

Clinical Pathways in Emergency Medicine

Volume I

Suresh S. David
Editor

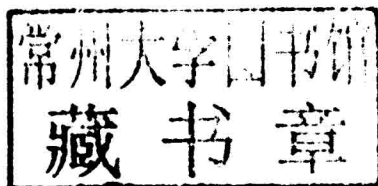


Springer

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Preface

In the history of humankind, Medicine has never been more exciting and challenging than in the twenty-first century. One of the great challenges of being a contemporary academic clinician is to find ways to correlate pertinent Basic Sciences to clinical application, at the bedside. When I set out to prepare *Clinical Pathways in Emergency Medicine*, it evoked a thought for contemplation. 'Do we need one more book in the specialty of Emergency Medicine?' That helped to harness an unprecedented approach: from the perspective of a nascent, yet inquisitive emergency physician who is keen to understand the rationale of occurrence, manifestation, and management of acute clinical conditions. And this book differs significantly by providing an algorithm at the end of each chapter, which, at a glance, provides a roadmap for the journey ahead.

Clinical Pathways in Emergency Medicine is an international congregation of contributors, who have offered their expertise which has immensely flavored the global approach to Emergency Medicine. The authors include a remarkable blend of colleagues, friends, former students, and new stars on the horizon of Emergency Medicine. A multi-author manuscript of this nature cannot be delivered without the dedication exhibited by them. In addition to being luminaries from around the globe, they are among the most progressive clinicians in various sub-specialties of Emergency Medicine. And I could not have wished for a better bunch of Section Editors, who superbly orchestrated the creation and revision of manuscripts. Each one of them is an enviable embodiment of clinical excellence.

Sound clinical experience, coupled with knowledge, based on authoritative books and peer-reviewed publications, remains the foundation, on which clinical management needs to be built. In my three decades of clinical practice, I have been humbled multiple times, by the way in which anecdotal experience and written literature is flouted by the human body.

Today's dogma becomes tomorrow's heresy. *Clinical Pathways in Emergency Medicine* is a compendium of contemporary evidence-based knowledge. However, no book remains perfect and a shrewd clinician knows very well that the practice of medicine, based out of a book, has its own limitations. Nevertheless, I am optimistic that this edition of the book would facilitate satiation to the hunger for knowledge among increasing numbers of aspirants in the field of Emergency Medicine.

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Prof. Suresh S. David

Contents

Part I Resuscitation

Section Editor: Raja Sekhar Maraju

- 1 **Airway Management in ED** 3
Venugopalan Poovathumparambil
- 2 **Anaphylaxis** 19
Rosie Furse
- 3 **Cardiopulmonary Resuscitation** 31
Raja Sekhar Maraju
- 4 **End of Life Care in the Emergency Department** 45
Arti Baskaran
- 5 **Fluid Resuscitation** 57
Jonathan Leung and Derek Hicks
- 6 **Post-cardiac Arrest Care** 73
Neal Durge and Chris Solomonides
- 7 **Vascular Access** 83
Mir Saaduddin Ahmad

Part II Cardiology

Section Editor: Suresh S. David

- 8 **Acute Cardiac Arrhythmias** 101
Rachel Gnanaprakasam and Suresh S. David
- 9 **Acute Coronary Syndromes** 117
George Koshy and Raja Sekhar Maraju

10 Heart Failure	129
Lakshay Chanana	
11 Hypertensive Emergencies	139
Ashish Nandy and Sanjukta Dutta	

Part III Critical Care

Section Editor: John Victor Peter

12 Acid-Base Disorders	155
Kishore Pichamuthu	
13 Acute Respiratory Failure	167
John Victor Peter	
14 Hypotension and Shock	179
John Victor Peter and Mathew Pulicken	
15 Mechanical Ventilation	191
Shivakumar S. Iyer and Jignesh Shah	
16 Severe Sepsis	207
Suhel Al-Soufi and Vineet Nayyar	

Part IV Respiratory System

Section Editor: Dhakshinamoorthy Vijayasankar

17 Acute Shortness of Breath	221
Seema O. Brij, Paul Bambrough, and D. Vijayasankar	
18 Bronchial Asthma	235
G. Krishna Prasad, Prakash E. George, and Jebu A. Thomas	
19 Chronic Obstructive Pulmonary Disease (COPD)	245
Seema O. Brij, Sumit Chatterji, and Malcolm Marquette	
20 Pulmonary Embolism	259
Dhakshinamoorthy Vijayasankar	

Part V Environmental Medicine

Section Editor: Jaybalan Allan Matthew

21 Accidental Hypothermia and Cold Injury	271
Seelan Pillay	
22 Altitude Medicine	285
Jaybalan Allan Matthew	
23 Electrical Injuries	297
Roshen Maharaj	

