

# PICS 2015

29th Annual  
Paediatric Intensive  
Care Society  
Conference

14th -16th September 2015  
Birmingham UK



Birmingham  
Children's Hospital

Birmingham Children's Hospital **NHS**  
NHS Foundation Trust

# Programme & Abstracts



**PICS** Paediatric Intensive  
Care Society



[www.picsmeeting.com](http://www.picsmeeting.com) #PICS2015

Industry Symposium

# Empowering PICU with communication technology to improve patient and staff experience

Tuesday 15th September 2015

13.15 - 13.45

Hall 9

Birmingham Children's PICU had to expand their ward due to an increase in patient demand and the need for more beds. This expansion resulted in more patients, a bigger ward but the same number of nurses and consultants to run the PICU. The increased size of the ward lead to poor line of sight of colleagues, additional isolation rooms and an increased concern of patient safety and staff isolation.

Hear how Birmingham Children's have used innovative technology to address the above challenges.

## Speakers:

Adrian Plunkett, Birmingham

and

Rachael Soundy, Birmingham

## Chairman:

Peter-Marc Fortune, Manchester

Birmingham Children's Hospital   
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## PICS Council

President:	Peter Wilson
Vice President:	Fiona Lynch
Immediate Past President:	Kevin Morris
Honorary Secretary:	Jeff Perring
Honorary Treasurer:	Oliver Bagshaw
President-Elect:	Peter-Marc Fortune
Medical Members:	Margerita Burmester David Grant Padmanabhan Ramnarayan Yamuna Thiru
Nurse Members:	Darren Darby Yvonne Heward Fiona Lynch Andrea McCarthy Lynda Pittilla
Trainee Members:	Adrian Humphry Eldilla Rizal

## Local Organising Committee

David Ellis (Chair)  
Heather Duncan (Alumni Co-ordinator)  
Barney Scholefield (Programme Director)  
Jane Cassidy  
Margaret Farley  
Yvonne Heward  
Rhian Isaac  
Alison Jones  
Hari Krishnan  
Annemieke Miedema  
Kevin Morris  
Adrian Plunkett  
Jenna Spry  
Manu Sundaram  
Justin Wang

## Scientific Committee

Akash Deep (Co-Chair)  
Adrian Plunkett (Co-Chair)  
Miriam Fine-Goulden  
Saiuath Raman  
Lyvonne Tume

## Speaker Faculty

### From Canada and the Toronto Hospital for Sick Children

Gail Annich  
Peter Cox  
Brian Kavanagh  
Karen Kinnear  
Peter Laussen  
Steven Schwartz

### From Birmingham's Children's Hospital

David Barron  
Phil Botha  
Jane Cassidy  
Heather Duncan  
Yvonne Heward  
Alison Jones  
Reinout Mildner  
Kevin Morris  
Rachael Morrison  
Richard Neal  
Gale Pearson  
Adrian Plunkett  
Barney Scholefield  
Phil Wilson

### From Europe/UK

Joe Brierley, *Great Ormond Street Hospital for Children, London, UK*  
Julian Bion, *Intensive Care Medicine, University of Birmingham, Birmingham, UK*  
Andrew Durward, *Evelina Children's Hospital, London, UK*  
Caroline Haines, *Bristol, UK*  
Gillian Charlotte Halley, *Royal Brompton Hospital, London, UK*  
Jos Latour, *Plymouth University, UK*  
Andrew Magnay, *Royal Stoke University Hospital, Stoke-on-Trent, UK*  
Roger Parslow, *University of Leeds, Leeds, UK*  
Peter Rimensberger, *University Hospital of Geneva, Geneva, Switzerland*  
Lyvonne Tume, *Alder Hey Children's Hospital, Liverpool, UK*

### From USA

Michael Bell, *Children's Hospital of Pittsburgh of UPMC, Pittsburgh, USA*  
Robert Tasker, *Harvard Medical School, Boston, USA*

# Contents

Welcome	3
Networking Programme	4
General Information	5
Open Meetings & Annual Members' Meeting	6
Pre Conference Scientific Programme	8
Programme: Tuesday 15th	9
Wednesday 16th	11
Authors' Index	13
Oral Poster Listing	17
Poster Listing	18
Oral Presentation Abstracts	20
Oral Poster Presentation Abstracts: Tuesday	25
Wednesday	31
Poster Presentation Abstracts	35
Acknowledgements	64
Exhibitors': Editorials	64
Floorplan	68

## Conference Secretariat



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# Welcome

from Toronto's Hospital for Sick Children

The Hospital for Sick Children Critical Care Alumni Association are very pleased to be able to help sponsor the Paediatric Intensive Care Society 2015 conference in Birmingham.

Over the past 20 years, over 400 Fellows from across the world have trained through our Department of Critical Care Medicine Fellowship Program and many are now leaders in critical care across the world, and have led changes in clinical practice with novel research that has changed the field.

We are very proud of being able to train so many wonderful clinicians and the purpose of our Alumni Association is not only to make sure that we can stay in contact with all of our former Fellows, but that they can also stay in contact with each other.

We had our first Alumni meeting in November 2013 at the Critical Care Canada Forum and a follow-up meeting in 2014. We are very pleased to be able to help support PICS 2015, particularly because of the large number of clinicians across the UK and Europe who have trained with us in the past. Indeed, our support to the PICS 2015 is in recognition of our former Fellows and an effort on our behalf to maintain connections. We hope everyone thoroughly enjoys and benefits from PICS 2015, both professionally and socially.

Best wishes to all from Peter Laussen  
and Peter Cox on behalf of the  
*SickKids Critical Care Alumni Association*



# Welcome

from Birmingham Children's Hospital

Welcome to Birmingham and the 29th Annual Meeting of the UK Paediatric Intensive Care Society.

On behalf of the organising committee at Birmingham Children's Hospital we warmly welcome you to The Heart of England.

We are all really excited about this conference, not just because it is in Birmingham and the grand International Convention Centre, but because this year we have a fantastic opportunity to present a truly international faculty.

For 2015, Birmingham Children's Hospital and PICS are hosting the annual alumni meeting of the Toronto Hospital for Sick Children. We are honoured to welcome members of the Toronto Alumni based in Europe, North America and beyond, and we thank them for their valuable contribution to the nursing and medical scientific programme for PICS 2015.

The pre-conference day includes workshops offering small group training led by our own Birmingham team of airway, ultrasound, communication and neuro-monitoring experts. The Masterclass follows, with representation from the Toronto Alumni offering us 'How the "experts" manage patients with....' across the breadth of challenging conditions we face in PICU. Thank you to the entire workshop and masterclass faculty for a great start to our conference.

The main programme follows and we are proud to offer a wide range of educational topics pushing the boundaries of current PICU patient care. safety and quality, ventilation, education and nursing research, cardiac and neuro-monitoring advances, and the complex patient are a few of the highlights in the packed scientific programme. Opinion leaders, researchers and practitioners from the UK and Internationally aim to challenge current practice and raise

the bar in how we deliver paediatric critical care. Having such a distinguished faculty in the Heart of England creates an opportunity for all of us as PICU specialists, both qualified and in training, to have access to some fantastic learning opportunities.

Importantly we would like to thank all of you for coming to Birmingham and to those contributing to this meeting by submitting your own research, quality improvement and expert opinion via the abstract submissions. The quality this year has been excellent. We look forward to the "Awards for Best Abstracts" presented on Wednesday afternoon, and your contribution to the question and answer sessions.

We welcome and thank over 24 companies who are exhibiting products and services focused on enhanced PICU care and quality service delivery to patients. Their support is integral to the quality of the conference so please try and spend time with them during the conference.

Traditionally the conference promotes networking and socialising. This year we would like to welcome you to The Malt House, a traditional Birmingham canal side pub, for the Welcome Reception, and the Banqueting Suites at the Town Hall on Tuesday for the Annual Banquet.

Finally, the Birmingham organising committee invites you to relax, enjoy Birmingham, learn, network, meet old friends and make new ones. It is our pleasure to have you here at PICS 2015.

Thank you for coming.

David Ellis – Chair, Local Organising Committee  
Barney Scholefield – Programme Director  
Heather Duncan – Alumni Co-ordinator



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## PICS Annual Dinner

15th September 2015  
19.30 – Birmingham's Banqueting Suite

After a good day of science it is time to have a fun interlude. This year's Annual Dinner in the Banqueting Suite will aim to have delegates relax and enjoy each others company, supplemented by snippets of entertainment, good food and drink and concluding with dancing.

The Banqueting Suite is in The Council House, which is in the heart of Birmingham's city centre. The Council House itself is a beautiful Grade II\* listed building, boasting some of the city's most talked about design. Since its opening, this venue has received and welcomed members of the Royal Family, world leaders, media and film stars, people from the literary world and now the PICS 2015 delegates!

The Banqueting Suite offers traditional Victorian elegance as a backdrop to our evening.

Tickets must be pre-booked.

## Networking Programme

14th September 2015 – 18.00

(coinciding with Registration)

The Malt House at Brindley Place

After the Pre-conference Workshops and the clinical management lectures presented by experts from the Toronto Hospital for Sick Children staff there will be the traditional Welcome Reception to the PICS Annual Meeting.

This year delegates will be enjoying local Birmingham alongside a central canal and using the The Malt House Public House, just a 100m from the International Convention Centre.

A wholly historic pub with a plush plot by Birmingham's bustling canal, The Malt House is a Brindley place pub known for its laid back atmosphere and hearty pub fare.

A traditional building that was once a historic maltings, The Malt House is a canal-side staple. Visited by Bill Clinton way back in the day and known for its historic interiors, The Malt House knows very little of the contemporary but plenty of the classic.

The Malt House offers a balcony overlooking the main bar with the traditional wooden awnings, overhanging beams, roaring fireplaces, plus a top notch second floor exterior terrace and a canal-side seating area.

On offer will be 'canapés' of the best tradition of British pub food, best enjoyed with a drink and colleagues.



Optima Medical Ltd is the leading distributor of neurophysiology monitoring systems and is the exclusive distributor for the Xltek EEG and ICU systems in the United Kingdom and Ireland. Xltek systems are used by over 85% of neurophysiology departments in the UK. The Xltek ICU system offers continuous brain monitoring wherever and whenever needed in an ultra-compact, minimal footprint setup. A simple and intuitive touchscreen interface combined with advanced event detection and trending offers the ultimate ICU package.



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# General Information

## Badges

Name badges will be issued to all participants when they arrive at Registration. Participants are kindly requested to wear their own badge at all times throughout the days of the conference. Badges may be checked at any time for security purposes. Access to all scientific events and Exhibition areas will only be possible with your own name badge. Replacement name badges may be purchased from the Registration Desk.

## Catering

Delegates' lunch and teas and coffees throughout the Conference will be served from the various service points within the Exhibition areas in Hall 11 and the Foyer. Please visit a range of points during the conference. Please take time to visit the Exhibitors during the breaks. They will be pleased to see you.

## Certificates of Attendance

Each pre-registered delegate will receive a Certificate of Attendance with their Registration pack on arrival.

## Checking out of your accommodation

Please ensure that you check-out of your accommodation by the required time and that you settle any hotel room extras (telephone, meals etc) on departure. See Luggage Storage Facilities section below.

## Cloakroom/Luggage Storage Facilities

There is a large cloakroom on the Ground Floor of the International Convention Centre. All items are left at the owner's risk. There is a £1 charge to leave items.

## Continuous Professional Development

The Certificates of Attendance for both the workshop, masterclass and attendance at the conference are placed in your registration envelope.

## Conference Recording

The presentations over the two days, including the questions and answers, will be recorded and available on the Paediatric Intensive Care Society website and on the conference website within 7

days of the close of the conference. The conference would like to thank Vocera for providing an educational grant towards this service.

## Exhibition

We encourage all participants to visit all Exhibition stands in the Hall 11, Hall 11 Foyer and the Foyer to Hall 9. Please go exploring to ensure that you visit the companies which may be of interest to you. Please refer to page 64 for full listings.

