Cases in Paediatric Critical Care Transfer and Retrieval Medicine
Cases in Paediatric Critical Care Transfer and Retrieval Medicine

Edited by
Shelley Riphagen
Evelina London Children's Hospital
Sam Fosker
Evelina London Children's Hospital
Contents

List of Contributors  viii
Preface  xv
List of Abbreviations  xvi

1 Models of Care  1
Shelley Riphagen

2 Logistics and Organisation  3
Shelley Riphagen and Karen Starkie

3 Air Retrieval  7
Karen Starkie

4 Improving Team Performance  13
Shelley Riphagen and Karen Starkie

5 I Like Children, but I Don’t Fancy Intubating One …  19
Rumiko King and Joanne Perkins

6 Upper Airway Obstruction  29
Gareth Waters and Andrew Nyman

7 Just Bronchiolitis?  35
Sam Fosker and Shelley Riphagen

8 Foreign Body Aspiration  41
Alexander Hall and Andrew Nyman

9 A Child with Facial Swelling  48
Michael Carter and Shelley Riphagen

10 Pneumonia and Empyema  53
Elizabeth Daisy Dunn and Marilyn McDougall

11 The Child with a Cough and Concerning White Cell Count  59
Jo Dyer and Maja Pavcnik

12 Worsening Stridor, to Intubate … or Not to Intubate  65
Joanna Davies and Shelley Riphagen

13 Difficult Asthma  70
Christopher Hands and Andrew Nyman

14 Transfer of Child with Pulmonary Hypertension  74
Kenneth MacGruer and Alison Pienaar

15 A Blue Baby  79
Joanna Davies and Shelley Riphagen

16 A Shocked Blue Baby Who Won’t Improve  84
Jenny Budd and Shelley Riphagen

17 Under a Spell  89
Catia Pinto and Miriam Fine-Goulden

18 A Decline in Function  94
Shelley Riphagen

19 Rash, Tachycardia and Irritability  99
Shelley Riphagen

20 Is the Baby’s Heart Rate Supposed to Be Slower than Mine?  105
Olga Van Der Woude and Shelley Riphagen

21 A Pale Lethargic Girl  109
Maria Gual Sanchez and Shelley Riphagen

22 Too Fast for Comfort  116
Sarah Hardwick and Miriam Fine-Goulden
<table>
<thead>
<tr>
<th>Chickenpox and Other Bugs</th>
<th>Michelle Alisio and Marilyn McDougall</th>
<th>122</th>
</tr>
</thead>
<tbody>
<tr>
<td>When Amoxicillin Just Doesn’t Cover It</td>
<td>Michael Carter and Marilyn McDougall</td>
<td>127</td>
</tr>
<tr>
<td>Tumour Lysis</td>
<td>Jo Dyer and Shelley Riphagen</td>
<td>135</td>
</tr>
<tr>
<td>Respiratory Insufficiency on Maximal Support: Is That It?</td>
<td>Federico Minen and Jon Lillie</td>
<td>141</td>
</tr>
<tr>
<td>Cardiac Arrest</td>
<td>Abi Whitehouse and Jon Lillie</td>
<td>148</td>
</tr>
<tr>
<td>A Neurosurgical Emergency</td>
<td>Livia Procopiuc and Alison Pienaar</td>
<td>154</td>
</tr>
<tr>
<td>A Fall from Height</td>
<td>Caroline Smith, Sam Fosker and Shelley Riphagen</td>
<td>159</td>
</tr>
<tr>
<td>Brain against the Clock</td>
<td>Tanmay Toteja and Sam Fosker</td>
<td>165</td>
</tr>
<tr>
<td>When Vomit Turns to Blood</td>
<td>Anna Canet Tarres and Shelley Riphagen</td>
<td>171</td>
</tr>
<tr>
<td>Bilious Vomiting and Distended Abdomen? Let's Find a Surgeon</td>
<td>Xabier Freire-Gomez and Alison Pienaar</td>
<td>178</td>
</tr>
<tr>
<td>What Can’t Go Down, Must Come Up</td>
<td>Emily Cadman and Alison Pienaar</td>
<td>185</td>
</tr>
<tr>
<td>Not All Burns Can Be Seen</td>
<td>Alex Williams and Ariane Annicq</td>
<td>191</td>
</tr>
