) of flow and place the device into a well-fitting face mask that has an inflatable cuff.

A standard medication nebulizer can also be placed in-line with the Boussignac device to help deliver meds to the lungs faster.

When set to a low level (2.0–4.0 cm H2 O) of CPAP, users can achieve a 30% increase in drug delivery and deeper lung penetration of the medication.

The usual steaming exhalation of wasted medication is nearly eliminated.

A second oxygen source is required to simultaneously power both the nebulizer and CPAP.

The open end of the Boussignac CPAP device provides several advantages over a closed system.

A soft suction catheter can be passed through the opening to remove any fluids from the patient's mouth without interrupting the CPAP treatment.

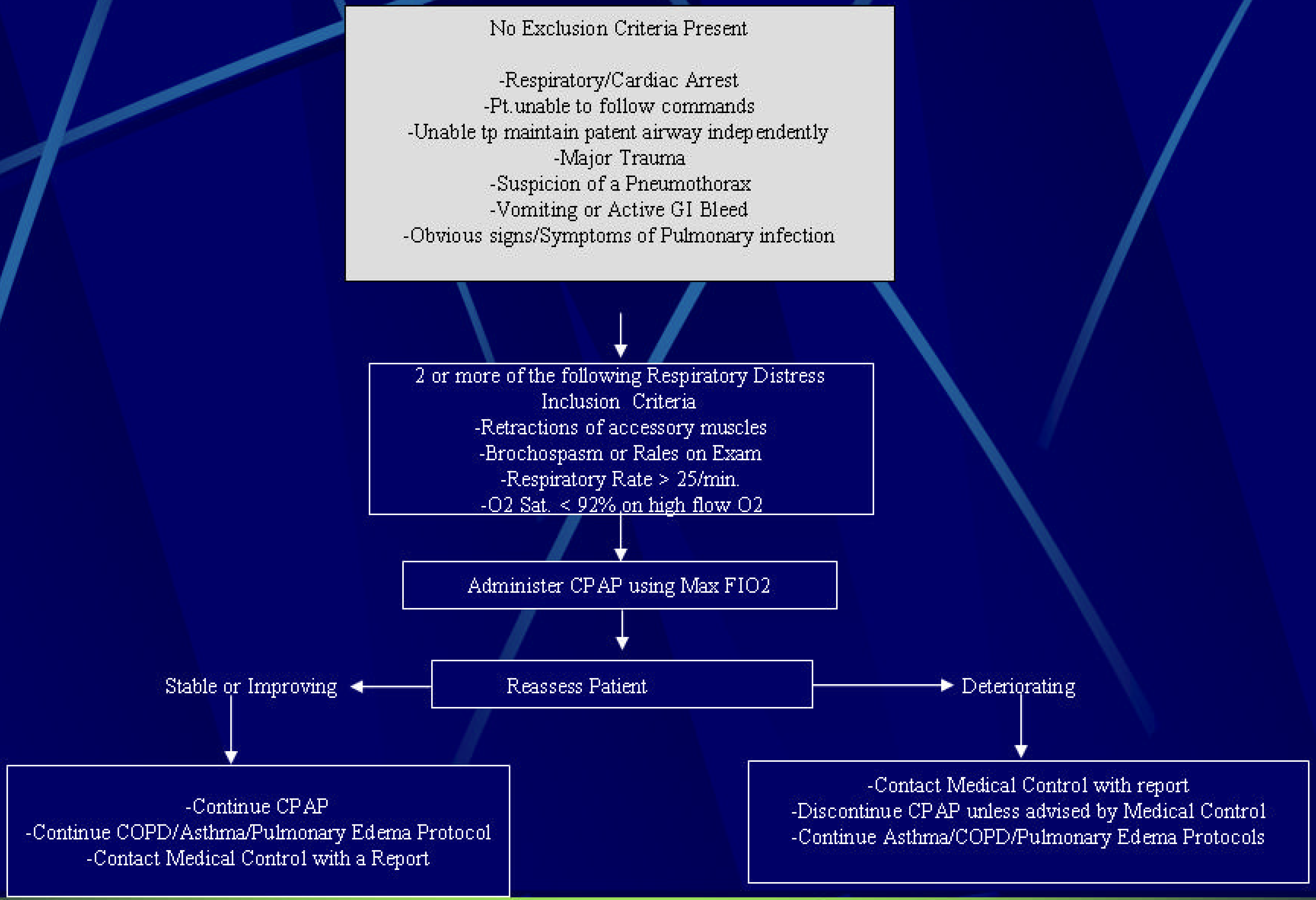

01/24/2007


20 • 30
40
15
60
10
5
APPROX
Cm H_2O

Application of CPAP

CPAP System

CPAP Training Flow Sheet



Determine the required level of CPAP, and select the desired flow rate.