## Feedback Forms

It is important for Organisers to have feedback to help direct future events. Please take time to fill in the Feedback Form in your pack and hand it in at the Registration Desk before leaving the conference. Your view is valued.

## Instructions to Presenters

### Oral Presenters:

Please allow plenty of time for pre-loading your presentation to the main computer. Presenters should download presentations in the Hall 9 Technicians booth. Presentations will take place in Hall 9 and 10.

### Poster Presenters:

Posters will be displayed in Hall 10a and Hall 11 near the Exhibition.

Posters should be put into place as early as possible on the first day of the conference and removed at the end of the conference. Authors of posters are invited to be by their posters during break times through the conference, to meet and discuss the poster with other participants.

Each poster has been allocated an area to be displayed, with a poster number. This number cannot be moved or the poster location swapped for any other.

PLEASE REMEMBER TO TAKE YOUR POSTER HOME WITH YOU! POSTERS LEFT BEHIND WILL BE DESTROYED.

## Liability

Neither Birmingham Children's Hospital, Paediatric Intensive Care Society, Index Communications Meeting Services nor The International Conference Centre is able to take responsibility whatsoever for injury or damage to persons or property during the conference.

## Messages

The telephone number for International Convention Centre is General enquiries: +44 (0)121 644 5025. It may take time for messages to reach participants in this large building, but every effort will be made.

## Mobile Phones

We appreciate that all conference participants need to be available for calls, but the Organisers ask that all mobile phones and tablets are switched off or to mute mode in all sessions. We would like to make a polite request that any calls be made or taken in the foyer areas or as far as possible away from the auditorium to avoid disruption.

## Paediatric Intensive Care Society Awards

The Paediatric Intensive Care Society is offering prizes for the best poster and best oral presentations that demonstrate the most valuable contribution to paediatric patient care in the PIC Units.

## PICS 2015 Best Presentation Awards

PICS 2015 will be granting best presentation awards to the best oral and poster abstracts presented during the conference.

2 awards in the amount of £250 will be granted to oral presentations.

2 awards in the amount of £200 will be granted to an oral poster presentation.

1 award in the amount of £100 will be granted to a poster presentation.

Winners will be announced during the Conference Closing Ceremony on Wednesday 16th September 2015 at around 14.30

## Registration Desk

The Registration Desk will be open during the following hours:

### Monday 14th September 2015

07.30 – 17.00 hrs

(Located at Austin Court, Birmingham. B1 2NP)

18.00 – 20.30 hrs

(located at The Malthouse, Brindley Place)

### Tuesday 15th September 2015

07.30 – 17.00 hrs

(located in the Hall 10 foyer at the ICC)

### Wednesday 16th September 2015

08.00 – 17.00 hrs

(located in the Hall 10 foyer at the ICC)

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## Smoking

Please note that this is a No Smoking conference and smoking is not permitted in any part of venue.

## Transport

(for more information please visit the conference website)

Useful information:

### Taxi:

The best way to get a taxi is to hail one. Outside the Conference Centre, to the right of the building is a good spot because there are frequently taxis circling the building.

### Train:

For enquiries, Tel: 08457 48 49 50  
[www.thetrainline.com](http://www.thetrainline.com)

### Air:

Local air travel from Birmingham International Airport 0871 222 0072  
<https://birminghamairport.co.uk>

## Venue

The International Convention Centre  
Broad Street, Birmingham, B1 2EA  
General enquiries: +44 (0)121 644 5025

## Wifi

Wifi is available in the venue. This is complimentary and open for general browsing purposes. Please be aware that many people may be connecting at the same time, during break times, for example.



# Open Meetings for all delegates to attend

## Monday | 4th September 2015

### PICCS Acute Transport Group

Chair: Eithne Polke

Secretary: Sandra Stark

### PICCS Advance Nursing Practitioners

Contact: Lynn Shields

### PICCS Nurse Educators Group

Contact: Nicola Kidd, Joanna Durham and Sarah Hughes.

## Tuesday | 5th September 2015

### PICCS SG Meeting

17.45 - 18.45 Hall 9

Chair: Mark Peters

### PICCS Ethics Special Interest Group

17.45 - 18.45 Hall 10

Chair: Joe Brierley

### PICCS Cardiac Group

15.30 - 15.50 Hall 10b

Chair: Duncan Macrae

A short meeting of the cardiac subgroup will be held following the ECLS/Cardiac session. Everyone with an interest in Cardiac intensive care is welcome to attend. The principal aim of the meeting is to discuss the 'resuscitation' of this group and seek ideas for what the group might do and how it might do it over the coming year.

### PICCS Faculty Team Run

07.00 – 08.00

Meet under the canopy at the Hyatt Regency next to the ICC

A friendly and relaxed run around central Birmingham taking in the canal route around the conference venue. No need to register – just turn up and enjoy the early morning!

Leads: Barney Scholefield and Adrian Plunkett

# Paediatric Intensive Care Society Annual Members' Meeting

Wednesday | 6th September 2015.

12.15 – 12.45 Venue: Hall 9

A chance to interact with PICCS Council to receive updates and discuss the future of PICCS. All PICCS members welcome. Please grab your lunch and bring to Hall 9.

[www.picsociety.uk](http://www.picsociety.uk)







# A NEW LOOK FOR PICS!

PICS was founded over 25 years ago as a multidisciplinary forum for those involved and interested in paediatric intensive care. Since that time, the Society has evolved considerably. Today's PICS is a vibrant and modern organisation, with the care and safety of critically ill children its core objective.

Following a consultation of the PICS membership in June 2015, a record number of 258 members voted to choose a logo that would best convey to the world the essence of today's PICS. The result was far from unanimous, but the majority of members voted for a logo that conveyed the core clinical role of PICS members presented in a modern format.

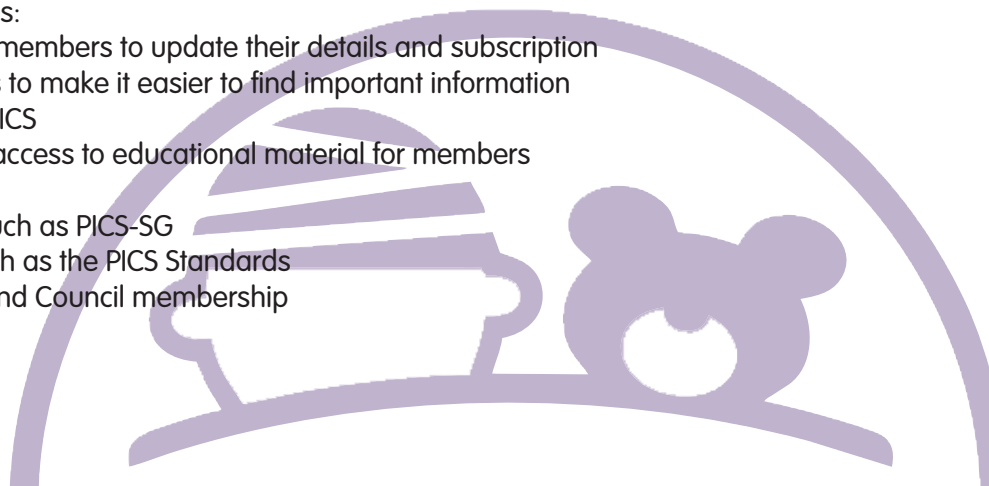
## A new website [www.picsociety.uk](http://www.picsociety.uk)

A modern website is an essential requirement for today's PICS. Over the past year, PICS have been working on redesigning the website based on feedback from the membership.



The new website has several new features:

- 👤 A dedicated Members section for members to update their details and subscription
- 👤 Completely redesigned webpages to make it easier to find important information
- 👤 Calendar of Events organised by PICS
- 👤 Redesigned Trainees section and access to educational material for members
- 👤 Latest News and Newsletters
- 👤 Information on PICS Subgroups, such as PICS-SG
- 👤 Easy access to PICS Resources such as the PICS Standards
- 👤 Details of PICS Council meetings and Council membership





# Pre-Conference Scientific Programme

Monday 14th September

*Birmingham's Children's Hospital and Toronto Hospital for Sick Children will be providing a morning Workshop Session and an afternoon Masterclass.*

## Workshop Programme

14 September 2015, 09:00-12:15, Austin Court, Birmingham. BI 2NP

Attendees can attend 3 out of the 4 Workshops. When registering attendees should list in order of their preferences which Workshops they wish to attend. The organisers will allocate on a first come first served basis.

### 1. Approach to a difficult airway in PICU.

Lead: Dr Steve Cray (Consultant Anaesthetist/PICU).

Faculty: Dr James Montgomery (Consultant Paediatric Anaesthetist), Dr Dannie Seddon (Consultant Paediatric Anaesthetist), Dr Ed Carver (Consultant Paediatric Anaesthetist)

Attendees will gain:

1. Structured approach to the difficult airway patient.
2. APA difficult airway guidelines and their practical application in PICU.
3. Can't intubate, can't ventilate scenarios.
4. Hands-on practical experience of difficult airway manikins using Airtrac, Glidescope and Fibreoptic intubation.

### 2. Use of Ultrasound in Paediatric Intensive Care.

Lead: Dr Prabh Nayak (Consultant Paediatric Intensivist).

Faculty: Dr Steve Cossey (Lead ANP in PICU), Dr Mani Thyagarajan (Consultant Paediatric Radiologist), Dr Rajesh Phatak (Consultant Paediatric Intensivist), Dr Cathy Gibbons (Senior Registrar in PICU), Dr Anthony Assing (Specialist doctor in Paediatric Cardiology).

Attendees will gain:

1. 'Experiential learning' - Ultrasound guided central vascular access and PICC insertion using manikins and tips to avoid pitfalls.
2. Ultrasound of the chest for pleural and pericardial effusion - hands on experience and video demonstration.
3. Echocardiogram for the Intensivist - 4 chamber view of the heart using transthoracic ultrasound.

### 3. Advanced communication skills for the Paediatric Intensivist.

Lead: Sr Rachael Morrison (Advanced Nurse Practitioner PICU).

Faculty: Dr Jane Cassidy (Consultant Paediatric Intensivist), Ms Natalie Wilson (Actress)

Attendees will gain:

1. Safe and supportive interactive environment for experimental learning using role play and actors to stimulate the part of a parent or colleague. Delegates will guide role play between an actor (as parent) and an Intensivist. Scenario options are: the challenging parent or colleague, passive aggression and breaking bad news.
2. Feedback in role from actors – eg "we said this to you, how did that feel". This feedback is evidence based and from families feedback.
3. Strategies or tools to improve the quality of future communication.
4. A taster of this model of education.

### 4. Cerebral function monitoring in PICU.

Lead: Dr Barney Scholefield (Consultant Paediatric Intensivist).

Faculty: Dr Hari Krishnan (Consultant Paediatric Intensivist), Ms Fay George (Neurophysiologist), Mr Pete Bill (Head of Neurophysiology Team)

Attendees will gain:

1. Theory and guidance for PICU cerebral function monitoring (CFAM) & EEG monitoring.
2. Scenario based simulation of CFAM monitoring – bedside interpretation, pitfalls and trouble shooting.
3. Demonstration of remote monitoring.

## Masterclass Programme

14 September 2015, 13:00 -17:00, Austin Court, Birmingham. BI 2NP

A faculty from the Toronto Hospital for Sick Children Alumni staff will provide a Masterclass addressing difficult topics in PICU. Delegates can pre-book to attend the afternoon Masterclass only.