<tr>
<td>Drowning and Organ Donation</td>
<td>Emma Prower and Joanne Perkins</td>
<td>197</td>
</tr>
<tr>
<td>The Cold Shocked Child</td>
<td>Sam Fosker and Shelley Riphagen</td>
<td>202</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>Fiona Bickell and Shelley Riphagen</td>
<td>207</td>
</tr>
<tr>
<td>Adolescent Psychosis and Seizures: Infection, Ingestion or Encephalitis?</td>
<td>Sasha Herring and Marilyn McDougall</td>
<td>210</td>
</tr>
<tr>
<td>The Collapsed Neonate</td>
<td>Ain Satar and Shelley Riphagen</td>
<td>216</td>
</tr>
<tr>
<td>A Floppy Breathless Child</td>
<td>Sam Fosker and Shelley Riphagen</td>
<td>221</td>
</tr>
<tr>
<td>Fever in the Time of COVID-19 (SARS-CoV2)</td>
<td>Marilyn McDougall</td>
<td>227</td>
</tr>
<tr>
<td>A Palliative Care Transfer Home</td>
<td>Joanna Davies and Miriam Fine-Goulden</td>
<td>231</td>
</tr>
<tr>
<td>A Story that Just Doesn’t Add Up</td>
<td>Emma Smith and Shelley Riphagen</td>
<td>237</td>
</tr>
<tr>
<td>Multidrug Overdose: A Practical Guide to Stabilisation and Transfer</td>
<td>Nav Somasinghe and Joanne Perkins</td>
<td>243</td>
</tr>
<tr>
<td>Death Is a Possible Outcome</td>
<td>Dawn Knight and Shelley Riphagen</td>
<td>248</td>
</tr>
<tr>
<td>A Cold, Unconscious 12-Year-Old Girl</td>
<td>Louisa Brock and Marilyn McDougall</td>
<td>253</td>
</tr>
<tr>
<td>Another Collapsed Neonate</td>
<td>Hannah Hayden and Maja Pavcnik</td>
<td>259</td>
</tr>
<tr>
<td>The Challenges of Chemotherapy</td>
<td>Heather Burnett and Maja Pavcnik</td>
<td>263</td>
</tr>
<tr>
<td>Diarrhoea and Vomiting</td>
<td>Georgina Humble and Shelley Riphagen</td>
<td>267</td>
</tr>
</tbody>
</table>
50  A Life-Threatening Sickle Cell Crisis  272
    Juan Ramon Valle Ortiz and Shelley Riphagen

51  A Baby with Acute Liver Failure  277
    Marilyn McDougall

52  Air Transport of a Critically Ill Baby  281
    Joanna Davies and Shelley Riphagen

53  Crew Resource Management  288
    Sam Fosker

54  Chest Drain Insertion  293
    Marilyn McDougall

55  Paediatric Airway Clearance for Acute Management on Retrieval  299
    Rosalie Summers

56  Use of Ultrasound for Paediatric Retrieval  303
    Ariane Annicq

57  Vasoactive Drugs on Retrieval  306
    Benedict Griffiths

Index  311

Colour plates can be found between pages 142 and 143.
Contributors

Editors

Sam Fosker is an anaesthetic trainee with an interest in pre-hospital and retrieval medicine and is currently undertaking a clinical fellow role at the Evelina London Children's Hospital and South Thames Retrieval Service. He is a Fellow of the Academy of Wilderness Medicine and has worked on projects in multiple different countries.

Shelley Riphagen is a South-African and Canadian-trained paediatric intensivist and clinical lead for the South Thames Retrieval Service, integrated within the Evelina London Children’s Hospital PICU. She has a keen interest in retrieval medicine and triage and the electronic technology to support this. She continues to jointly deliver a successful paediatric critical care advanced practitioner training programme for senior nurses and allied health professionals that started in 2003.