24 Heat-Related Illnesses	307
Ruvendra D. Shah	
25 Submersion and Diving-Related Illnesses	315
Jaybalan Allan Matthew	

Part VI Gastrointestinal System

Section Editor: Suresh S. David

26 Abdominal Pain	329
Harshil Mehta	
27 Acute Pancreatitis	347
Ajay Kumar Mishra	
28 Gastrointestinal Bleeding	357
Sridhakshini Sathasivam	
29 Intestinal Emergencies	363
Dhavapalani Alagappan and Sathya Kaliannan	
30 Jaundice	375
Praveen Eadala	

Part VII General Medicine and Allied Specialties

Section Editor: Suresh S. David

31 Acute Thyroid and Adrenal Disorders	387
P.E. Rama Subrahmanyam	
32 Biomarkers in Emergency Medicine	405
Anoop T. Chakrapani	
33 Bleeding and Coagulation Disorders	417
Rebecca Mathews and Reeba Mary Issac	
34 Blood Transfusion Reactions	429
Sajit Varghese	
35 Dermatological Emergencies	437
S. Senthilkumaran	
36 Diabetic Emergencies	457
Sandeep Balanrao Gore	
37 Febrile Neutropaenia	473
N.V. Maheshwari	
38 Geriatric Emergencies	485
Sethu Babu	

39	Near Hanging	497
	T.V. Ramakrishnan	
40	Oncological Emergencies	503
	Sameer Rathi	
41	Pituitary and Parathyroid Disorders	513
	Anoop James George and Suresh S. David	

Part VIII Infectious Diseases

Section Editor: Babu Urumese Palatty

42	Acute Fever of Indeterminate Cause	529
	Shashiraj Eswarappa and Babu Urumese Palatty	
43	Dengue	539
	Parvinder K. Chawla	
44	Dog Bite	549
	Suresh S. David	
45	Emerging Respiratory Pandemics	557
	Seema Oommen	
46	Food Poisoning	567
	P.C. Rajeev and Jerry Johny	
47	HIV-Related Emergencies	577
	Menon Sachin Venugopal and Vivek Gopinath	
48	Malaria	591
	Menon Sachin Venugopal and B.L. Harikrishnan	
49	Standard Precautions Against Biohazardous Diseases	601
	Sandeep Nathanael David	
50	Varicella and Herpes Zoster Infections	609
	Binod Basheer and Salish Varghese	

Part IX Nephrology

Section Editor: Gopal Basu

51	Acute Kidney Injury	621
	Sreejith Parameswaran	
52	Electrolyte Imbalance: Potassium, Magnesium, Calcium and Phosphorous	637
	Jacob K. Addo	

53 Electrolyte Imbalance: Sodium and Water	651
Gopal Basu	
54 Emergencies of End-Stage Renal Disease and Kidney Transplantation	669
Sishir Gang	

Part X Neurology

Section Editor: Shakuntala Murty

55 Altered Mental Status	681
Shakuntala Murty	
56 Dizziness and Syncope	693
Girish Narayan	
57 Headache	703
Thomas Mathew and Sagar Badachi	
58 Neurosurgical Emergencies	715
Ruth-Mary deSouza and Tony Elias	
59 Seizures	733
Raghunandan Nadig	
60 Stroke	747
Praveen Kumar B. Gowder	

Part XI Obstetrics and Gynaecology

Section Editor: Suresh S. David

61 Abnormal Uterine Bleeding	767
Devendra Naik	
62 Assessment of Sexual Assault	775
Shweta Tyagi	
63 First and Second Trimester Emergencies	781
Rachel Gnanaprakasam	
64 Gynaecological Infections	797
Benita Florence	
65 Third Trimester Emergencies	809
Suresh S. David and Harshil Mehta	
Index	823

Part I

Resuscitation

Chapter 1

Airway Management in ED

Venugopalan Poovathumparambil

Key Points

- Hypoxia secondary to poorly managed airway leads to increased morbidity and mortality.
- Assess the patient to determine the type of airway intervention needed based on the set of circumstances and presentation.
- It is important to be conversant in the use of various anaesthetic agents.
- Avoid hypoxaemia or hypercarbia while preparing or while intubating the patient.
- Always have a backup plan in case of a failed airway. It is important to be conversant with the airway algorithms and also have the correct equipment available.

Introduction

- Airway management is considered a core responsibility of emergency physicians as airway assessment and management is the first step in the management of any acutely unwell patient.
- Patients in extremis requiring resuscitation often have a compromised airway, usually due to decreased consciousness.
- Prompt airway management followed by adequate ventilation mitigates secondary hypoxic damage to the brain and other vital organs.

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- Rapid sequence intubation is a key skill for any physician working in an emergency department.
- Mismanagement of the airway can lead to catastrophic and often devastating consequences for both the patient and the providers caring for them [1].