12.30 Coffee on arrival.

13.00 How I run a successful PICU training programme. *Peter Cox, Toronto.*

13.30 How I use HFOV in the child with acute respiratory failure. *Peter Rimensberger, Geneva.*

14.00 How I organize my PICU system of care to provide state of the art care. *Peter Laussen, Toronto.*

14.30 Break.

15.00 How I use inotropes (and cardiovascular monitoring) in the patient with septic shock. *Brian Kavanagh, Toronto.*

15.30 How I use ECMO in the setting of severe acute respiratory failure. *Gail Annich, Toronto.*

16.00 How I use haemodynamic monitoring to provide state of the art care. *Steven Schwartz, Toronto.*

16.30 How I set up and deliver neuro-ICU. *Robert Tasker, Boston.*

17.00 Close

Venue: IET, Birmingham: Austin Court. 80 Cambridge St, Birmingham, West Midlands BI 2NP, United Kingdom.

Approximately 3 minutes walk from the International Conference Centre and 10 minutes from New Street Railway Station.

Many thanks to the companies who provided equipment



# Tuesday 15th September 2015

08.00	Registration Opens
08.50	Welcome and Introduction <i>David Ellis, Chair of BCH Local Organising Committee</i>
<b>Session 1 : Ventilation</b>	
Chairs: Kevin Morris & Peter Laussen <b>Hall 9</b>	
09.00	Permissive hypercapnia: bench to bedside <i>Brian Kavanagh, Toronto</i>
09.25	Neurally adjusted ventilatory assist (NAVA): its place in PICU <i>Peter Rimensberger, Geneva</i>
09.50	Congenital diaphragmatic hernia <i>Peter Cox, Toronto</i>
10.15	Controlled ventilation in asthma <i>Andrew Durward, London</i>
10.40	High-flow oxygen: taking over our world? <i>Andrew Magnay, Stoke</i>

11.00 Break

<b>Session 2 : Free Papers:</b>	
<b>Basic Science/Physiology</b>	
Chairs: Adrian Plunkett & Akash Deep <b>Hall 9</b>	
11.30	O1 Alterations in oxygen extraction in children exposed to hypobaric hypoxia <i>S. Raman</i>
11.40	O2 Carbon dioxide management during the first 24 hours of Extracorporeal Cardiopulmonary Resuscitation (ECPR) <i>E. Brincat</i>
11.50	O3 Variation in oxygen extraction during systemic inflammatory response in children <i>S. Raman</i>
12.00	O4 The accuracy of peripheral pulse oximetry after palliative surgery for children with cyanotic congenital heart disease <i>G. E. Scrimgeour</i>
12.10	O5 Central venous-to-arterial carbon dioxide difference is higher in SVC than in IVC after cavopulmonary shunt <i>B. K. Fule</i>
12.20	O6 Inability to reduce shock index prior to intensive care unit admission is associated with mortality in paediatric septic shock <i>S. Ray</i>

## Session 3 : Nursing I - Inspiring Nursing Research

Chairs: Yvonne Heward & Karen Kinnear **Hall 10b**

11.30	Embrace, engage, become inspired <i>Jos Latour, Plymouth</i>
11.50	Develop, test, evaluate <i>Lyvonne Tume, Liverpool</i>
12.10	Facilitating research in the paediatric intensive care unit <i>Alison Jones, Birmingham</i>

12.30 - 14.00 Lunch, Exhibition: Hall 11 and Foyer

Poster Viewing : Hall 10a and Foyer

13.15 - 13.45	<b>Industry Symposium hosted by Vocera Hall 9</b> <b>Empowering PICU with communication technology to improve patient and staff experience</b> Chair: Peter-Marc Fortune <i>Adrian Plunkett and Rachael Soundy, Birmingham</i> See Page 1
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**Session 4 : Safety & Quality**Chairs: Richard Neal  
& Peter Rimensberger**Hall 9**Data visualisation for better decisions  
*Peter Laussen, Toronto***Session 5 : ECMO/Cardiac**Chairs: Linda Edwards & Andrew Durward **Hall 10b**Future of ECMO  
*Gail Annich, Toronto*

14.00

14.00

14.25

Out with the old, in with the new? Safety I and Safety II  
*Jane Cassidy, Birmingham*

14.25

Future of cardiac devices beyond ECMO  
*Phil Botha, Birmingham*

14.40

Remote monitoring: Formula I and beyond  
*Heather Duncan, Birmingham*

14.45

Surgical management of single ventricles  
*David Barron, Birmingham*

15.00

Learning from excellence in PIC  
*Adrian Plunkett, Birmingham*

15.05

Medial management of cardiac failure  
*Steven Schwartz, Toronto*

15.15

Sense Check: so just how customer focused is your PICU  
*Phil Wilson, Birmingham*

15.30

Refreshments Hall 11 and Foyer

**Session 6 : Long Term Ventilation & the Complex patient**Chairs: Annemieke Miedema  
& Andrew Magnay**Hall 9**End of life care and parallel planning  
*Reinout Mildner, Birmingham*

16.00

16.00

Chairs: Rhian Isaac & Barney Scholefield **Hall 10b**OP1 Paediatric burns intensive care – an untold story  
*S. A. Mir*

16.05

OP2 Slow advancement of enteral feed volumes to prevent necrotising enterocolitis in very low birth weight infants (systematic review)  
*L. E. Young*

16.10

OP3 Survey of oxygen delivery practices in UK paediatric intensive care units  
*S. Raman*

16.15

OP4 Predicting fluid responsiveness in 100 critically ill children: the effect of baseline contractility  
*R. Saxena*

16.20

OP5 Endotoxaemia in critical illness  
*B. Cheesebrough*

16.25

National long term ventilation pathway: removing the lottery  
*Gillian Halley, London*

16.25

OP6 Intratracheal rhDNase with physiotherapy in acute severe asthma  
*A. Nyman*

16.30

OP7 Reducing blood testing in PICU, a quality improvement project  
*S. Sundararajan*

16.35

OP8 Temperature and lymphocyte counts in patients with sepsis in PICU  
*S. Ray*

16.40

OP9 The impact of collaborative working on organ donation, within the regional PICU, Belfast  
*D. Mckimm*

16.45

OP10 Majority of alarms are false and non-actionable in a ward environment  
*A. Macdonald*

16.50

Empowerment of parents  
*Jos Latour, Plymouth*

16.50

OP11 Enteral feeding practices before and after congenital diaphragmatic hernia repair: a 10 year retrospective review  
*D. Zeitlin*

16.55

OP12 VAP – is it or isn't it?  
*J. Cassidy*

17.00

OP13 Prospective evaluation of a feeding guideline based upon gastric emptying  
*D. E. Knight*

17.05

OP14 Accuracy of wireless and standard patient monitors in children  
*B. K. Fule*

17.10

The National Tracheostomy Safety Project – implications for paediatric practice  
*Richard Neal, Birmingham*

17.10

OP15 Incidence and risk factors for failed extubation: a prospective cohort study  
*B. Griffiths*

17.30

Discussion time

17.30

Close

17.30

Close



# Wednesday 16th September 2015

## Session 8 : National/International PICM programme

Chairs: Barney Scholefield & Peter Cox **Hall 9**

- 09.00 Intensive care medicine: establishing a new speciality  
*Julian Bion, Birmingham*
- 09.25 Survival in PICU and beyond  
*Roger Parslow, Leeds*
- 09.50 ESPNIC and the new European Diploma  
*Joe Brierley, London*
- 10.10 Where does the data say PIC is heading?  
*Gale Pearson, Birmingham*

09.00  
09.25  
09.50  
10.10

## Session 9 : Nursing 2 - Workforce challenges

Chairs: Lyvonne Tume & Alison Jones **Hall 10b**

- Turning around a workforce - the Toronto experience  
*Karen Kinnear, Toronto*
- Nurse retention and team growth - the Birmingham experience  
*Yvonne Heward, Birmingham*
- Reducing stress using language  
*Rachael Morrison, Birmingham*
- Critical care workforce beyond PICU  
*Caroline Haines, Bristol*

10.30 Refreshments Hall 11

## Session 10 : Free Papers

Chairs: Adrian Plunkett & Akash Deep **Hall 9**

- 11.00 O7 Catch trial: Randomised controlled trial of impregnated central venous catheters for preventing blood stream infection in children  
*Q. Mok*
- 11.10 O8 Discussing research without prior consent (deferred consent) with parents: an evidence based approach to inform recruitment to paediatric critical care trials  
*K. Woolfall*
- 11.20 O9 Times series peripheral white cell differential gene expression in children with meningococcal sepsis  
*A. Rashid*
- 11.30 O10 The implausibility of 'usual care' in an open system: sedation and weaning practices in paediatric intensive care units (PICUS) in the United Kingdom (UK)  
*L. Tume*
- 11.40 O11 A randomised trial of feedback on external chest compressions during paediatric cardiopulmonary resuscitation: secondary analysis of the effect on dynamic load profile  
*R. K. Gregson*
- 11.50 O12 Should milrinone therapy be guided by monitoring of drug levels?  
*C. Korb*

12.00 - 13.00 Lunch, Exhibition Hall 11 Poster Viewing Hall 10a

## Session 11 : Neuromonitoring/ Brain

Chairs: Hari Krishnan & Brian Kavannagh **Hall 9**

- 13.00 Paediatric TBI and the ADAPT Trial  
*Michael Bell, Pittsburgh*

## Session 12 : Oral posters 2

Chairs: Heather Duncan & Jenna Spry **Hall 10b**

- 13.00 OPI6 Suppression of hypercortisolaemia secondary to ectopic ACTH-secreting tumour using an etomidate infusion in a child  
*R. Hannah*
- 13.05 OPI7 A systematic review and meta-analysis of antifibrinolytics for bleeding following paediatric cardiopulmonary bypass surgery  
*D. P. Sangaran*
- 13.10 OPI8 Mechanical properties of traditional elastoplast tracheal tube taping vs a novel transparent tape (Blenderm) in a model of inadvertent extubation  
*H. Toellner*

13.25

Stroke: monitoring lessons from the adult brain  
*Robert Tasker, Boston*

13.15 OP19 Changing infusion practice generates significant efficiencies in nursing time and resource usage in paediatric intensive care  
*A.B. Sutherland*

13.20 OP20 Clinical course and outcome of children requiring long term ventilation (LTV) - single centre experience  
*M. Sundaram*

13.25 OP21 Sedation and death in paediatric intensive care unit: a retrospective descriptive cohort study  
*R. Dhar*

13.30 OP22 Audit assessing do not attempt cardio-pulmonary resuscitation (DNACPR) orders in patients with life-threatening and life-limiting conditions at Bristol Royal Hospital for Children (BRHC)  
*K. Gadhvi*

13.35 OP23 Heated humidified high-flow nasal cannula (HHFNC) - more than just hot air?  
*W. Y. E. Chia*

13.40 OP24 Quantifying delays and identifying barriers to timely discharge from intensive care  
*R. Hannah*

13.45 OP25 An assessment of cuff inflation pressures and the role of nitric oxide within remote ischaemic preconditioning  
*S. Lawday*

13.50 Discussion time

13.50

Bacterial meningitis: neuroprotection beyond antibiotics?  
*Kevin Morris, Birmingham*

14.10

Seizures: how to detect, when to treat?  
*Barney Scholefield, Birmingham*

14.30

Awards Ceremony  
*Adrian Plunkett and Akash Deep*

14.40

Refreshments Hall II

### Session 13 : Patient and Family Experiences

15.00

The journey after traumatic brain injury – a family perspective  
*Charlie Fogarty with his parents Sarah and Mark Fogarty*  
*Introduced by Kevin Morris, Birmingham*

15.30

Neonatal organ donation – a new hope  
*Jessica Evans and Mike Houlston, parents. Angharad Griffiths, Specialist Nurse in Organ Donation, Cardiff*  
*Introduced by: Kay Hawkins, Manchester*

16.00

Children's rights, education and health – an international perspective  
*Malala Yousafzai, Nobel Peace Prize Winner*  
*Introduced by: Fiona Reynolds, Birmingham*