Contributors

Michelle Alisio is a South-African trained paediatrician working at the Royal London Hospital as a Senior Clinical Fellow in Paediatric Emergency Medicine (PEM). She is currently assisting in creating an online PEM teaching programme with Don’t Forget the Bubbles. Outside of work, she enjoys being in nature, travelling and music. She draws inspiration from Nelson Mandela’s quote ‘There can be no keener revelation of a society’s soul than the way in which it treats its children.’

Ariane Annicq is a paediatrician from Belgium who has specialised in paediatric intensive care and retrieval medicine since 2014, having worked in a number of international models of care. She became a consultant at the Evelina London Children’s Hospital in 2019. She is continuing to develop the Paediatric Critical Care Advanced Practitioners Masters’ program with Riphagen. Ariane has a special interest in point-of-care ultrasound (POCUS) and is a POCUS trainer.

Fiona Bickell is currently the Lead Nurse for PICU and the South Thames Retrieval Service at the Evelina London Children’s Hospital. She has been a paediatric intensive care nurse for over 25 years and has a passion for retrieval and transport medicine. Her appointment as Lead Nurse will enable her to enhance the experience of families in PICU and ensure the development of PICU nurses of the future.

Louisa Brock is an Adult and Paediatric Emergency Medicine Consultant working in South West London. She completed a year-long post Certificate of Completion Training second- ment with South Thames Retrieval Service to gain more experience in retrieval medicine and stabilisation of the critically unwell child. Prior to settling in London, she worked in Emergency Departments in Wales, Manchester and South Africa and is grateful for the varied and valuable experience these places have offered her. Away from work she enjoys horse riding, triathlons and supporting Welsh rugby.

Jenny Budd is a paediatric intensive care nurse with 20 years of experience within this speciality. Budd is a qualified Advanced Nurse Practitioner (ANP) and is the nursing lead
for ECMO at the Evelina London Children’s Hospital. She is proud to be part of an outstanding team at Evelina and South Thames Retrieval Service. She hopes that this book provides useful information for those undertaking paediatric retrieval.

Heather Burnett is an ANP working on PICU at the Evelina London Children’s Hospital, and for the South Thames Retrieval Service. She previously worked on the PICU at St Mary’s Hospital.

Emily Cadman is a final year paediatric emergency medicine trainee from London. She studied in Bristol and started training in the south west. Early experiences in training gave her a taste for retrieval and transport medicine and her younger self wishes this book existed back then. As well as acute and emergency medicine, she interested in medical education, ethics and law and is Vice-Chair of a London research ethics committee.

Anna Canet Tarres is a paediatrician from Spain who has been training in paediatric intensive care since 2017. Since September 2019, she has been a PICU fellow at the Evelina London Children’s Hospital and part of the South Thames Retrieval Service.

Michael Carter is an NIHR Academic Clinical Lecturer in Paediatrics at King’s College London, and Sub-specialty Registrar in Paediatric Intensive Care and Retrieval Medicine at Evelina London Children’s Hospital. He works in the Schools of Life Course Sciences, and in Dr Shankar-Hari’s group (Immunology and Microbial Sciences) to investigate the pathophysiology of severe inflammation following cardiac surgery and in sepsis. He aims to take a ‘life course’ view of our patients in intensive care, acknowledging that the consequences of each admission to an intensive care unit will have profound importance for a patient’s long-term health.

Joanna Davies trained at the Nightingale School of Nursing. She has worked in PICU for 27 years and has been a Retrieval Nurse Practitioner (RNP) for South Thames Retrieval Service for the last 14 years. She is co-author for Children in Intensive Care: a Survival Guide, now on its third edition.

Elizabeth Daisy Dunn is a senior paediatric trainee, with a particular interest in high dependency care in unwell children, simulation training and medical education. Having been part of the team at the Evelina London Children’s Hospital Paediatric Intensive Care Unit, she is now currently undertaking a Medical Education Fellowship in Paediatrics at St George’s Hospital, and is also an honorary senior lecturer at St. George’s University of London Medical School. She is heavily involved in both undergraduate and postgraduate medical education and is herself undertaking a Postgraduate Certificate in Healthcare and Biomedical Education. Having trained both within London and the surrounding area, Dunn hopes this book will help to educate and inform all those involved in the care of unwell children, thus helping to provide better care to the patients they treat.

