INTRODUCTION

Hyperventilation syndrome is defined as "a rate of ventilation exceeding metabolic needs and higher than that required to maintain a normal level of plasma CO_2".

Physiological hyperventilation can occur in a number of situations, including life-threatening conditions such as:

- pulmonary embolism
- diabetic ketoacidosis
- asthma
- hypovolaemia.

As a rule, hyperventilation due to emotional **stress** is **rare in children**, and physical causes are much more likely to be responsible for hyperventilation.

Specific presenting features can include:

- acute anxiety
- tetany due to calcium imbalance
- numbness and tingling of the mouth and lips
- carpopedal spasm
- aching of the muscles of the chest
- feeling of light headedness or dizziness.

HISTORY

Refer to dyspnoea guide

ASSESSMENT [1,2]

Assess **ABCD**'s:

Specifically consider:

- history of onset of hyperventilation
- previous history and cause of hyperventilation episodes
- previous medical history
- differential diagnosis such as pulmonary oedema, acute asthma, chest infection, pulmonary embolism, diabetic ketoacidosis or other causes of metabolic acidosis, pneumothorax, drug overdose or acute myocardial infarction (***refer to specific guidelines***)
- auscultation of breath sounds during assessment of breathing
- hyperventilation in the presence of the following should immediately confirm an alternative diagnosis:
  - cyanosis
  - reduced level of consciousness
  - reduction in SpO_2.

MANAGEMENT [1,2]

If ABCD need correction then treat as per medical guidelines as it is unlikely to be due to hyperventilation syndrome but is more likely to be physiological hyperventilation secondary to an underlying pathological process.

Maintain a calm approach at all times.

Reassure the patient and try to remove the source of the patient's anxiety, this is particularly important in children.

Coach the patient's respirations whilst maintaining a calm environment.

ADDITIONAL INFORMATION

The cause of hyperventilation cannot always be determined with sufficient accuracy (especially in the early stages) in the pre hospital environment.

Always presume hyperventilation is secondary to hypoxia or other underlying respiratory disorder until proven otherwise.

The resulting hypocapnia will result in respiratory alkalosis bringing about a decreased level of serum ionised calcium. This electrolyte imbalance will result in tetany, paresthesia and carpopedal spasm.

The practice of encouraging the patient to rebreathe their own air (via a paper bag) can be potentially harmful if the cause of the hyperventilation is due to an increased oxygen demand from a medical cause.[3] This practice should therefore be abandoned in pre-hospital care.

The aim of treatment is to restore a normal level of pCO_2 over a period of time by reassuring the patient and coaching then regarding their respirations.

Key Points – Hyperventilation

- Medical conditions can cause hyperventilation.
- In children a medical cause is more likely than stress.
- Administer oxygen until otherwise indicated.
- Paper bag treatment is no longer considered appropriate.
- Tetany, paresthesia and carpopedal spasm may occur.

REFERENCES

[1] Ball R. Waiting to Exhale: the assessment and management of hyperventilation. *Journal of Emergency Medical Services* 1998;23(1):62-75.

[2] Caroline NL. *Emergency Care in the Streets.* Boston, Mass: Little, Brown and Company, 1995.

[3] Callaham M. Hypoxic hazards of traditional paper bag rebreathing in hyperventilating patients. *Annals of Emergency Medicine* 1989;18(6):622-28.

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METHODOLOGY

Refer to methodology section.