With the Boussignac, Cm H_2O of CPAP provided with oxygen flow at:

10 LPM = 2.5–3.0
15 LPM = 4.5–5.0
20 LPM = 7.0–8.0
25 LPM = 8.5–10.0

At a 25 LPM flow rate, an EMS crew can anticipate a full (2,200 psi) "D" cylinder of oxygen to last 14 minutes and a full "E" cylinder to last 23 minutes.

Minutes of Oxygen by Cylinder Size

All based on full 2200 PSI Cylinders

Flow (LPM)	D Cylinder (EMS Portable)	E Cylinder (EMS Portable)	M Cylinder (EMS Ambulances)
5	70	123	703
6	58	102	598
8	44	77	498
10	35	61	374
12	29	51	299
15	23	41	199
20	16	29	175
25	14	23	140

Several features about the Boussignac set it apart:

- ***Portable and can be kept in a respiratory kit and taken into a patient's home (so is the Whisperflow)***
- ***Disposable***
- ***Can be left at the hospital***
- ***Can use nebulizers with it***
- ***Can suction through it***

Jim Doyle
Governor

Helene Nelson
Secretary

State of Wisconsin

Department of Health and Family Services

DIVISION OF PUBLIC HEALTH

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dhfs.wisconsin.gov

`Numbered Memo Series 06-04
April 2006

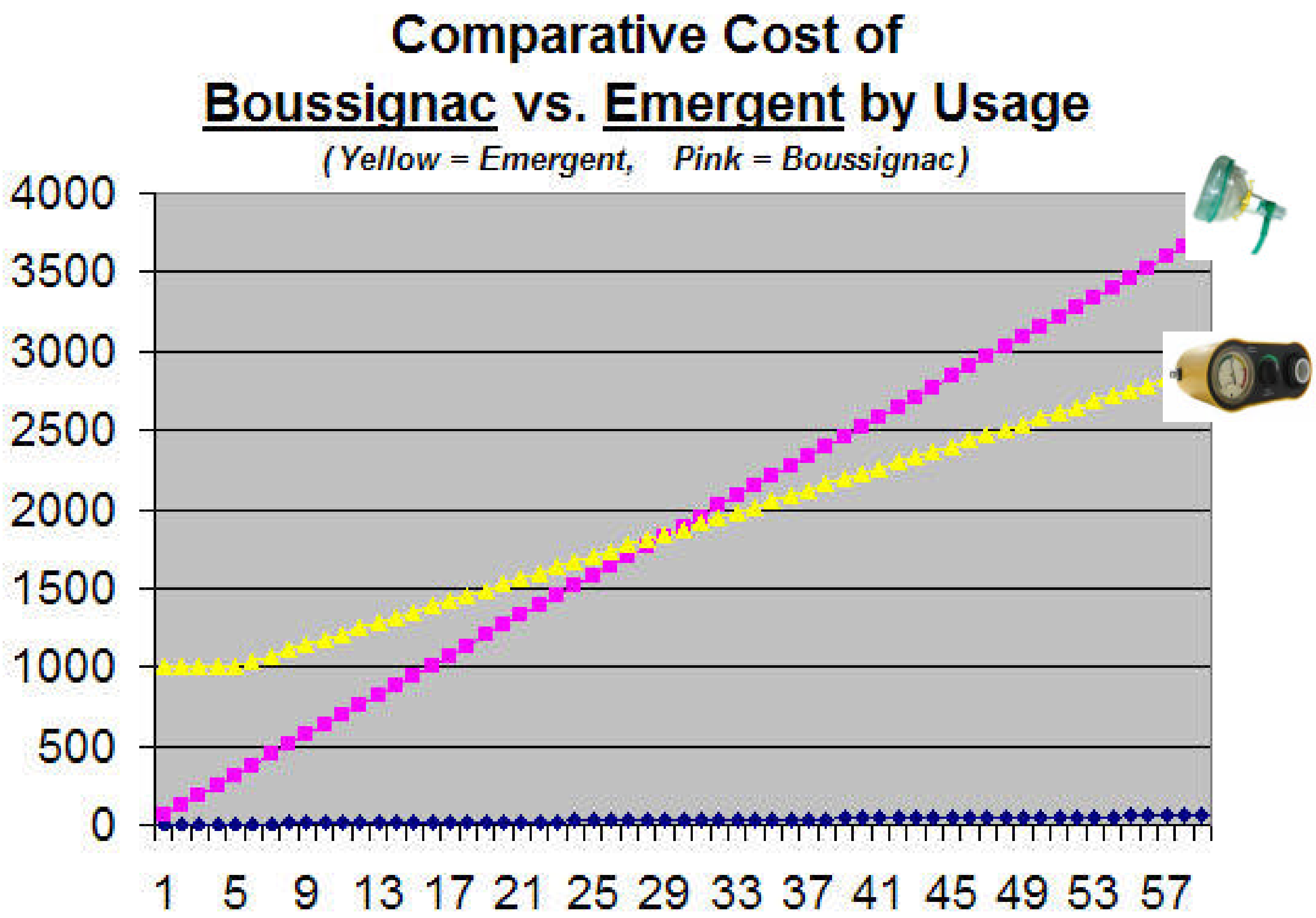
To: Ambulance Service Providers
Ambulance Service Medical Directors
EMS Training Centers
EMS Coordinators