Jo Dyer has been a paediatric intensive care nurse since 2000, training in Southampton before joining the Evelina London Children’s Hospital PICU team in 2006. She qualified as a RNP in 2014 and now works both as an RNP for South Thames Retrieval Service and a Band 7 nurse on the PICU.

Miriam Fine-Goulden is a paediatric intensive care consultant at the Evelina London Children’s Hospital, Guy’s & St. Thomas’ NHS Foundation Trust and South Thames Retrieval Service for Children. She is an honorary clinical senior lecturer at King’s
College London. She trained in the UK at Cambridge University and at University College London. She has written for *The Science of Paediatrics: MRCPCH Mastercourse* (Elsevier) and co-edited *Challenging Concepts in Paediatric Critical Care* (OUP). Her specialist interests include: ECMO, education, child mortality, healthcare policy and strategy and medical communications. She tweets @finegoulden.

**Xabier Freire-Gomez** is a qualified paediatrician trained in Spain, pursuing a career in paediatric intensive care. He has worked at the Evelina London Children’s Hospital PICU as a senior fellow (ECMO and Airway Fellow) with a special interest in congenital heart disease and mechanical ventilation, including non-invasive ventilation. He's currently working as a critical care retrieval consultant in Barcelona and is very excited about his future job at RCHM PICU (Melbourne).

**Benedict Griffiths** is an intensive care and retrieval medicine consultant at the Evelina London Children’s Hospital with South Thames Retrieval Service. He started his medical career as a physiotherapist. He has an interest in fluid shifts in critical illness and paediatric difficult airways.

**Alexander Hall** is a senior anaesthetic registrar with an interest in paediatric anaesthesia and difficult airway management. He is currently undertaking his advanced paediatric anaesthetic fellowship at the Evelina London Children’s Hospital. Hall has an interest in peri-operative care and is completing a postgraduate diploma in anaesthesia and perioperative medicine.

**Christopher Hands** trained in paediatrics and paediatric intensive care in London. He is a clinical fellow in paediatric intensive care at Evelina London Children’s Hospital, and an honorary lecturer in child health at the Liverpool School of Tropical Medicine.

**Sara Hanna** is a paediatric intensive care consultant at the Evelina London Children’s Hospital. She is a Cambridge graduate and completed paediatric intensive care training at Guy’s and St Thomas’ and Royal Melbourne Children’s Hospital. She is also Medical Director of the Evelina London.

**Sarah Hardwick** works as an ANP in PICU at the Evelina London Children’s Hospital and for South Thames Retrieval Service. She joined Evelina in 2000 and qualified as an ANP in 2009. Prior to this she worked in children’s and adult nursing in various settings after qualifying in 1991.

**Hannah Hayden** is a UK-trained paediatric intensivist with an interest in organ donation, retrieval medicine, global health and education. She has worked in many countries overseas including teaching on ETAT+ Courses as well as Masters of Health Professions Education in Somaliland with King’s Somaliland Partnership.

**Sasha Herring** began her nursing career in Australia and worked in PICU at the Royal Children’s Hospital Brisbane. Since 1998 she has been at the Evelina London Children’s Hospital, beginning her training as an RNP in 2003. Her area of special interest is the continuing professional development of non-medical prescribers who are prescribing for children.

**Georgina Humble** qualified as a paediatric nurse at Kingston University. Post qualifying she started working in PICU at St George’s Hospital and after 7 years relocated to PICU at...
the Evelina London Children’s Hospital to undertake ANP training. She currently works as a paediatric critical care ANP for South Thames Retrieval Service and in the PICU.

**Paul James** is South-African and British-trained doctor who has specialised in paediatric anaesthesia and intensive care. His main areas of interest are paediatric airway management, paediatric cardiac anaesthesia and ECMO. He also enjoys taking these skills outside the UK and works for a number of charities including Healing Little Hearts, Chain of Hope and Medical Education for Kenya. Outside work he is never off his bike or running up a hill and enjoys long distance ultra-triathlons.