Signs and Symptoms of a Potential Airway Problem

A conscious patient who is able to speak is deemed to have a patent airway.

Threatened Airway

- Loud noisy breathing
- Accessory muscles supported respiration
- Abdominal muscle using expiration

Airway Management

Basic Airway Management

- Clear airway of any secretions and look for foreign bodies.
- Head tilt and chin lift (not in trauma).
- Jaw thrust (in trauma cases).

To continue patency of airway that is amenable to basic airway manoeuvres, one of the two basic airway adjuncts can be used.

- Oropharyngeal airway (OPA)
 - The size an OPA by measuring the length from the angle of the mouth to the tragus of the ear. Stand at the head end of the patient. Open the mouth and insert gently behind the tongue. In adults, insert the OPA with the concave side facing the palate. Once the tip reaches the posterior end of the hard palate, turn the OPA to have the concave surface in line with the tongue. Gently push it in until it sits comfortably on the tongue. Never force the OPA. It is not indicated if the patient is gagging on the airway. Alternatively, use tongue depressor or laryngoscope blade for OPA insertion. Tolerance of an OPA indicates loss of gag reflex and becomes an indication for definitive airway management
- Nasopharyngeal airway (NPA)
 - NPA is useful in patients who are not tolerating OPA. Size an NPA by measuring the distance between the tip of the nose to the tragus. Approximate the diameter of the NPA to the patient's nostrils. Lubricate the NPA adequately

and insert by facing the bevel to the septum in order to avoid turbinate injury. Assess patency of the nose and any signs of fracture to the base of the skull (like CSF leak, Battle sign, Raccoon eye). Basal skull or midfacial fractures are only relative contraindications, and an NPA can still be used albeit with caution.

Endotracheal Intubation

It is extremely important to assess the airway prior to intubation. LEMON is a useful mnemonic to perform this assessment which can predict a difficult airway:

- (i) L – Look externally
- (ii) E – Examine 3-3-2
- (iii) M – Mallampati score
- (iv) O – Obstructions
- (v) N – Neck mobility

In an emergency, where a patient has not been prepared for anaesthetic, airway can be secured with some safety by performing a rapid sequence induction (RSI) for intubation.

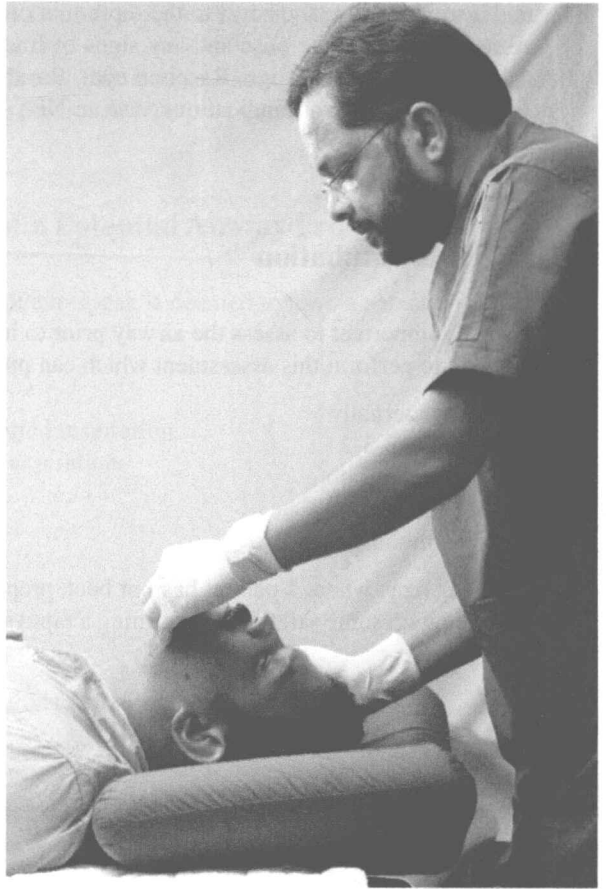
Seven Ps of Intubation

1. Preparation
2. Preoxygenation
3. Premedication
4. Paralysis with sedation
5. Protection and positioning
6. Placement of tube and confirmation
7. Post-intubation care

There are three axes, oral axis, pharyngeal axis and laryngeal axis, to consider for positioning of the patient during intubation Fig. 1.1.

Ideally, these three axes should be aligned. In neutral supine position, these axes are in different directions. Recently, one of the most popular methods to improve the chances of successful airway management is called the 'ramp' position. This position is to align the auditory canal with the sternum in a straight line. This 'ramp' position has been studied and validated as one of the most important steps in enhancing the chances of successful airway management [2]. The most common mistake made during intubation is 'cranking back' on the laryngoscope handle to lever the top of the blade to provide better visibility. This manoeuvre may improve glottic visualisation; however, it restricts the operator's ability to

Fig. 1.1 Patient head position for intubation



manipulate the tube by limiting the size of the oral opening and also jeopardises the teeth.