16.30

Close



# Authors' Index

Addin	M. J.	P82, P83	Carone	L.	P13	Dutta Kukreja	P.	OP11
Akerele	L.	OP10, OP14, P16	Carvalho	J.	P66	Dwan	K.	O7
Alexander	J.	P68	Cassidy	J.	O2, OP12, P7	Edwards	L.	O2, P55
Alurkar	S.	P13	Chan-Dominy	A. C.	P63, P66	Ellis	D.	O2, O5
Aramburo	A.	O12	Cheesebrough	B.	OP5	Emsden	S.	OP23
Arnold	P.	P78	Chia	W. Y. E.	OP23	Fairbairn	J.	P74
Bagkeris	E.	O11	Chillal	M.	O5	Farley	M.	O2, P20, P26, P32, P41, P53, P55, P58, P71
Bailey	N.	P30	Chisholm	E.	P48	Fazil	Q. A.	P50
Baines	P.	P78	Clement	R.	P43	Feelisch	M.	OP25
Baldock	A. J.	O4	Clough	G. F.	P51	Fernandez	B. O.	OP25
Bangalore	H.	OP1	Cole	T. J.	OP25	Finch	F.	P80
Banks	V.	P18	Colthurst	S.	O11	Fleming	S. J.	P12, P58
Baptiste	K.	P79	Connaire	S.	OP6	Fletcher	P.	P17
Barber	R. O.	OP19	Connell	F.	OP8	Ford	L. J.	P4
Beattie	T.	P4	Cooper	M.	P22, P76	Fraser	J.	OP22
Begg	C. J.	P82, P83	Crabbe	D.	P17	Frith	L.	O8
Begley	A.	P36	Cvetkovic	M.	P54	Fule	B. K.	O5, OP10, OP14, P16
Billyard	T.	P25, P44, P49	Davies	A.	O6	Gadhvi	K.	OP22, P14
Blackwood	B.	O10	Davies	P.	P52	Gamble	C.	O7, O8
Blaney	S.	P37	Davies	J.	O5	Gan	C. S.	O5
Borrows	E. L.	OP1, P65	Davison	C.	OP16	George	K.	P61
Bowen	S. J.	P35	Dawkins	I.	P21, P28	Ghez	O.	P66
Breatnach	C.	OP21	Dawson	A.	OP21	Giannakopoulou	I.	P66
Brennan	L.	O1	Dean	S.	O8	Gilbert	R. E.	O7
Brick	T.	P42	Desai	A.	P14	Gilbert-Kawai	E.	O1
Brierley	J.	O6, P18	Dhar	R.	O12	Glaedowe	F.	OP25
Brincat	E.	O2	Dhother	J.	OP21	Glover	P.	OP9
Brookes	I.	OP20	Donnelly	P.	P21	Goedvolk	C.	P21
Brunskill	K.	P46	Donnelly	A.	P38	Goss	E.	P62
Bull	J.	P35, P67	Draper	E. S.	P56	Goudie	K.	P41
Burgess	C.	P45	Duncan	H.	P12	Gould	V.	P47
Burlton	S.	P41	Durward	A.	OP10, OP14, P7, P16	Graino	B.	P3
Butterworth	E.	OP11			OP4, OP6, OP13, OP15, OP17, P37			
Campbell	G.	OP12, P62						
Carmichael	J.	P37						

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Gray	J.	OP12	Kelly	N.	P5, P9, P69	Marshall	V.	P36, P56
Greenough	S.	P17	Keown	K.	P11, P57	Martin	J.	OP12
Gregson	R. K.	O11	Khan	K.	O12	Martin	D.	O1
Griffiths	B.	OP15	Kigozi	P.	P13	Matam	R. B.	OP10, OP14, P16
Griksaitis	M. J.	O4	Kirkby	J.	O1	Mayer	A. P.	P15
Grocott	M.	O1	Kirkham	F.	O1	Mayo	B.	P50, P71
Guerrero	R.	P78	Klein	N.	O9, OP8	McAdam	J.	P36
Gyles	A.	P33	Klonin	H.	P1	McCarron	M.	P82, P83
Hackett	M.	OP9	Knight	D. E.	OP13	McCormick	E.	P11
Hancock	S.	P54	Kong	A.	P36	McFadzean	J.	P48
Hannah	R.	OP16, OP24, P35	Korb	C.	O12	McGuire	W.	OP2
Harron	K.	O7	Krishnan	H.	P62	McHale	S.	P22
Healy	A.	P8	Kwan	A.	O9	McKenna	D.	P38
Heath	P.	O9	Laker	S.	O5	McKimm	D.	OP9
Heward	Y.	P23	Lane	S.	P78	Mehr	M.	P45
Holec	V.	P31	Langley	R.	P47	Mikrou	P.	P68
Hood	E.	P5, P60	Larmour	K.	OP13	Millar	M.	O7
Hoptroff	V.	P73	Lawday	S.	OP25	Milner	P.	OP12
Hoseh	O.	P18	Lees	D.	P42	Minnion	M.	OP25
Hubank	M.	O9	Lees	M.	P2, P84	Mir	S. A.	OP1, P3, P65
Huddart	M.	P1	L'Esperance	V.	O1	Mitchell	K.	O1
Hughes	D.	O7	Lillie	J.	OP15	Moitt	T.	O7
Hunt	B. J.	OP17	Lloyd	E.	P70	Mok	Q.	O7
Iftikar	S. Y.	O9	Lo	T. Y. M.	P4, P47, P48	Montgomery	M.	P25, P44, P49
Inwald	D.	O6	Longden	J.	P15	Morgan	J.	OP2
Irvine	V.	OP16	Longman	S.	P7, P60	Morgan	G.	P37
Isaac	R.	P8	Loughead	R.	OP10, OP14, P16	Morris	K. P.	O2, O5, P58
James	P.	P37	Lumsden	J.	OP7	Morrison	R.	P7
Jemmett	E.	OP19, P19	Lutman	D.	O6, P51, P65	Morrison	G.	P37, P58
Johnson	R.	P78	Lyttle	M. D.	O8	Mullen	S.	P56
Johnson	K.	P12	Macdonald	A.	OP10, OP14, P16	Murdoch	I. A.	OP4, OP6, OP15, OP17
Jones	K.	P52	Macintosh	I.	OP24, P35, P67			
Jones	A.	P23	Macrae	D.	O12, P66	Mustafa	K.	P63
Jordan	L. E.	P54	Magnay	A.	P73	Mythen	M.	O1
Kalantre	A.	P78	Magner	C.	OP21	Nadel	S.	OP5, OP8
Kapetanstrataki	M.	P12	Mahoney	S.	P46	Nash	A.	P60
Kashrap	A.	P73	Makhecha	S.	O12	Nayak	P.	O5, P20, P26, P32, P53, P55, P71
Kashyap	A.	P25, P44, P49	Makuloluwa	K. K.	P81			
Keaney	A.	P56	Marsden	C.	P27			

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Nellisery	S.	P55	Russell-Jones	E. C.	P59	Tibby	S.	O7, OP4, OP6,
Nyman	A.	OP6, OP15, P37	Rutherford	M.	P42			OP13, OP15,
O'Dea	L.	P17	Sadasivam	K.	P10			OP17
O'Donnell	L.	P72	Salam	H.	P66	Tieman	E. P	P40
Pappachan	J. V.	O4, OP25, P80,	Sangaran	D. P.	OP17	Timmins	C.	P23
		P81	Sanz	I.	O2	Toellner	H.	OP18
Parker	M.	P32, P53	Saxena	R.	OP4	Toogood	R.	P62
Parslow	R. C.	P1, P12	Scholefield	B.	O2, O5	Tough	H.	OP9
Patel	K.	P59	Scrimgeour	G. E.	O4	Townsley	P.	P64
Pathan	N.	O6	Sebastian	S.	OP20	Traynor	M.	P72
Peters	M. J.	O1, O3, O6, O9,	Sera	F.	O1	Tume	L. N.	O10, P46, P78
		O11, OP3, OP8	Sharma	S.	OP11	Virdee	S.	P6
Phatak	R.	P31, P61	Shields	L.	P51	Walker	P. L. C	P28
Phillips	R.	P20, P26	Siemens	K.	OP17	Warren	A.	P52
Playfor	S. D.	OP18, P2, P19,	Simmons	N.	P61	Welsby	H. D. M.	O11
		P84	Siu	E.	P10	Westlake	K.	P27
Plunkett	A.	O5, P5, P6, P9,	Skellett	S.	O11	Westrope	C.	P58
		P69	Smith	D.	P20, P26, P32,	Westwood	K.	OP12
		OP25	Somerfield	J.	P53	Wilson	C.	OP8
Poudevigne	M.	OP25	Soundy	R.	P70	Woolfall	K.	O8
Pryde	K.	P35	Steeley	S.	P6	Wyres	E.	P43
Purcell	C.	P67	Sultan	S.	OP4	Yek Kee	C.	P58
Pyshorn	R.	P51	Sundaram	M.	OP10, OP14, P16	Young	L. E.	OP2
Quigg	S.	P23	Sundaram	M.	P73	Young	P.	P15
Qureshi	S.	P37	Sundaram	M.	OP20, P73	Young	B.	O8
Rajagopal	V.	P18	Sundararajan	S.	OP7	Zeitlin	D.	OP11, P17
Raman	S.	O1, O3, OP3	Sutherland	A. B.	OP19, P19			
Ramaraj	R.	P78	Sutton	B.	P28			
Ramnarayan	P.	O6, O7, P3	Sykes	K.	OP16, P75			
Randle	E.	P3	Taitt	K.	P23			
Rashid	A.	O9	Taylor	N.	P22			
Ray	S.	O3, O6, OP3,	Taylor	R.	P36			
		OP8, P3	Taylor	S.	P33			
Read	N.	P30	Templar	C.	P29			
Richardson	J.	P11, P38, P57	Terris	M.	P56			
Ritson	P.	P78	Theophilus	K.	P24			
Roberts	C. E.	P51	Thistlethwaite	J. C.	P27, P75			
Rowlands-Strike	H.	OP16	Thruston	I.	OP13			

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# Abstracts

Oral Poster Listing	17
Poster Listing	18
Oral Presentation Abstracts	20
Oral Poster Presentation Abstracts: Tuesday	25
Wednesday	31
Poster Presentation Abstracts	35





# Poster Listing: Oral Posters

These posters will feature both in the oral programme (see pages 9 to 12). Abstracts for these Oral Posters can be found in this book on pages 20 to 24.