**Rumiko King** is an anaesthetic registrar at St. George’s Hospital in London with interest in paediatric anaesthesia.

**Dawn Knight.** After nearly 11 years practicing as a corporate lawyer Knight qualified as a children’s nurse in 2002 from Southbank University London. On qualification she joined Evelina London Children’s Hospital and after a 1-year rotation, joined PICU where she remains. She qualified as an RNP in 2013 and shortly after as a non-medical prescriber. Since then she has consolidated this RNP role and developed as an ANP on PICU.

**Jon Lillie** is a paediatric intensivist and ECMO lead at the Evelina London Children’s Hospital. Having worked across six PICUs and three ECMO centres, he has realised that there are different valid approaches to the same problem and dogma prevents improvement within paediatric critical care. The right answer is not always offered by those that shout the loudest and there may not even be a ‘right’ answer. Through research and teamwork, he hopes to enjoy the next 20 years, improving care and knowledge within the speciality. He tweets @DrJonLillie.

**Kenneth MacGruer** is a final year paediatric intensive care medicine (PICM) trainee. After studying in Edinburgh, he trained in paediatrics in Manchester and Melbourne before starting PICM in Evelina London Children’s Hospital.

**Marilyn McDougall** completed her paediatric training in Cape Town, South Africa and now works as a full-time paediatric intensive care consultant at the Evelina London Children’s Hospital and South Thames Retrieval Service. She is the Clinical Director of the South Thames Paediatric Network and an honorary senior lecturer at Kings College London. She enjoys teaching and has developed a particular interest in simulation education. She co-authored *Children in Intensive Care: A Survival Guide*, now in its third edition and published by Elsevier in 2018.

**Federico Minen** is an Italian-trained paediatrician who moved to the UK to specialise in paediatric intensive care. Currently a senior fellow in the Evelina London Children’s Hospital paediatric intensive care, he has a special interest in cardiac diseases, airway management and procedural sedation.

**Andrew Nyman** is a paediatric intensive care consultant at the Evelina London Children’s Hospital, Guy’s & St. Thomas’ NHS Foundation Trust and South Thames Retrieval Service for Children. He is an honorary clinical senior lecturer at King’s College London. He obtained his medical training in South Africa and completed paediatric specialisation in the UK, with further subspecialty training in Australia. His specialist interests include: bronchoscopy and airway pathology, ECMO, clinical research and health informatics.
List of Contributors

Juan Ramon Valle Ortiz completed paediatric training in Spain and is currently working in paediatric intensive care and anaesthesia.

Maja Pavcnik is a paediatric intensive care consultant at the Evelina London Children’s Hospital, Guy’s & St. Thomas’ NHS Foundation Trust, and South Thames Retrieval Service for children. She is from Slovenia and has worked in a number of international models of care. Her specialist interests include: education, retrieval medicine and child mortality.

Joanne Perkins is a consultant in paediatric intensive care and in paediatric anaesthesia at the Evelina London Children’s Hospital. She completed medical training in Ireland and came to London to complete post-Certificate of Completion Training fellowship in paediatric intensive care. Her areas of interest include audit, education and medicine safety.

Alison Pienaar has worked as a consultant in paediatric intensive care at the Evelina London Children’s Hospital Guy's and St Thomas’ Foundation Trust and South Thames Retrieval Service from 2013. She is an Honorary Clinical Senior Lecturer at King’s College London. She completed her training in South Africa and her areas of clinical interest include transport medicine, extracorporeal life support and patient safety.

Catia Pinto is currently training to become an ANP at the Evelina London Children’s Hospital. She started her intensive care training in an adult cardiac intensive care unit where she developed an interest in congenital heart disease. She later specialised in a PICU at Great Ormond Street Hospital before moving to Evelina in 2019 to start her ANP training.

Livia Procopiuc is a German trainee in anaesthesia and adult intensive care currently pursuing an out of programme Fellowship in Paediatric Intensive Care at the Evelina London Children’s Hospital and the South Thames Retrieval Service.

Emma Prower is a senior registrar in Intensive Care Medicine based at Kings College Hospital. She has a particular interest in intensive care outreach and the deteriorating patient.