Paralysing agents facilitate intubation and are beneficial in:

1. Tight heads (head injury, \uparrow ICP)
2. Tight hearts (CAD, vascular heart disease)
3. Tight lung (bronchial asthma, hyperreactive airway, COPD)
4. Tight vessels (HTN, coarctation of the aorta)

Check the following equipment for their availability and functioning before intubation:

- Suction, oxygen, BVM device and transportable ventilator
- Airway adjuncts – appropriately sized OPA and NPA

- Appropriately sized supraglottic airway devices (SGD) like laryngeal mask airway (LMA0 or iGel)
- Laryngoscope with appropriate blade available and light source checked
- Spare laryngoscope handle
- Appropriately sized ETT: cuff checked plus a size above and below
- Stylet/bougie
- Monitors including EtCO₂ monitor
- Drugs
 - Sedatives/anaesthetics – etomidate, midazolam, fentanyl, propofol, thiopentone and ketamine
 - Paralytics – suxamethonium, pancuronium, vecuronium, atracurium and rocuronium
- Others – atropine, lignocaine, preservative free spray 4 % or 10 %, Lubricant ,

It is important to wear proper personal protection equipment like gloves, plastic apron and visors. Ideally, three assistants are required in performing an RSI: one person for managing the airway, second person for applying cricoid pressure and third person for drug administration. For crash intubation, even one assistant is acceptable.

Preoxygenation

This can be achieved by using BVM device with 100 % O₂ for 3–5 min or by 100 % O₂ through eight vital capacity breaths.

Premedication

This is best remembered by the mnemonic LOAD:

- L: Lignocaine 1–1.5 mg/kg
- O: Opioid – Fentanyl 3 mcg/kg
- A: Atropine 0.02 mg/kg
- D: Defasciculating agents [1/8th of intubating dose of non-depolarising muscle relaxants prior to suxamethonium will reduce the fasciculations]

Induction and paralytic agents Agents used to sedate and obtund reflexes prior to paralysis and intubation are called 'induction' agents – midazolam, fentanyl, propofol, etomidate, ketamine, thiopentone, etc. are agents currently available (Tables 1.1, 1.2 and 1.3).

Suxamethonium is one of the best paralytic agents for emergency intubation. Rocuronium is another paralytic agent that gives equal intubating condition but within just 60 s and without any adverse effects of suxamethonium.

Table 1.1 Sedative induction agents

Agent	Dose	Induction	Duration	Benefits	Caveats
Thiopental	3–5 mg/kg IV	30–60 s	10–30 min	↓ ICP	↓ BP
Methohexital	1 mg/kg IV	<1 min	5–7 min	↓ ICP short duration	BP seizure, laryngospasm
Ketamine	1–2 mg/kg IV	1 min	5 min	Bronchodilator, ‘dissociative’ amnesia	↑ Secretions, ↑ ICP emergence phenomenon
Etomidate	0.3 mg/kg IV	<1 min	10–20 min	↓ ICP ↓ IOP, neutral BP	Myoclonic excitation, vomiting, no analgesia
Propofol	0.5–1.5 mg/kg IV	20–40 s	8–15 min	Antiemetic, anticonvulsant ↓ ICP	Apnea, ↓ BP, no analgesia
Fentanyl	3–8 µg/kg IV	1–2 min	20–30 min	Reversible analgesia, neutral BP	Highly variable dose ICP: variable effects, chest wall rigidity

Table 1.2 Succinylcholine

Adult dose	1.0–1.5 mg/kg
Onset	45–60 s
Duration	5–9 min
Benefits	Rapid onset, short duration
Complications	Bradyarrhythmias
	Masseter spasm
	Increased intragastric, intraocular and possibly intracranial pressure
	Malignant hyperthermia
	Hyperkalaemia
	Prolonged apnea with pseudocholinesterase deficiency
	Fasciculation-induced musculoskeletal trauma
	Histamine release
	Cardiac arrest

Table 1.3 Non-depolarising muscle relaxants

Agent	Adult intubating IV dose	Onset	Duration	Complications
Vecuronium (intermediate/long)	0.08–0.15 mg/kg	2–4 min	25–40 min	Prolonged recovery time in obese or elderly or if there is hepatorenal dysfunction
	0.15–0.28 mg/kg (high-dose protocol)		60–120 min	
Rocuronium (intermediate/long)	0.6 mg/kg	1–3 min	30–45 min	Tachycardia
Atracurium (intermediate)	0.4–0.5 mg/kg	2–3 min	25–45 min	Hypotension
				Histamine release
				Bronchospasm