- OP1 PAEDIATRIC BURNS INTENSIVE CARE – AN UNTOLD STORY
- OP2 SLOW ADVANCEMENT OF ENTERAL FEED VOLUMES TO PREVENT NECROTISING ENTEROCOLITIS IN VERY LOW BIRTH WEIGHT INFANTS (SYSTEMATIC REVIEW)
- OP3 SURVEY OF OXYGEN DELIVERY PRACTICES IN UK PAEDIATRIC INTENSIVE CARE UNITS
- OP4 PREDICTING FLUID RESPONSIVENESS IN 100 CRITICALLY ILL CHILDREN: THE EFFECT OF BASELINE CONTRACTILITY
- OP5 ENDOTOXAEMIA IN CRITICAL ILLNESS
- OP6 INTRATRACHEAL RHDNASE WITH PHYSIOTHERAPY IN ACUTE SEVERE ASTHMA
- OP7 REDUCING BLOOD TESTING IN PICU, A QUALITY IMPROVEMENT PROJECT
- OP8 TEMPERATURE AND LYMPHOCYTE COUNTS IN PATIENTS WITH SEPSIS IN PICU
- OP9 THE IMPACT OF COLLABORATIVE WORKING ON ORGAN DONATION, WITHIN THE REGIONAL PICU, BELFAST
- OP10 MAJORITY OF ALARMS ARE FALSE AND NON-ACTIONABLE IN A WARD ENVIRONMENT
- OP11 ENTERAL FEEDING PRACTICES BEFORE AND AFTER CONGENITAL DIAPHRAGMATIC HERNIA REPAIR: A 10 YEAR RETROSPECTIVE REVIEW
- OP12 VAP – IS IT OR ISN'T IT?
- OP13 PROSPECTIVE EVALUATION OF A FEEDING GUIDELINE BASED UPON GASTRIC EMPTYING
- OP14 ACCURACY OF WIRELESS AND STANDARD PATIENT MONITORS IN CHILDREN
- OP15 INCIDENCE AND RISK FACTORS FOR FAILED EXTUBATION: A PROSPECTIVE COHORT STUDY
- OP16 SUPPRESSION OF HYPERCORTISOLAEMIA SECONDARY TO ECTOPIC ACTH-SECRETING TUMOUR USING AN ETOMIDATE INFUSION IN A CHILD
- OP17 A SYSTEMATIC REVIEW AND META-ANALYSIS OF ANTIFIBRINOLYTICS FOR BLEEDING FOLLOWING PAEDIATRIC CARDIOPULMONARY BYPASS SURGERY
- OP18 MECHANICAL PROPERTIES OF TRADITIONAL ELASTOPLAST TRACHEAL TUBE TAPING VS A NOVEL TRANSPARENT TAPE (BLENDERM) IN A MODEL OF INADVERTENT EXTUBATION
- OP19 CHANGING INFUSION PRACTICE GENERATES SIGNIFICANT EFFICIENCIES IN NURSING TIME AND RESOURCE USAGE IN PAEDIATRIC INTENSIVE CARE
- OP20 CLINICAL COURSE AND OUTCOME OF CHILDREN REQUIRING LONG TERM VENTILATION (LTV) - SINGLE CENTRE EXPERIENCE
- OP21 SEDATION AND DEATH IN PAEDIATRIC INTENSIVE CARE UNIT: A RETROSPECTIVE DESCRIPTIVE COHORT STUDY
- OP22 AUDIT ASSESSING DO NOT ATTEMPT CARDIO-PULMONARY RESUSCITATION (DNACPR) ORDERS IN PATIENTS WITH LIFE-THREATENING AND LIFE-LIMITING CONDITIONS AT BRISTOL ROYAL HOSPITAL FOR CHILDREN (BRHC)
- OP23 HEATED HUMIDIFIED HIGH-FLOW NASAL CANNULA (HHFNC) - MORE THAN JUST HOT AIR?
- OP24 QUANTIFYING DELAYS AND IDENTIFYING BARRIERS TO TIMELY DISCHARGE FROM INTENSIVE CARE
- OP25 AN ASSESSMENT OF CUFF INFLATION PRESSURES AND THE ROLE OF NITRIC OXIDE WITHIN REMOTE ISCHAEMIC PRECONDITIONING

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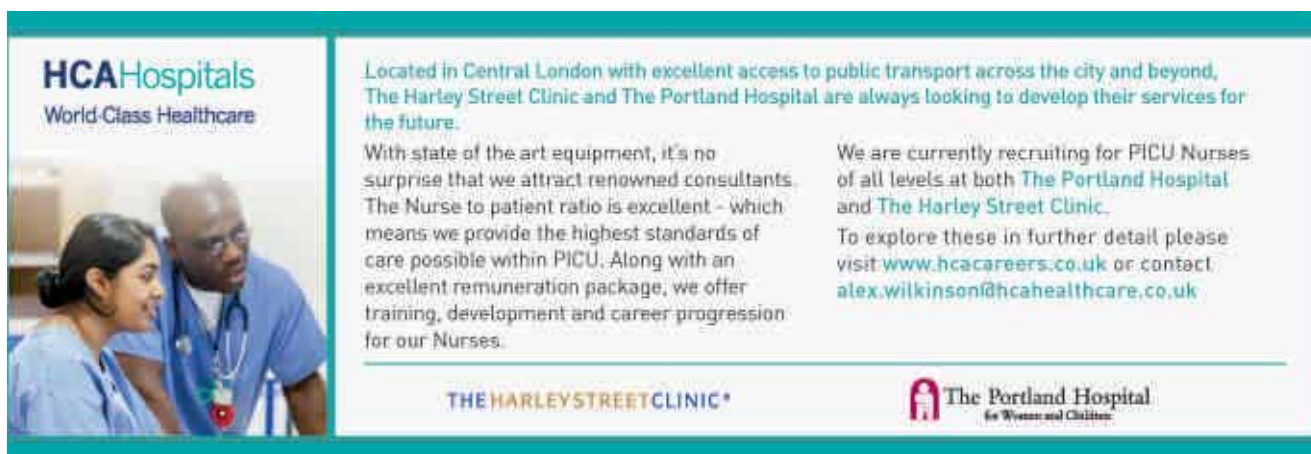
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# Poster Listing

Abstracts for these posters can be found in this book on pages 35 to 63.

- P1 THE IMPACT OF ESTABLISHING A DEDICATED HIGH DEPENDENCY UNIT IN A DISTRICT GENERAL HOSPITAL ON TRANSFER RATES TO PICU
- P2 THE IMPACT OF ERRORS ON PIM SCORES
- P3 LOCAL HOSPITAL EXTUBATION IN PAEDIATRIC STATUS EPILEPTICUS
- P4 EQUIPMENT OR EXPERIENCE: THE ROLE OF VIDEO LARYNGOSCOPY IN THE HANDS OF INEXPERIENCED USERS
- P5 TACKLING PICU STAFF RETENTION: A MATTER OF APPRECIATION?
- P6 REDUCTION IN COMMUNICATION DELAYS IN PAEDIATRIC INTENSIVE CARE FOLLOWING IMPLEMENTATION OF HANDS-FREE COMMUNICATION TOOL
- P7 TAKING THE "HINT & HOPE" OUT OF ESCALATION
- P8 SORBITOL AND MALTILOL INTAKE OF PAEDIATRIC INTENSIVE CARE PATIENTS
- P9 EXCELLENCE REPORTING IN PICU: A DESCRIPTIVE STUDY OF A NEW SAFETY PARADIGM
- P10 IMPACT OF AN ELECTRONIC INFUSION CALCULATOR
- P11 COMPARISON OF BLIND BAL VERSUS ENDOTRACHEAL ASPIRATE ON VENTILATED PATIENTS IN PICU
- P12 DESCRIPTIVE EPIDEMIOLOGY OF ADMISSIONS TO PICU OF CHILDREN LESS THAN 2 YEARS OLD WHO WERE BORN POST-TERM IN THE UK AND REPUBLIC OF IRELAND, 2003-2014
- P13 AUDIT OF REFERRALS TO THE ORGAN DONATION TEAM
- P14 AUDIT EVALUATING AN ARTERIAL LINE ASSESSMENT ALGORITHM ON THE PAEDIATRIC INTENSIVE CARE UNIT (PICU) AT BRISTOL ROYAL HOSPITAL FOR CHILDREN (BRHC)
- P15 EVALUATION OF THE USE OF LIMITATION OF TREATMENT AGREEMENTS IN CHILDREN WHO DIE FOLLOWING PICU ADMISSION
- P16 WIRELESS MONITORING IN CHILDREN CAN BE ACHIEVED OVER THE MAJORITY OF INTENDED MONITORING TIME
- P17 COMPLIANCE WITH DEPARTMENT OF HEALTH (DOH) GUIDANCE ON ANTIMICROBIAL STEWARDSHIP USING AN ELECTRONIC (PAPERLESS) PRESCRIBING SYSTEM
- P18 AN AUDIT OF EMERGENCY RE-ADMISSIONS TO PICU
- P19 THE IMPACT OF FIXED CONCENTRATION SEDATION INFUSIONS ON FLUID OVERLOAD IN CRITICALLY ILL CHILDREN
- P20 SINGLE PASS ALBUMIN DIALYSIS: A CASE REPORT
- P21 A RETROSPECTIVE ANALYSIS OF REINTUBATION RATES ON A PAEDIATRIC INTENSIVE CARE
- P22 MONITORING AND REVIEW OF ALL EMERGENCY '2222' CALLS LEADS TO GREATER UNDERSTANDING OF HUMAN FACTORS AND SYSTEMS FAILURES RELATING TO THE DETERIORATING PATIENT
- P23 FROM BIG TO SMALL: CHANGING A WORKFORCE CULTURE
- P24 PARENTS AND FAMILY FEEDBACK FOR A PICU TECHNICAL SUPPORT TEAM
- P25 INCREMENTAL GAINS: A SMALL CHANGE TO IMPROVE PERFORMANCE IN PAEDIATRIC INTENSIVE CARE TRANSPORT
- P26 THE USE OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN NEONATES WITH SYSTEMIC HERPES INFECTION: AN ETHICAL DILEMMA
- P27 IMPLEMENTATION OF CLOSED ENDO-TRACHEAL SUCTION; AN ANALYSIS OF POTENTIAL HEALTH ECONOMIC BENEFITS
- P28 INADVERTANT HYPOTHERMIA MIMICKING BRAIN DEATH
- P29 MOUTH CARE IN THE VENTILATED CHILD WITH MUCOSITIS
- P30 A YEAR IN PAEDIATRIC INTENSIVE CARE, A CHILD PROTECTION TEAM PERSPECTIVE
- P31 TRANSPORT SERVICE GUIDANCE AND DIABETIC KETOACIDOSIS MANAGEMENT - RECENT OUTCOME
- P32 AN INNOVATION TO IMPROVE THE DELIVERY OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN A LARGE AND BUSY PAEDIATRIC INTENSIVE CARE UNIT (PICU) - THE CVVH NURSE CHAMPIONS
- P33 3 P'S AND A POD: PRACTICAL PREPARATION AND PLANNING FOR TIME CRITICAL NEONATAL CARDIAC TRANSFERS
- P34 POSTER WITHDRAWN
- P35 TIME TO MOVE ON: IMPROVING THE SAFETY OF STEP-DOWN FROM PICU
- P36 CAN I COME WITH YOU AND WHY ARE YOU PUTTING IN THAT TUBE?
- P37 EXPERIENCE OF BIODEGRADABLE TRACHEOBRONCHIAL AIRWAY STENTS
- P38 SAFETY THROUGH FRIENDSHIP: BFF-DAISY
- P39 POSTER WITHDRAWN
- P40 UNPLANNED EXTUBATION, A CONTINUOUS QUALITY IMPROVEMENT INITIATIVE (CQI) IN PICU: ACHIEVEMENTS AND CHALLENGES
- P41 THE USE OF SOCIAL MEDIA TO ENHANCE COMMUNICATION WITHIN PIC SPECIALIST TEAMS
- P42 MULTI-PROFESSIONAL TEACHING ON THE PAEDIATRIC INTENSIVE CARE UNIT IMPROVES KNOWLEDGE, COMPETENCE AND TEAM MORALE
- P43 COLLABORATIVE WEANING ON THE PAEDIATRIC INTENSIVE CARE UNIT