Maria Gual Sanchez studied medicine in Barcelona and then moved to Madrid (Hospital Universitario La Paz) for her paediatric training. The last part of her training was focused on the critically ill child. Since September 2019 she has been a PICU fellow in Evelina Children’s Hospital and part of the South Thames Retrieval Service.

Ain Satar is a trainee paediatrician working in the Evelina PICU. As part of her training she is developing a particular interest in allergy, simulation and high dependency care. Satar is a passionate educationalist currently completing a Postgraduate Certificate in Medical Education, and is active in both undergraduate and postgraduate education in London.

Caroline Smith is a maxillofacial clinical fellow at the Royal London Hospital having worked previously in other maxillofacial teams and dental practice. She is a Dental Officer in the British Army and has a Masters in Humanitarianism and Conflict Response.

Emma Smith is a senior paediatric registrar who has trained at a number of central London hospitals including Evelina Children’s Hospital, where she spent a year working on PICU and as part of the South Thames Retrieval Team. She has a special interest in paediatric high dependency care as well as simulation.
Nav Somasinghe is an adult nephrology and intensive care medicine trainee with an interest in retrieval medicine and pre-hospital care.

Karen Starkie is a paediatric, intensive care nursing sister based at the Evelina London Children’s Hospital. She has been retrieving for over 17 years and is currently the South Thames Retrieval Service Co-ordinator.

Rosalie Summers is a Highly Specialist Paediatric Respiratory Physiotherapist who has worked within Evelina London Children’s Hospital and its PICU since 2005. Physiotherapists are an integral part of the PICU team within Evelina and Rosalie feels confident this improves patient care. She has a keen interest in using her knowledge of ventilation and physiotherapy techniques to treat critically unwell children often at the point of admission. She has led work developing an online learning package to assist in training her physiotherapy colleagues and the wider multidisciplinary team, ensuring effective quality care for all.

Tanmay Toteja is a paediatric intensive care trainee presently at the Royal Brompton Hospital, London. He trained as a paediatrician in New Delhi, India and then in London at the Imperial College NHS trust and the Evelina London Children’s Hospital. Initially trained in neonatal intensive care, he is currently pursuing PICM training. He has a keen interest in medical education, simulation learning (part of the London School of Paediatrics simulation programme), cardiac intensive care and retrieval of sick children.

Olga Van Der Woude is an anaesthetist from the Netherlands who moved to the UK after completing her specialist training in Utrecht, the Netherlands. She specialised in paediatric anaesthesia at Royal Manchester Children’s Hospital and currently is a Senior Clinical Fellow in Paediatric Cardiac Anaesthesia and Intensive Care at the Evelina London Children’s Hospital.

Gareth Waters is a UK PICM Grid trainee, currently working on PICU at the Evelina London Children’s Hospital. His background is in anaesthesia, and he trained in the Oxford Deanery, after having studied medicine at the University of Oxford.

Abi Whitehouse is a general paediatric registrar with special interests in both respiratory and HDU medicine. She enjoys cycling, walking and sewing alongside completing her paediatric training. Whitehouse also has a keen research background, with a PhD in paediatric respiratory medicine and ongoing research projects looking at interventions to prevent the health effects associated with air pollution exposure.

Alex Williams is an ANP. He works at Evelina London Children’s hospital on Paediatric Intensive Care and South Thames Retrieval Service. He has worked in PICU since 2010.
Preface

The Service
The South Thames Retrieval Service (STRS) is a paediatric emergency inter-hospital transfer service for critically ill children. Integrated within the Paediatric Intensive Care Unit (PICU) at the Evelina London Children’s Hospital (ELCH), it operates two retrieval teams 24/7 all year round.

STRS is the hub of a Paediatric Critical Care Network for South London and the South East of England, serving 20 district general hospitals in the region and three network PICU’s in South London at the Evelina, St George’s Hospital and Kings College Hospital.