From: Dan Williams, Chief
Wisconsin Emergency Medical Services Systems Section
Bureau of Local Health Support and EMS

Re: Continuous Positive Airway Pressure (CPAP) Device

Continuous Positive Airway Pressure (CPAP) use is now available to all EMT-Basic and EMT-Intermediate Technician providers in Wisconsin. This makes CPAP an optional skill in Wisconsin at all EMT levels.

The use of CPAP by Wisconsin EMTs for the treatment of respiratory distress resulting from congestive heart failure (CHF), pulmonary edema, chronic obstructive pulmonary disease (COPD), asthma, and pneumonia has been shown to be both as safe and effective. CPAP has been shown to rapidly improve vital signs, gas exchange, reduce the work of breathing, decrease the sense of dyspnea, and decrease the need for endotracheal intubations in patients who suffer from shortness of breath from asthma, COPD, pulmonary edema, CHF, and pneumonia.


Comparative Cost of
Boussignac vs. Emergent by Usage
(Yellow = Emergent, Pink = Boussignac)
4000
3500
3000
2500
2000
1500
1000
500
0
1
5
9
13
17
21
25
29
33
37
41
45
49
53
57

UT Southwestern Medical Center at Dallas/BioTel EMS System
Protocols for Therapy
Special Study Protocol - DFR Station 45 Only – APPROVED – Ray Fowler, MD

Respiratory Distress

Assess and support ABCs. Place the patient in a position of comfort, minimize patient exertion. Apply SpO_2, $ETCO_2$ monitors. Administer as much oxygen as necessary to alleviate symptoms. Maintain SpO_2 values of 96% or better. Apply ECG monitor and establish IV access.

Assess breath sounds

CHF Suspected: Crackles or rales with evidence of respiratory distress

Nitroglycerin 0.4mg SL
- May be administered without an IV if SBP > 110mmHg
- May repeat twice (at 2-min intervals) if SBP remains > 110mmHg

If no significant improvement on NTG, Administer CPAP at 5 cm pressure

Obtain 12-Lead ECG and transmit to BioTel

If no improvement, BioTel may authorize
- Nitroglycerin 0.4mg SL (IF SBP > 110mmHg)
- Albuterol 2.5mg via nebulizer
- Lasix* 40mg IVP or twice the patient's usual single, daily PO dose (max of 100mg) ONLY after patient has received nitroglycerin

Wheezing

If Anaphylaxis, proceed to Allergic Reaction Protocol

Albuterol 2.5 mg via nebulizer*

If wheezing persists but NOT improving: Combine 2nd and 3rd Albuterol doses with Atrovent 0.5 mg

If wheezing persists but improving: Repeat Albuterol nebulizer* X 2, if needed

If no response:
- Administer CPAP at 5 cm pressure
- Epinephrine 1:1,000 0.3mg SC, unless contraindicated

If no improvement, BioTel may authorize
- Albuterol with or without Atrovent*
- Epinephrine 1:1,000 0.3mg SC*
- Magnesium Sulfate (10%) 2 grams IV piggyback over 6 - 10 minutes

CPAP Contraindications:
- Children under 13 years of age;
- Facial deformities or patient to small for mask to seal. (If the mask doesn't fit, you can't use CPAP);
- Agonal respirations or respiratory arrest;
- Pneumothorax
- Tracheostomy
- Unconsciousness