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- P44 FACTORS IMPACTING ON-SCENE STABILISATION TIME IN INTENSIVE CARE TRANSPORT  
P45 INTRA-HOSPITAL TRANSFERS: THE TECHNICAL SIDE  
P46 ARE SEPTIC SHOCK PATIENTS MANAGED IN ACCORDANCE WITH GUIDELINES?  
P47 CLINICAL USEFULNESS OF CLINICAL PULMONARY INFECTION SCORE (CPIS) IN DIAGNOSIS OF VENTILATOR ASSOCIATED PNEUMONIA (VAP)  
P48 INTERRUPTIONS TO REGISTRARS' TASKS IN PAEDIATRIC ICU  
P49 HOW OLD IS TOO OLD? – REFERRALS OF PATIENTS AGED 16 AND OVER TO A PICU TRANSFER SERVICE  
P50 WHAT IS THE INCIDENCE OF PSYCHOLOGICAL DISTRESS SYMPTOMS IN PARENTS FOLLOWING ADMISSION OF THEIR CHILD TO PICU? A LITERATURE REVIEW
- P51 I WILL SURVIVE – A NEW MODEL OF TRAINING TO INCREASE STAFF RESILIENCE ON RETRIEVAL  
P52 MIND THE GAP: EXPLORING THE GENERATIONAL IMPACT WITHIN THE PAEDIATRIC INTENSIVE CARE SETTING  
P53 AN INNOVATION TO IMPROVE THE DELIVERY OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN A LARGE AND BUSY PAEDIATRIC INTENSIVE CARE UNIT (PICU) - THE CVVH NURSE CHAMPIONS
- P54 SPLENIC RUPTURE MANAGEMENT AUDIT – MAKE THAT CALL ... SAVE A SPLEEN!  
P55 CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN POST OPERATIVE CARDIAC INFANTS ON EXTRACORPOREAL LIFE SUPPORT (ECLS) – A SINGLE CENTRE EXPERIENCE
- P56 INTRODUCING AN ADMISSION PROFORMA TO PICU, A QUALITY IMPROVEMENT?  
P57 BRONCHIOLITIS – AN UNLUCKY YEAR OR AN EVOLVING MONSTER?  
P58 EXPERIENCE OF CIRCUIT SURVIVAL IN EXTRACORPOREAL CONTINUOUS RENAL REPLACEMENT THERAPY UTILISING SMALL CALIBRE VENOUS CANNULAE
- P59 QUALITY IMPROVEMENT IN RESPIRATORY SUPPORT FOR PATIENTS WITH BRONCHIOLITIS  
P60 MEDICATION ON PICU: NURSES' PERCEPTION OF AN INDEPENDENT CHECK  
P61 A YEAR OF SEPTIC BABIES: WHAT WE DID AND HOW THEY DID  
P62 THE USE OF LOCALLY ADAPTED HEALTHCARE RESOURCE GROUPS (HRGS) TO GUIDE THE RE-DISTRIBUTION OF NURSING STAFF WITHIN A TERTIARY CENTRE PAEDIATRIC INTENSIVE CARE UNIT (PICU)
- P63 FLUID THERAPY AFTER SURGERY FOR CONGENITAL HEART DISEASE – HOW MUCH IS ENOUGH?  
P64 INCIDENCE OF SIGNIFICANT CARDIOVASCULAR EVENTS POST CARDIAC SURGERY  
P65 EMERGENCY PAEDIATRIC BURNS TRANSFERS – A TALE OF TIME  
P66 SEVERE LEFT VENTRICULAR INLET AND OUTFLOW OBSTRUCTION FROM RHABDOMYOMA IN A NEONATE: A CHALLENGING CIRCULATION  
P67 PAEDIATRIC OUTREACH TEAM: FLEXING TO MEET SEASONAL DEMAND  
P68 A CASE OF TRANSIENT LACTIC ACIDOSIS IN A PAEDIATRIC PATIENT RECEIVING INTRAVENOUS SALBUTAMOL FOR LIFE-THREATENING ASTHMA  
P69 IMPACT OF EXCELLENCE REPORTING IN PICU: A STAFF SURVEY  
P70 FLYING HIGH WITH HIGH FLOW  
P71 IS THE USE OF EPOPROSTENOL PREDICTABLE IN CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT)?  
P72 "MORE THAN A NUMBER TEN YEARS ON" INTRODUCING A SKILL MIX TOOL INTO THE PAEDIATRIC INTENSIVE CARE UNITS  
P73 FAT EMBOLISM IN DUCHENNE MUSCULAR DYSTROPHY  
P74 CENTRAL LINES: ADDRESSING THE CHANGES  
P75 ENHANCING MAJOR TRAUMA TEAM PERFORMANCE USING PAEDIATRIC MAJOR TRAUMA SIMULATION  
P76 AN EVALUATION OF PARENTAL SATISFACTION IN NOTTINGHAM PAEDIATRIC CRITICAL CARE UNIT  
P77 POSTER WITHDRAWN  
P78 OPEN OR CLOSED ENDOTRACHEAL SUCTION IN HIGH-RISK SINGLE VENTRICLE INFANTS AFTER SURGERY  
P79 NURSE LED URINARY CATHETER MANAGEMENT TO REDUCE CATHETER ASSOCIATED URINARY TRACT INFECTIONS IN PAEDIATRIC INTENSIVE CARE
- P80 DO RED BLOOD CELL TRANSFUSIONS LEAD TO CHANGES IN THE BLOOD GAS PARAMETERS OF CHILDREN ON A PAEDIATRIC INTENSIVE CARE UNIT?  
P81 A PROSPECTIVE OBSERVATIONAL STUDY OF CLINICAL OUTCOMES AND FLUID BALANCE FOLLOWING CARDIAC SURGERY IN CHILDREN WITH CONGENITAL HEART DISEASE  
P82 IMPROVING HUMAN FACTORS IN PICU: INTRODUCTION AND SUBSEQUENT UPTAKE OF AN AIRWAY SAFETY CHECKLIST  
P83 IMPROVING HUMAN FACTORS IN PICU: STAFF PERCEPTIONS OF AN INTUBATION SAFETY CHECKLIST  
P84 THE IMPACT OF DIFFERENT MORTALITY PREDICTION TOOLS ON THE PREDICTED MORTALITY OF A COHORT OF PATIENTS WHO DIED IN PICU

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# Oral Presentation Abstracts

01



## ALTERATIONS IN OXYGEN EXTRACTION IN CHILDREN EXPOSED TO HYPOBARIC HYPOXIA

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**Introduction:** The adaptive responses to hypobaric hypoxia are thought to overlap with changes seen following reduced oxygen delivery in critical illness. The Young Everest Study 2 (YES2) expedition investigated these responses.

**Methods:** The forearm muscle tissue oxygen index (TOI) was estimated with near infrared spectroscopy using a vascular occlusion test (NIRS VOT) in 12 healthy children at sea level (London) and following a 4 day ascent to Namche Bazaar (3525 metres), Nepal. The NIRS VOT curve consists 4 phases - baseline, obstruction of blood flow with a pressure cuff (down slope), cuff deflation (upslope) and recovery.

A mixed level functional data analysis (FDA) was performed using the NIRS VOT recording (one recording per child at each altitude). This measures the TOI at a frequency of 2/sec over 12 minutes resulting in 1440 data points. FDA utilises each data point to create 24 functional curves. The interaction between TOI and altitude was examined nested within individuals.

**Results:** The predicted summary functional curves for the two altitudes are shown in figure 1.

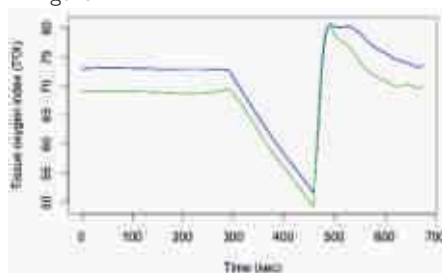
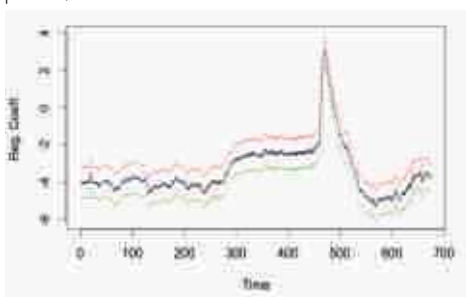


Figure 1 – Predicted functional NIRS VOT curves at the two altitudes  
Legend: Blue – Sea Level, Green – Namche, 3525 mts

Figure 2: Functional ANOVA – FDA compares the 24 curves (point-by-point comparison of matched paired data) and produces a regression coefficient curve with confidence intervals (CI). Black – Summary curve, Red – Upper CI, Green – Lower CI.



The lowest TOI (forearm oxygen extraction) was significantly lower in Namche Bazaar (Regression coefficient: -1.95, 95%CI: -1.13, -2.76,  $p < 0.001$ ).

**Conclusion:** Forearm muscle oxygen extraction is reduced under hypobaric hypoxic conditions. If a similar response was observed in the critically ill child, the current understanding of oxygen delivery targets may need to be reevaluated. Functional data analysis could lend itself as a tool for analyzing continuous physiological data in intensive care.

02



## CARBON DIOXIDE MANAGEMENT DURING THE FIRST 24-HOURS OF EXTRACORPOREAL CARDIOPULMONARY RESUSCITATION (ECPR)

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**Introduction:** ECPR is used to restore circulatory and cerebral blood flow in refractory cardiac arrest. Cerebral blood flow is also dependent on arterial CO<sub>2</sub> levels (PaCO<sub>2</sub>). Hypocarbica (PaCO<sub>2</sub> < 4kPa) may reduce cerebral blood flow risking cerebral ischaemia. The sweep gas flow on extracorporeal life support (ECLS) and residual pulmonary CO<sub>2</sub> clearance can influence PaCO<sub>2</sub>. To monitor, we sample blood at two ECLS circuit points (pre-oxygenator (ECLSVCO<sub>2</sub>), post-oxygenator (ECLSAO<sub>2</sub>)), and from the patient's arterial line (PaCO<sub>2</sub>) and analyze using the alpha-stat method. Our protocol instructs changes to sweep gas flow based on ECLSVCO<sub>2</sub>, targeting 4.5-6.5kPa.

**Aim:** To evaluate CO<sub>2</sub> management in the first 24 hours of ECPR using ECLSVCO<sub>2</sub> guided therapy.

**Method:** Single centre, retrospective observational study, including all ECPR cases between 2010-2014. Assessing the relationship between ECLSVCO<sub>2</sub>, ECLSAO<sub>2</sub> and PaCO<sub>2</sub>, the incidence of hypocarbica, and CO<sub>2</sub> fluctuation in the first hour of ECPR.

**Results:** Twenty-three patients (mean (SD) age 1.93 (2.94) years) underwent 24 runs of ECPR, of which 12 (53%) were discharged alive from PICU. The relationship between ECLSVCO<sub>2</sub>, ECLSAO<sub>2</sub> and PaCO<sub>2</sub> was inconsistent and unpredictable. Using ECLSVCO<sub>2</sub> to guide sweep flow was associated with a PaCO<sub>2</sub> < 4kPa in 38%, and < 3.5% in 25% of patients. PaCO<sub>2</sub> reduced by more than 5kPa in 42% of patients in the first hour. No correlation was found between ECLS blood flow, sweep gas flow and PaCO<sub>2</sub>. 34/57 (60%) of the paired samples evaluated showed a PaCO<sub>2</sub> lower than ECLSAO<sub>2</sub> implying the lungs contributed to CO<sub>2</sub> clearance.

**Conclusion:** ECLSVCO<sub>2</sub> and ECLSAO<sub>2</sub> are not reliable surrogates of PaCO<sub>2</sub>. Using ECLSVCO<sub>2</sub> guided therapy resulted in frequent hypocarbica episodes and rapid reduction in PaCO<sub>2</sub> which may have adverse effects on cerebral blood flow in the early post-arrest period. An ECPR protocol needs to take into account the likelihood of residual pulmonary blood flow and gas exchange.

03



## VARIATION IN OXYGEN EXTRACTION DURING SYSTEMIC INFLAMMATORY RESPONSE IN CHILDREN

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**Introduction:** Oxygen consumption (VO<sub>2</sub>) and oxygen delivery (DO<sub>2</sub>) have a linear relationship until they uncouple at a critical threshold.



During shock in adults,  $VO_2$  falls initially followed by an increase. (Shoemaker 1971) Serial  $VO_2/DO_2$  data are scarce in critically ill children. We employed a novel, non-invasive approach to estimate changes in muscle oxygen extraction throughout an episode of systemic inflammation response syndrome (SIRS).

**Methods:** Children with SIRS, who were expected to be ventilated for > 3 days, were studied on the Great Ormond Street Hospital paediatric intensive care unit.