STRS supports the care of children presenting critically ill to their local hospitals from the first referral call until resolution of the case. This support is facilitated through a dedicated phone line. The calls are taken by doctors (PICU fellows) or paediatric critical care retrieval advanced nurse practitioners, who are able to take details of the referral and provide immediate advice to referrers. Calls are then triaged by the responsible retrieval consultant, with additional resuscitation and stabilisation advice to the local team. The STRS team is dispatched to undertake the transfer, as soon as it is ascertained that the child will need ongoing critical care and it is necessary to transfer the child.

Over the past 20 years, STRS has transferred between 500 and 1000 children per annum, rapidly rising from lower levels in the year 2000 to current numbers. This has provided a huge number of interesting and challenging cases of very sick children, many of which are expanded in this book.

The Book
Learning from personal and from other’s experience is a fundamental learning tool in medicine.

The aim of this book is to use challenging cases in the management of critically ill children, from presentation to transfer and admission to PICU to identify key learning from others’ experience. It provides an opportunity to participate in the resuscitation, stabilisation and transfer virtually, without the stress associated with having the critically ill child and distressed family in front of you. It provides an opportunity to consider how you would have done things, perhaps differently, and review what was done. It has the benefit of seeing the case through from start to finish, so that personal management strategies applied can be reviewed without impact to the child. It also gives opportunity to learn from the good practice or insight of others and to take this learning forward, to ensure that the next child with similar presentation has the best outcome.
Abbreviations

(D+) HUS  Diarrhoea positive haemolytic uraemic syndrome
AKI  Acute kidney injury
ALL  Acute lymphoblastic leukaemia
ALT  Alanine aminotransferase
AML  Acute myeloid leukaemia
APLS  Advanced Paediatric Life Support
APTT  Activated partial thromboplastin time
APTTR  Activated partial thromboplastin time ratio
ARDS  Acute respiratory distress syndrome
ASD  Atrial septal defect
AV  Atrioventricular
AVNRT  Atrioventricular node re-entry tachycardia
AVPU  Alert, verbal, pain, unresponsive
AVRT  AV re-entry tachycardia
BE  Base excess
BNP  Brain natriuretic peptide
BP  Blood pressure
BPD  Bronchopulmonary dysplasia
Bpm  Beat per minutes
BSPED  British Society of Paediatric Endocrinology and Diabetes
BTS  British Thoracic Society
BVM  Bag valve mask ventilation
CATS  Children’s Acute Transport Service
CDH  Congenital diaphragmatic hernia
CHD  Congenital heart disease
CNS  Central nervous system
CO  Cardiac output
CPAP  Continuous positive airway pressure
CPAP/BiPAP  Continuous/bilevel positive airway pressure
CPR  Cardiopulmonary resuscitation
CRP  C-reactive protein
CrUSS  Cranial ultrasound
CSF  Cerebrospinal fluid
CT  Computed tomography
CVVH  Continuous veno-venous haemofiltration
CXR  Chest X-ray/radiograph
DBD  Donation after brain death
DCD  Donation following circulatory death
DGH  District general hospital
DKA  Diabetic ketoacidosis
DNAR  Do not attempt cardiopulmonary resuscitation
DOPES  Displacement, obstruction, pneumothorax, equipment, stomach
List of Abbreviations