CPAP should be discontinued and intubation performed if the patient:
- Develops respiratory or cardiac arrest
- Becomes unresponsive to verbal stimuli (GCS <9)

For COPD with chronic hypoxia (home O_2), titrate oxygen flow to maintain SpO_2 of 88%-92%
Observe for possible depressed ventilation
If $ETCO_2$ rises in response to O_2 therapy, the concentration of supplemental oxygen may need to be decreased

Continuous Positive Airway Pressure Ventilation

Indications:

Any patient who is complaining of shortness of breath for reasons other than pneumothorax and:

- Is awake and oriented and able to cooperate;
- Has the ability to maintain an open airway (GCS>10);
- Has a respiratory rate greater than 25 breaths per minute;
- Has a systolic blood pressure above 90 mmHg
- Uses accessory muscles during respirations

Precautions:

Exercise extreme caution when administering CPAP if the patient has:

- Impaired mental status and is not able to fully cooperate with the procedure;
- Failed at past attempts at noninvasive ventilation;
- Active upper GI bleeding or history of recent gastric surgery;
- Complaints of nausea or is vomiting;
- Inadequate respiratory effort;
- Excessive secretions

Procedure:

1. Explain the procedure to the patient.
2. Place the patient on continuous pulse oximetry and waveform capnography.
3. Ensure adequate oxygen supply to ventilation device (100% when starting and until SpO_2 is >96%).
4. Place the delivery device over the mouth and nose.
5. Secure the mask with provided straps or the other provided devices
6. Use 5 cm $H2_0$ of PEEP
7. Check for air leaks
8. Monitor and document the patient's respiratory response to the treatment
9. Continue to coach patient to keep mask in place and readjust as needed
10. If respiratory status deteriorates, remove device and provide BVM ventilation with or without endotracheal intubation.

Removal Procedure:

- CPAP therapy should not be removed unless the patient cannot tolerate the mask or experiences continued or worsening respiratory failure.
- BVM ventilation and/or intubation should be considered if the patient is removed from CPAP therapy

Special Notes:

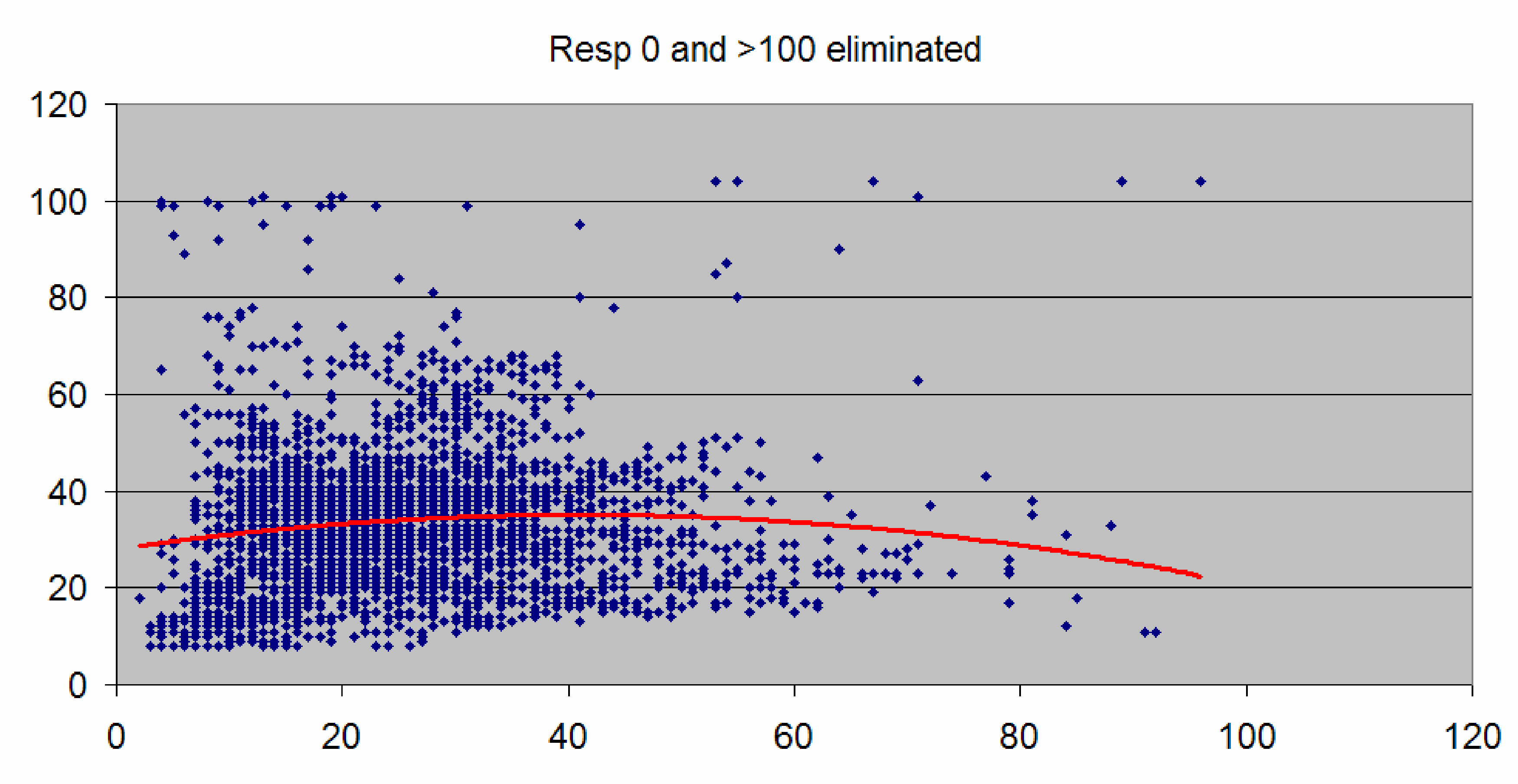
- Contact BioTel as soon as you know you are going to use CPAP so the receiving hospital can be prepared for patient
- Upon arrival at the hospital, do not remove CPAP until hospital therapy is ready to be placed on patient.
- Most patients will improve in 5-10 minutes. If no improvement within this time, consider ventilation with a BVM.
- Monitor patient for gastric distention.
- Use nitroglycerine tablets to avoid nitroglycerine spray from being dispersed on medics