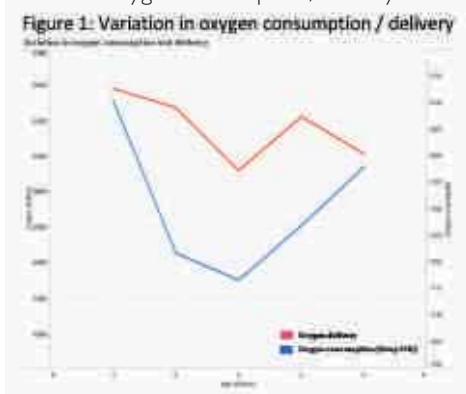
Near infrared spectroscopy with a vascular occlusion test (NIRS VOT) was used daily to measure the forearm muscle oxygen extraction (recorded as the drop in tissue oxygen index – DropTOI). Cardiac index was estimated by suprasternal Doppler.

Alterations in DropTOI during ICU stay were investigated in a multi-level logistic regression model with day of illness, etiology and  $DO_2$  as covariates. Age, gender and weight were excluded (no statistically significant association).

**Results:** Serial measurements were undertaken in 32 children accounting for 75 recordings. On univariate analysis, the observed median DropTOI was 21.1 (IQR: 15.6-23.8) on day 1 of illness and decreased to the lowest value – 17.6 – on day 3 (IQR: 14.1-20.0). (Figure 1)

The multivariate analysis displayed considerable variation in DropTOI. In addition, the effect of  $DO_2$  on DropTOI is small (-0.0011, 95%CI: -0.0004, -0.0018).

Figure 1: Variation in oxygen consumption / delivery



**Conclusion:** The NIRS-VOT is an easy to use, non-invasive measure of muscle oxygen extraction, which warrants further validation as a clinical bedside tool. Our observations suggest that  $VO_2$  falls from an early peak in paediatric critical illness and this is unrelated to changes in  $DO_2$ .

## O4

### THE ACCURACY OF PERIPHERAL PULSE OXIMETRY AFTER PALLIATIVE SURGERY FOR CHILDREN WITH CYANOTIC CONGENITAL HEART DISEASE

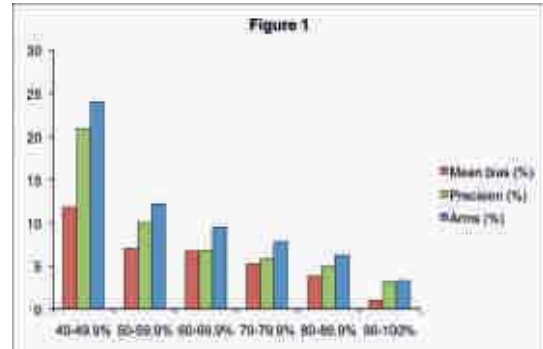
G. E. Scrimgeour, M. J. Griksaitis, J. V. Pappachan, A. J. Baldock  
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**Introduction:** Non-invasive peripheral pulse oximeters are routinely used to measure oxyhaemoglobin saturations ( $SpO_2$ ) in children with cyanotic congenital heart disease (CCHD). They are calibrated against the gold standard of multi-wavelength co-oximetry on arterial blood samples ( $SaO_2$ ) in healthy volunteers, to a lower limit of 80%. Saturations below this are derived by extrapolation and accuracy is known to diminish. Children with CCHD often have saturations below 80%. There are little data to support the reliability of pulse oximetry in these patients. We assessed the accuracy of a newer generation pulse oximeter in children with CCHD.

**Methods:** *Subjects:* Children with CCHD admitted to the paediatric intensive care unit after cardiac surgery. *Samples:* Prospective, paired

samples of  $SpO_2$  (Masimo SET® LNCS Neo pulse oximeter) and  $SaO_2$  (ABL800 FLEX blood gas analyser).

**Results:** Bland-Altman analysis was performed on 515 paired samples from 19 patients.  $SpO_2$  tended to overestimate  $SaO_2$  (mean bias +4.6% +/-6.6%). The data were divided into six  $SaO_2$  bands between 40-100%. Bias increased significantly as  $SaO_2$  fell ( $r = -0.96$ ,  $p = 0.002$  95% CI -0.99 to -0.68. Figure 1). The U.S. Food and Drug Administration (FDA) requires pulse oximetry manufacturers to report the accuracy root mean squared (Arms), which must be  $\leq 3\%$  for  $SaO_2$  between 70-100%. In our study the Arms over this range was +6.4%. The FDA standard was only met when  $SaO_2$  was above 90%. Over half the data points were taken when  $SaO_2$  was below the calibration limit for pulse oximeters.



**Conclusions:** 1. Pulse oximetry tends to overestimate  $SaO_2$ , especially in lower  $SaO_2$  ranges. Critical hypoxaemia may be undetected as clinicians are reassured by falsely high  $SpO_2$  readings. 2. Pulse oximetry does not meet the standards required by the FDA when used in children with CCHD. 3. Better extrapolation algorithms and broader calibration may improve this important technology.

## O5

### CENTRAL VENOUS-TO-ARTERIAL CARBON DIOXIDE DIFFERENCE IS HIGHER IN SVC THAN IN IVC AFTER CAVOPULMONARY-SHUNT

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**Introduction:** Central venous-to-arterial carbon dioxide difference ( $P_{cv-a}CO_2$  gap, the difference between central venous and arterial  $pCO_2$ ) may provide additional information about adequacy of tissue perfusion to that obtained from the arterial-central venous oxygen saturation difference ( $S_{a-cv}O_2$ ) and lactate. Normal value is considered below 0.8kPa in adults. There is limited information in children and no studies assessed whether the site of central venous line (CVL) has an implication on  $P_{cv-a}CO_2$  gap.

**Methods:** We investigated a group of children after Norwood stage II correction (partial cavopulmonary-shunt, CPS). Samples for blood gas analysis were taken simultaneously from three sites within 1 hour, and after 4, 8 and 12 hours of PICU admission:

- arterial cannula
- SVC (internal jugular) CVL
- IVC (femoral) CVL

We calculated the  $P_{cv-a}CO_2$  gap, and  $S_{a-cv}O_2$  and compared these between pairs of sites using Wilcoxon signed-ranked tests.

We also assessed the relation of  $P_{cv-a}CO_2$  gap,  $S_{a-cv}O_2$  and lactate to each other and assessed the changes over time in these parameters.

**Results:** We analysed 65 values of site differences (triplets of blood gases and lactate) in 18 patients.

$P_{cv-a}CO_2$  gap and  $S_{a-cv}O_2$  was significantly higher in SVC compared to IVC ( $p < 0.001$  for both comparisons). Interestingly, lactate was highest in IVC. (Table, median (IQR))

	SVC	IVC	Arterial
$t_{iCa}CO_2$ (kPa)	0.62 (0.51-0.76)	0.59 (0.34-0.9)	NA
$f_{iMv}O_2$ (%)	0.33 (0.28-0.35)	14.8 (10.5-20.0)	NA
Lactate (mM)	1.69 (1.38-2.31)	1.89 (1.4-2.67)	1.55 (1.24-2.09)

**Conclusion:**  $P_{cv-a}CO_2$  gap and  $S_{a-cv}O_2$  were different in SVC compared to IVC in this cohort. These findings may reflect the unique characteristics of circulation (i.e. SVC congestion) early after CP shunt.

Further studies are required to confirm our findings, to evaluate the normal values and clinical utility of  $P_{cv-a}CO_2$  gap in a larger and more heterogeneous population of children.



## INABILITY TO REDUCE SHOCK INDEX PRIOR TO INTENSIVE CARE UNIT ADMISSION IS ASSOCIATED WITH MORTALITY IN PAEDIATRIC SEPTIC SHOCK

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**Introduction:** The use of SI in early sepsis management in the paediatric intensive care unit (PICU) has been previously described<sup>1</sup>. We aimed to explore the utility of SI in the management of paediatric septic shock prior to admission to PICU

**Methods:** A retrospective case-note review of children referred with sepsis to a regional PIC retrieval service over a 7-year period (2005-2011). Children requiring inotropes were included for analysis. SI was calculated at 3 time-points: referral (R), first face-to-face contact with the retrieval team (A) and drop-off on PICU (D). Age-normalised thresholds were calculated using APLS thresholds (maximum heart rate/minimum systolic pressure) to categorise values as normal/abnormal<sup>1</sup>. Hospital mortality was the primary outcome measure. Odds ratios (OR) were used for univariate analysis. Multi-level modelling was used to evaluate the changes in SI on mortality.

**Results:** 703 children were referred with sepsis, 344/703 (48.9%) required inotropes. The median (inter-quartile range) SI at R, A and D are 1.7 (1.37-2.07), 1.71 (1.40-2.17) and 1.53 (1.21-2.04) respectively. The OR (95% confidence interval) of death if the SI was abnormal was 1.02 (0.60-1.73) at R, 1.76 (1.04-2.94) at A and 2.80 (1.68-4.66) at D. Using a multi-level model, there was a statistically significant change in the SI in those who survived compared to those who died. The interval between time-points had no significant effect on SI.

**Conclusions:** We noted a 2.8 fold increase in mortality risk with abnormal SI at retrieval in septic children. A decrease in SI from referral to drop-off on PICU was associated with survival. The utility of SI as a therapeutic target in sepsis needs further evaluation.

**Reference:** 1. Rousseaux J et al. Prognostic value of shock index in children with septic shock. *Pediatr Emerg Care.* 2013;29(10):1055-9



## CATCH TRIAL: RANDOMISED CONTROLLED TRIAL OF IMPREGNATED CENTRAL VENOUS CATHETERS FOR PREVENTING BLOOD STREAM INFECTION IN CHILDREN

Q. Mok, R. E. Gilbert, K. Dwan, K. Harron, T. Moitt, M. Millar, P. Ramnarayan, S. Tibby, D. Hughes, C. Gamble, on behalf of the CATCH trial\*

**Introduction:** Impregnated central venous catheters (CVCs) are recommended for adults to reduce bloodstream infection (BSI) but not for children due to a lack of evidence for their effectiveness.

**Methods:** Multicentre randomised trial of children expected to require a CVC for  $\geq 3$  days admitted to 14 English paediatric intensive care units (PICUs) in 2010-2012. The primary outcome, time to first BSI between 48 hours after randomisation and 48 hours after CVC removal, was compared for any impregnation (antibiotic or heparin) versus standard CVCs (primary analyses) and in pair-wise comparisons of all three CVC types (secondary analyses).

**Results:** BSI occurred in 3.59% (18/502) randomised to standard CVC, 1.44% (7/486) to antibiotic and 3.42% (17/497) to heparin CVC. Primary analyses showed no effect of impregnated (antibiotic or heparin) compared with standard CVCs (hazard ratio for time to first BSI 0.71; 95%CI 0.37-1.34). Secondary analyses showed antibiotic CVCs were superior to standard (HR 0.43; 0.20-0.96) and to heparin CVCs (HR 0.42; 0.19-0.93), but heparin did not differ from standard (HR 1.04; 0.53-2.03). Clinically important and statistically significant absolute risk differences were found only for antibiotic vs standard (-2.15%; 95%CI: -4.09, -0.20) and antibiotic vs heparin CVCs (-1.98%; -3.90, -0.06). Time to thrombosis, mortality by 30 days, and minocycline or rifampicin resistance, did not differ significantly by CVC allocation.

**Conclusions:** Compared with standard CVCs, only antibiotic-impregnated CVCs significantly reduced the risk of BSI (number needed to treat with antibiotic instead of standard CVC to prevent one BSI = 47). Widespread adoption of antibiotic-impregnated CVCs could help prevent BSI in PICU.

**Funding:** UK National Institute for Health Research.



## DISCUSSING RESEARCH WITHOUT PRIOR CONSENT (DEFERRED CONSENT) WITH PARENTS: AN EVIDENCE BASED APPROACH TO INFORM RECRUITMENT TO PAEDIATRIC CRITICAL CARE TRIALS

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**Introduction:** Research with critically ill children is vital to make sure that they benefit from evidence-based healthcare. Problems in prospectively seeking parents' (or legal representatives) consent for research when their child is critically ill have been a barrier to conducting clinical trials. Delaying the treatment of children for informed consent is difficult to justify as it may cause harm to the child. To enable research to proceed, European and UK legislation allows practitioners to conduct research without seeking prior informed consent from parents. Nevertheless, research without prior informed consent may be seen as eroding the autonomy of parents and children and has been much debated.