ECG Electrocardiogram
ECMO Extracorporeal membrane oxygenation
ENT Ear, nose, throat
ESR Erythrocyte sedimentation rate
ETCO₂ End-Tidal Carbon Dioxide
ETT Endotracheal tube
FiO₂ Fraction of inspired oxygen
GA Group A Streptococcus
GCS Glasgow Coma Scale
HDU High dependency unit
HFNC High flow nasal cannula
HFOV High frequency ventilation
HIE Hypoxic ischaemic encephalopathy
HR Heart rate
HUS Haemolytic uraemic syndrome
ICP Intracranial pressure
INR International Normalized Ratio
IV Intravenous
IVIG Intravenous immunoglobulin
LMA Laryngeal mask airway
MAP Mean airway pressure
MAS Meconium aspiration
MCCD Medical Certificate of Certification of Death (usually referred to as 'death certificate')
MHI Manual hyperinflation
MRI Magnetic resonance imaging
MRSA Multi-resistant Staphylococcus aureus
NBP Non-invasive blood pressure
NDMA N-methyl-D-aspartate receptor
NICE National Clinical Institute of Excellence
NICU Neonatal intensive care unit
NIV Non-invasive ventilation
NPIS National Poisons Information Service
NSAID Non-steroidal anti-inflammatory drug
ODT Organ donation team
OPA/NPA Oropharyngeal/nasopharyngeal airways
OSI Oxygen saturation index
OI Oxygenation index
PALISI Paediatric Acute Lung Injury and Sepsis Investigators
PaO₂ Partial pressure of oxygen
pCO₂ Partial pressure of carbon dioxide
PCR Polymerase chain reaction
PCT Procalcitonin
PDA Patent ductus arteriosus
PEEP Positive end-expiratory pressure
PEG Percutaneous endoscopic gastrostomy
PFO Patent foramen ovale
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PICU</td>
<td>Paediatric intensive care unit</td>
</tr>
<tr>
<td>PIM-TS</td>
<td>Paediatric Multisystem Inflammatory Syndrome – Temporally Associated with SARS-CoV-2</td>
</tr>
<tr>
<td>POCUS</td>
<td>Point of care ultrasound</td>
</tr>
<tr>
<td>PT</td>
<td>Prothrombin time</td>
</tr>
<tr>
<td>PEA</td>
<td>Pulseless electrical activity</td>
</tr>
<tr>
<td>PVL</td>
<td>Panton-Valentine Leukocidin</td>
</tr>
<tr>
<td>RBC</td>
<td>Red blood cells</td>
</tr>
<tr>
<td>RCPCH</td>
<td>Royal College of Paediatrics and Child Health</td>
</tr>
<tr>
<td>RICP</td>
<td>Raised intracranial pressure</td>
</tr>
<tr>
<td>ROSC</td>
<td>Return of spontaneous circulation</td>
</tr>
<tr>
<td>RR</td>
<td>Respiratory rate</td>
</tr>
<tr>
<td>SA</td>
<td>Sinoatrial</td>
</tr>
<tr>
<td>SaO₂</td>
<td>Arterial oxygen saturation</td>
</tr>
<tr>
<td>SCIWORA</td>
<td>Spinal cord injury without radiological abnormality</td>
</tr>
<tr>
<td>SCUBU</td>
<td>Special Care Baby Unit</td>
</tr>
<tr>
<td>SIRS</td>
<td>Systemic inflammatory response syndrome</td>
</tr>
<tr>
<td>SMA</td>
<td>Spinal muscular atrophy</td>
</tr>
<tr>
<td>SNOD</td>
<td>Senior Nurses in Organ Donation</td>
</tr>
<tr>
<td>SOFA</td>
<td>Sequential (or sepsis-related) organ failure assessment</td>
</tr>
<tr>
<td>SORT</td>
<td>Southampton and Oxford Retrieval Service</td>
</tr>
<tr>
<td>SpO₂</td>
<td>Pulse oximetry</td>
</tr>
<tr>
<td>STRS</td>
<td>South Thames Retrieval Service</td>
</tr>
<tr>
<td>SV</td>
<td>Stroke volume</td>
</tr>
<tr>
<td>SVR</td>
<td>Systemic vascular resistance</td>
</tr>
<tr>
<td>SVT</td>
<td>Supraventricular tachycardia</td>
</tr>
<tr>
<td>TAPVD</td>
<td>Total anomalous pulmonary venous drainage</td>
</tr>
<tr>
<td>TGA</td>
<td>Transposition of the great arteries</td>
</tr>
<tr>
<td>TLS</td>
<td>Tumour lysis syndrome</td>
</tr>
<tr>
<td>TSS</td>
<td>Toxic shock syndrome</td>
</tr>
<tr>
<td>VBG</td>
<td>Venous blood gas</td>
</tr>
<tr>
<td>VILI</td>
<td>Ventilator-induced lung injury</td>
</tr>
<tr>
<td>VSD</td>
<td>Ventricular septal defect</td>
</tr>
<tr>
<td>VT</td>
<td>Ventricular tachycardia</td>
</tr>
<tr>
<td>WCC</td>
<td>White cell count</td>
</tr>
</tbody>
</table>