CPAP is quite a bit about treatment, but it is ALL ABOUT being a temporizing device

Patients on CPAP are generally so sick that they must be monitored constantly

Monitoring includes:

- *LOC*
- *Airway*
- *RR & L*
- *Circulation (Pulse, BP)*
- *General improvement or worsening*
- *Pulse Oximetry*
- *Capnography (if available???)*
- *Possible need for slight sedation*


Resp 0 and >100 eliminated
120
100
80
60
40
20
0
0
20
40
60
80
100
120

Anesthesiology
2000; 92:1523–30

Efficacy of Continuous Insufflation of Oxygen Combined with Active Cardiac Compression–Decompression during Out-of-hospital Cardiorespiratory Arrest

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Background: **During experimental cardiac arrest, continuous insufflation of air or oxygen (CIO) through microcannulas inserted into the inner wall of a modified intubation tube and generating a permanent positive intrathoracic pressure, combined with external cardiac massage, has previously been shown to be as effective as intermittent positive pressure ventilation (IPPV).**

Methods: **After basic cardiorespiratory resuscitation, the adult patients who experienced nontraumatic, out-of-hospital cardiac arrest with asystole, were randomized to two groups: an IPPV group tracheally intubated with a standard tube and ventilated with standard IPPV and a CIO group for whom a modified tube was inserted, and in which CIO at a flow rate of 15 l/min replaced IPPV (the tube was left open to atmosphere). Both groups underwent active cardiac compression–decompression with a device. Resuscitation was continued for a maximum of 30 min. Blood gas analysis was performed as soon as stable spontaneous cardiac activity was restored, and a second blood gas analysis was performed at admission to the hospital.**

Results: **The two groups of patients (47 in the IPPV and 48 in the CIO group) were comparable. The percentages of patients who underwent successful resuscitation (stable cardiac activity; 21.3 in the IPPV group and 27.1% in the CIO group) and the time necessary for successful resuscitation (11.8 ± 1.8 and 12.8 ± 1.9 min) were also comparable. The blood gas analysis performed after resuscitation (8 patients in the IPPV and 10 in the CIO group) did not show significant differences. The arterial blood gases performed after admission to the hospital and ventilation**

Summary thoughts…

Field ventilatory assistance with CPAP is now accepted and essential

Cost effective devices have now made it essential for EMS Medical Directors to place these devices in their ambulances

It is critical that standard quality control assessment be conducted following its use

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