CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Emergency Airway Management

Second Edition

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Emergency Airway Management

Second Edition

Edited by:

Andrew Burtenshaw
Consultant in Anaesthesia and Intensive Care Medicine, Worcestershire Acute Hospitals NHS Trust, Worcestershire, UK

Jonathan Benger
Professor of Emergency Care, University of the West of England, and Consultant in Emergency Medicine, University Hospitals Bristol NHS Foundation Trust, Bristol, UK

Jerry Nolan
Consultant in Anaesthesia and Intensive Care Medicine, Royal United Hospital, Bath, UK

CAMBRIDGE
UNIVERSITY PRESS

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107661257

© College of Emergency Medicine, London, 2015

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2008
Second edition 2015
Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data

ISBN 978-1-107-66125-7 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

Every effort has been made in preparing this book to provide accurate and up-to-date information which is in accord with accepted standards and practice at the time of publication. Although case histories are drawn from actual cases, every effort has been made to disguise the identities of the individuals involved. Nevertheless, the authors, editors and publishers can make no warranties that the information contained herein is totally free from error, not least because clinical standards are constantly changing through research and regulation. The authors, editors and publishers therefore disclaim all liability for direct or consequential damages resulting from the use of material contained in this book. Readers are strongly advised to pay careful attention to information provided by the manufacturer of any drugs or equipment that they plan to use.

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Contents

List of contributors vii
Foreword Drs Clifford Mann and J-P van Besouw ix
Notes x
List of abbreviations xi

1. **Introduction** 1
Andrew Burtenshaw, Jonathan Benger and Jerry Nolan

2. **Delivery of oxygen** 3
Carl Gwinnutt

3. **Basic airway management** 20
Stephen Bush and David Ray

4. **Indications for intubation** 30
Colin A. Graham and Dermot McKeown

5. **Airway assessment** 41
Dominic Williamson and Jerry Nolan

6. **Preparation for rapid sequence induction** 51
Simon J. A. Chapman and Les Gordon

7. **Pharmacology of emergency airway drugs** 63
Shirley Lindsay and Jonathan Benger

8. **Rapid sequence induction and tracheal intubation** 80
Jonathan Hulme and Dinendra S. Gill

9. **Difficult and failed airway** 90
Dermot McKeown and Gavin Lloyd

10. **Post-intubation management** 105
Paul Younge and John C. Berridge

11. **Emergency airway management in special circumstances** 121
Patricia Weir, Paul Younge, Jonathan Hulme, Dinendra S. Gill, Gavin Perkins, Dermot McKeown, Carl Gwinnutt, Jonathan Benger, and John Clift

11.1 **Paediatrics** 121

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

11.2 **Major trauma and raised intracranial pressure** 131

11.3 **Cardiorespiratory failure** 140

11.4 **Non-traumatic coma and seizures** 147

11.5 **Pre-hospital care** 154

11.6 **The pregnant patient** 158

12. **Non-invasive ventilatory support** 164
Dinendra S. Gill and Gavin Perkins

13. **Human factors, audit and skills maintenance** 174
Andrew Burtenshaw, Colin A. Graham and Kevin J. Fong

Appendix 1. Mnemonics 185

Appendix 2. Emergency airway algorithms 187

Appendix 3. Example intubation checklist 192

Appendix 4. NAP4 summary 193
Tim Cook, Nick Woodall, Chris Frerk and Jonathan Benger

Index 198

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Contributors

Jonathan Benger MD FRCS FCEM
Professor of Emergency Care, University of the West of England, and Consultant in Emergency Medicine, University Hospitals Bristol NHS Foundation Trust, Bristol, UK

John C. Berridge MB ChB FRCPEdin FRCA FFICM
Consultant in Anaesthesia and Intensive Care Medicine, York Teaching Hospitals NHS Foundation Trust, York, UK

Andrew Burtenshaw MBChB MRCP FRCA FFICM
Consultant in Anaesthesia and Intensive Care Medicine, Worcestershire Acute Hospitals NHS Trust, Worcestershire, UK

Stephen Bush MD
Consultant in Emergency Medicine, Leeds Teaching Hospitals Trust, Leeds, UK

Simon J. A. Chapman MBBS BMedSci FRCS(AE) Ed FCEM
Consultant in Emergency Medicine, Jersey General Hospital, St Helier, Jersey, UK

John Clift MBChB FRCA
Consultant in Anaesthesia and Critical Care Medicine, Sandwell and West Birmingham Hospitals NHS Trust, Birmingham, UK

Tim Cook BA MBBS FRCA FFICM
Professor and Consultant in Anaesthesia and Intensive Care Medicine, Royal United Hospital, Bath, UK

Kevin J. Fong MSc MRCP FRCA
Consultant Anaesthetist, University College London Hospitals, London, UK

Chris Frerk FRCA
Consultant Anaesthetist, Northampton General Hospital, Northampton, UK

Dinendra S. Gill BmedSci MBChB MRCS (RCS Eng) Dip IMC (RCS Ed) FCEM
Consultant in Emergency Medicine, Morriston Hospital, Swansea, UK

Les Gordon MB ChB FRCA
Consultant Anaesthetist, Morecambe Bay University Hospitals Trust, Lancaster, and Team Doctor, Langdale Ambleside Mountain Rescue Team, Cumbria, UK

Colin A. Graham MB ChB MPH MD FRCPEd FRCSEd FRCSGlasg FIMCRCSEd FCCP FCEM FHKCEM FHKAM (Emergency Medicine)
Professor of Emergency Medicine and Honorary Consultant in

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Emergency Medicine, Chinese University of Hong Kong and Prince of Wales Hospital, Shatin, New Territories, Hong Kong

Carl Gwinnutt MB BS FRCA
Emeritus Consultant in Anaesthesia, Salford Royal Hospital Foundation Trust, Salford, UK

Jonathan Hulme MBChB MRCP FRCA DipIMC FFICM
Consultant in Intensive Care Medicine and Anaesthesia, Sandwell and West Birmingham Hospitals NHS Trust; Honorary Senior Clinical Lecturer, Unversity of Birmingham, Birmingham; West Midlands Ambulance Service NHS Foundation Trust Medical Emergency Response Incident Team (MERIT); Director, West Midlands Central Accident Resuscitation Emergency (CARE) Team; Mercia Accident Rescue Service (MARS) BASICS, UK

Shirley Lindsay MBChB FRCA
Consultant Anaesthetist, Worcestershire Royal Hospital, Worcestershire Acute Hospitals NHS Trust, Worcester, UK

Gavin Lloyd MBBS FRCS(EM) FCEM
Consultant in Emergency Medicine, Royal Devon & Exeter Hospital, Devon, UK

Dermot McKeown FRCA FFICM
Consultant in Anaesthesia and Critical Care, Royal Infirmary of Edinburgh, Edinburgh, UK

Jerry Nolan FRCA FRCP FFICM FCEM (Hon)
Consultant in Anaesthesia and Intensive Care Medicine, Royal United Hospital, Bath, UK

Gavin Perkins MB ChB MD MMEd FRCP FFICM FERC
Professor of Critical Care Medicine, University of Warwick, Coventry, and Consultant in Intensive Care, Heart of England NHS Foundation Trust, Birmingham, UK

David Ray MD MBChB FRCA FFICM
Consultant in Anaesthesia and Critical Care, Royal Infirmary of Edinburgh, Edinburgh, UK

Patricia Weir FRCA FRCPCH
Consultant in Paediatric Anaesthesia and Intensive Care, Bristol Royal Hospital for Children, Bristol, UK

Dominic Williamson BM MRCP DA FCEM
Consultant in Emergency Medicine, Royal University Hospital Bath, Bath, UK

Nick Woodall MB ChB FRCA
Consultant Anaesthetist, Norfolk and Norwich University Hospitals NHS Foundation Trust, Norfolk, UK

Paul Younge DA MRCP FCEM FACEM
Consultant in Emergency Medicine, Frenchay Hospital, North Bristol NHS Trust, Bristol, UK

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Foreword

When the first edition of this book was published in 2008 it heralded a new approach to the way in which management of the airway in emergency situations was taught. The emphasis was placed firmly on competency rather than specialty. Both the book and the course it accompanies have achieved considerable success, delivering a didactic yet pragmatic approach to the management of the compromised airway.

As ever competence can only be achieved through both the acquisition of knowledge and practical skills and can only be maintained through regular practice and experiential learning. This book is a companion to these endeavours but not a substitute.

The essence of safe airway management is the decision-making process that achieves safety with effectiveness, thereby minimizing iatrogenic error whilst attaining airway security and optimizing ventilation and oxygenation.

The book lays the foundations for achieving these competencies with clear and concise descriptions of the anatomy, physiology and pharmacology of emergency airway management. This is complemented by discussions on the detailed management of some commonly encountered clinical scenarios.

The book has been extensively updated and revised since the first edition and now contains a new chapter examining the importance and influence of non-technical human factors. The introduction of and more widespread use of videolaryngoscopy is reflected by a description and discussion of its role as an aid to airway management. Also of major significance is the fact that the book now reflects the findings and conclusions of the National Audit of Major Airway Complications in the UK published in 2011 (NAP4).

The book should be an essential accompaniment to any trainee involved in the acute care of the patient with a potentially compromised airway including anaesthetists, emergency physicians and acute physicians in a variety of environments from pre-hospital care through to the emergency department, operating room and critical care unit.

Dr Clifford Mann FRCP FCEM
President, College of Emergency Medicine

Dr J-P van Besouw BSc (Hons) MBBS FRCA FRCP Ed Hon FRCS
President, Royal College of Anaesthetists

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Note

This book and the course it accompanies have been prepared by a group of clinicians from the specialties of anaesthesia, intensive care and emergency medicine.

The UK TEAM Course, this manual and all course materials are the intellectual property of these individuals, who are listed in the contributor list. However, the course has been developed and refined by the group as a whole, through a process of ongoing discussion and collaboration.

The rights of the Authors to be identified as the Authors of this Work have been asserted in accordance with the Copyright, Designs and Patents Act 1988.

This manual has been edited by Andrew Burtenshaw, Jonathan Benger and Jerry Nolan, to whom all comments should be addressed.

July 2014

Department of Anaesthesia and Intensive Care Medicine
Worcestershire Royal Hospital
Worcester, WR5 1DD
Andrew.Burtenshaw@worcsacute.nhs.uk

Academic Department of Emergency Care,
Bristol Royal Infirmary, Bristol, BS2 8HW
Jonathan.Benger@UHBristol.nhs.uk

Department of Anaesthesia and Intensive Care Medicine
Royal United Hospital
Bath, BA1 3NG
Jerry.nolan@nhs.net

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

Abbreviations

ABCD Airway, breathing, circulation and disability
ANTS Anaesthetic non-technical skills
APL Adjustable pressure limiting (valve)
ARDS Acute respiratory distress syndrome
ATLS Advanced trauma life support
BMI Body mass index
BMV Bag-mask ventilation
BTS British Thoracic Society
BURP Backwards, upwards, rightwards pressure
CICO Can't intubate, can't oxygenate
CMV Continuous mandatory ventilation
CO_2 Carbon dioxide
COPD Chronic obstructive pulmonary disease
CPAP Continuous positive airway pressure
CPP Cerebral perfusion pressure
CPR Cardiopulmonary resuscitation
CSI Cervical spine injury
CT Computed tomography
ECG Electrocardiograph
ED Emergency department
ENT Ear, nose and throat
EPAP Expiratory positive airway pressure
E_TCO_2 End tidal carbon dioxide
FEV_1 Forced expiratory volume over one second
FG French gauge
FGF Fresh gas flow
F_iO_2 Inspired oxygen concentration
FRC Functional residual capacity
GABA Gamma-amino butyric acid
GCS Glasgow Coma Scale
HAFOE High-airflow oxygen enrichment
HME Heat and moisture exchanger
ICNARC Intensive Care National Audit And Research Centre
ICP Intracranial pressure
ICU Intensive care unit
ILMA Intubating laryngeal mask airway
IOP Intraocular pressure
IPAP Inspiratory positive airway pressure
IPPV Intermittent positive pressure ventilation
LED Light-emitting diode
LMA Laryngeal mask airway
MAP Mean arterial pressure
MET Medical emergency team
MMC Modernizing medical careers
MV Minute volume
NAP4 Fourth National Audit Project of the Royal College of Anaesthetists and the Intensive Care Society
NEAR National Emergency Airway Registry
NIBP Non-invasive blood pressure
NICE National Institute for Health and Care Excellence
NIPPV Non-invasive positive pressure ventilation
NIV Non-invasive ventilation
NMJ Neuromuscular junction
NTSP National Tracheostomy Safety Project
O_2 Oxygen
P_ACO_2 Partial pressure of carbon dioxide (alveolar)
P_AO_2 Partial pressure of oxygen (alveolar)

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-66125-7 - Emergency Airway Management: Second Edition
Edited by: Andrew Burtenshaw, Jonathan Benger & Jerry Nolan
Frontmatter
More information

P_aCO_2 Partial pressure of carbon dioxide (arterial)
P_aO_2 Partial pressure of oxygen (arterial)
PEEP Positive end expiratory pressure
PICU Paediatric intensive care unit
PLMA ProSeal laryngeal mask airway
P_{max} Peak (maximum) inspiratory pressure
PO_2 Partial pressure of oxygen
$\dot{Q}$ Perfusion
RR Respiratory rate
RSI Rapid sequence induction (of anaesthesia)
SAD Supraglottic airway device
SBAR Situation, Background, Assessment, Recommendation
SIGN Scottish Intercollegiate Guidelines Network
SIMV Synchronized intermittent mandatory ventilation
S_aO_2 Oxygen saturation (arterial)
S_pO_2 Oxygen saturation by pulse oximetry
TBI Traumatic brain injury
TRM Team resource management
$\dot{V}$ Ventilation
$\dot{V}/\dot{Q}$ Ventilation/Perfusion ratio
VALI Ventilator associated lung injury
V_T Tidal volume

© in this web service Cambridge University Press www.cambridge.org