**Method and sample:** Findings from a mixed method study (CONNECT) involving 354 participants (292 parents, 39, nurses, 19 doctors and 4 clinical trials unit practitioners) were related to existing research and ethical theory to develop evidence based guidance to assist practitioners in discussing research without prior consent with parents and legal representatives.

**Results:** We provide recommendations to help address questions that practitioners may have about recruiting to a trial involving no prior consent, including: when should I approach parents to discuss research without prior consent? How should I explain to parents that their child has been entered into a trial without their prior consent? Should I involve children in the discussion? And what should happen if a child dies?

**Conclusions:** The CONNECT guidance directs practitioners on how to recruit to trials without prior consent to participate. We highlight the crucial importance of practitioners explaining to parents why no prior consent was sought, finding an appropriate timing for research discussions and personalising discussions about research when a child has died. Full CONNECT guidance can be found at: <https://www.liv.ac.uk/psychology-health-and-society/research/connect/>



## TIMES SERIES PERIPHERAL WHITE CELL DIFFERENTIAL GENE EXPRESSION IN CHILDREN WITH MENINGOCOCCAL SEPSIS

A. Rashid, M. Hubank, A. Kwan, S. Y. Iftikar, N. Klein, M. Peters, P. Heath, *Sheffield Children's Hospital & Sheffield University, Sheffield Institute of Translational Neuroscience, UK*

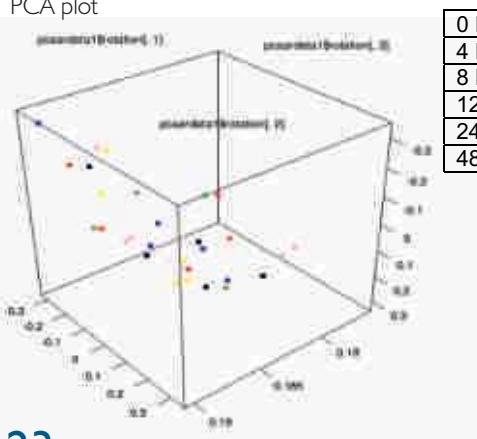
**Introduction:** In children, Meningococcal sepsis (MenS) causes a profound immunological response. Microarray analysis of peripheral white cells microarray in children with MenS could lead to better classification and differential treatment pathways.

**Method:** 5 children with meningococcal sepsis (4 confirmed and 1 clinically assumed) had blood samples taken at admission (designated 0 hours), 4, 8, 12 and 48 hours. Blood collected was mixed with PAXgene RNA reagent and then frozen at -80C. RNA was extracted by Qiagen PAXgene and checked by spectrophotometry and capillary electrophoresis.

**Results:** 33,297 probe sets from 29 Human Gene 1.0 ST Arrays were generated and then compared. The data was log base 2 normalized (ArrayExpress database E-MEXP-3850). Normalized and log2 converted box plots showed a standardized dataset with a maximal signal density at 7.0. Gene expression with respect to control was calculated in different combinations (Table 1: P value <0.005). Further heat maps were generated with fold changes for P1-P5 and 4hrs to 48 hrs versus T0 (0 hours). A cluster dendrogram heatmap representation for P1-P6 and P value <0.005 and T4hrs to T48 hrs versus T0 hours generated with R, showed greater definition. A PCA plot (fig 1) showed a mixed and changing pattern of differential gene expression.

**Conclusion:** Peripheral white cell time series data in children with MenS generated by microarray can be categorized using heat maps and therefore genomic classification is possible. Further validation is required to subgroup children with MenS.

PCA plot



0 Hrs	Yellow
4 Hrs	Red
8 Hrs	Green
12 Hrs	Blue
24 Hrs	Black
48 Hrs	Pink



## THE IMPLAUSIBILITY OF 'USUAL CARE' IN AN OPEN SYSTEM: SEDATION AND WEANING PRACTICES IN PAEDIATRIC INTENSIVE CARE UNITS (PICUS) IN THE UNITED KINGDOM (UK)

B. Blackwood<sup>1</sup>, L. Tume<sup>2,3</sup>

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<sup>2</sup>*PICU, Alder Hey Hospital, Liverpool and* <sup>3</sup>*University of Central Lancashire, Lancashire, UK*

**Introduction:** The power of the randomised controlled trial is dependent upon its operation in a closed system whereby the intervention is the only causal force acting upon the experimental group. Conversely, clinical arenas are open systems in many factors affect the implementation and effectiveness of an intervention. The comparator (usual care) can be difficult to define and comparisons of an intervention's effectiveness can be complicated in multi-centre trials.

**Aim:** To describe the PICU context, 'usual' practice in sedation and weaning children from mechanical ventilation, and factors affecting implementation prior to designing a trial involving a sedation and mechanical ventilation weaning intervention.

**Methods:** We used a fieldwork approach to collect data from 23 UK PICUs between June-November 2014 using observation, individual and multidisciplinary group interviews with staff.

**Results:** Pain and sedation practices were broadly similar in terms of drug usage, pain and sedation assessment tools and timing. Sedation protocols linking assessment to appropriate titration of sedatives and sedation holidays were rarely used (9% and 4% PICUs respectively). Ventilator weaning was primarily a medical-led process with 39% PICUs engaging senior nurses in the process and weaning protocols were rarely used (9% PICUs). Weaning methods were variable and based on clinician preference. No formal criteria or use of spontaneous breathing trials were used to test weaning readiness. Seventeen PICUs (74%) had prior engagement in multi-centre trials, but limited research nurse availability without trial funding. Barriers to previous trial implementation were complexity of the intervention, lack of belief in the benefit of the intervention and inadequate training. Facilitating factors were senior staff buy-in and dedicated research nurse provision.

**Conclusion:** We found that usual practice relating to sedation, analgesia and ventilator weaning were broadly similar and yet distinctively different from our proposed intervention which provides assurance in our ability to evaluate intervention effects.



## A RANDOMISED TRIAL OF FEEDBACK ON EXTERNAL CHEST COMPRESSIONS DURING PAEDIATRIC CARDIOPULMONARY RESUSCITATION: SECONDARY ANALYSIS OF THE EFFECT ON DYNAMIC LOAD PROFILE

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<sup>3</sup>*Paediatric and Neonatal Intensive Care, Great Ormond Street Hospital NHS Foundation Trust, London, UK*

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**Introduction:** We conducted a randomised controlled trial to examine the impact of feedback on rate of chest compressions for cardiopulmonary resuscitation in children. Results showed feedback significantly reduced mean rate and variability to within the prescribed range. This study explored secondary effects of feedback to control rate on the dynamic and static load profile – force on compression and residual force on release.

**Methods:** Fifty staff (10 male) were recruited to a randomised cross-over trial. They applied compressions to a manikin for 2 sessions, during one of which they were randomised to receive visual feedback comparing their real-time rate to published guidelines. A sensing mat placed over the manikin's chest measured rate and force. The effect on force of providing rate feedback was estimated using univariable and multivariable linear mixed effects models.

**Results:** The compression force (N) applied to the manikin varied enormously (mean (SD) 306 (94); range 142-769), a more than fivefold difference. Before averaging, the highest recorded force exceeded 800 N. Forces were greater and more variable in session 1 among those receiving feedback compared with those not (337 (90) versus 262 (66),  $p=0.001$ ). Overall, those receiving feedback second (as opposed to first) used significantly lower compression force (adjusted mean difference -75 (95% CI -120, -31),  $p=0.001$ ). The mean residual force of 18 N (SD 12, range 0-49) was unaffected by the intervention.

**Conclusion:** In summary, chest compression forces delivered to the same paediatric manikin showed marked variability. Extreme forces and incomplete offload may adversely impact outcome. Any sort of intervention may have unintended consequences, so it is important to monitor and provide feedback on dynamic and static forces as well as rate. Evaluating clinical response to known, standardised treatment profiles should help improve performance and optimise paediatric clinical outcome.

**Acknowledgements:** Sparks Medical Research Charity, NovelGMBH Munich

## SHOULD MILRINONE THERAPY BE GUIDED BY MONITORING OF DRUG LEVELS?

*C. Korb, A. Aramburo, A. Desai, K. Khan, S. Makhecha, D. Macrae, Royal Brompton Hospital, London, UK*

**Introduction:** The recommended infusion rate of milrinone is 0.25-0.75mcg/kg/min. Studies have shown the therapeutic range for milrinone serum levels (MSL) to be 100 to 300ng/ml. MSL outside therapeutic range have previously been reported in children<sup>1</sup>. Therapeutic blood levels can be achieved at low infusion rates in adults<sup>2</sup>. This report documents our early experience of therapeutic monitoring of MSL in our PICU.

**Methods:** Retrospective review of MSL results from May 2014 to June 2015. Data collected included milrinone dose and duration of therapy at sample collection, renal function and use of renal replacement therapy (RRT).

**Results:** 18 patients (median age 3 months, IQR 1-9) had 28 MSL measured. 18 (64%) MSL were therapeutic, 4 (14%) sub-therapeutic, and 6 (22%) supra-therapeutic. Median MSL was 239ng/ml (IQR 127-283ng/ml) with median milrinone dose of 0.3mcg/kg/min (IQR 0.1-0.5mcg/kg/min) and median infusion duration of 5 days (IQR 2-13 days). Among therapeutic MSL, 4 were from patients on RRT (dose 0-0.1mcg/kg/min, duration 1-5 days) and 6 on milrinone >5 days (dose 0.1-0.5mcg/kg/min, duration 8-33 days). All supra-therapeutic levels were from patients on RRT (2), on long-term therapy (1) or both (3).

**Conclusion:** Most MSL were within therapeutic range with the use of milrinone doses at or below recommended infusion rates. It is likely that the context sensitive elimination half-life of milrinone is longer with prolonged infusion. We suggest close monitoring of MSL for patients on RRT or long-term milrinone therapy. Prospective studies are required to evaluate routine MSL-guided milrinone titration in paediatric critical care.

### References:

1. Guerra G, et al. Incidence of milrinone bloods levels outside the therapeutic range and their relevance in children after cardiac surgery for congenital heart disease. *Intensive Care Med.* 2013;39(5):951-7.
2. Charisopoulou D, et al. Milrinone in advanced heart failure: dose and therapeutic monitor outside intensive care unit. *Angiology.* 2014;65(4):343-9.





# Oral Poster Presentation Abstracts - Tuesday

## OPI



### PAEDIATRIC BURNS INTENSIVE CARE – AN UNTOLD STORY

S. A. Mir<sup>1</sup>, H. Bangalore<sup>1,2</sup>, E. L. Borrows<sup>1,2</sup>

<sup>1</sup>St. Andrew's Centre for Burns, Broomfield Hospital, Essex, UK

<sup>2</sup>Paediatric Intensive Care Unit, Great Ormond Street Hospital, London, UK

**Introduction:** We describe five years of paediatric burns intensive care admission data from one of the UK's largest Burns Centres – data which, thus far, has not made it to the paediatric intensive care community.

**Methods:** All paediatric critical care admissions from September 2009 to January 2015 at St. Andrew's Centre for Burns, Broomfield Hospital, were identified using Metavision – a local database, and retrospectively reviewed.

**Results:** A total of 162 paediatric patients were admitted, 95 (58.6%) male and 67 (41.3%) female. Mean age was 3.8 years (0.2 – 15.9). Mean Modified Baux Score was 31.8 (2-111). Mean burn total body surface area (TBSA) was 28.2 % (1-100). Main mechanisms of injury were scalds (98, 60.5%), flame burns (24, 14.8%) and medical skin loss (30, 18.5%).

Burn size, as estimated by referring hospital, was underestimated in 30 (36.1%; by a mean of 9.4%), overestimated in 31 (37.3%; by a mean of 8.5%) and equal to that assessed on admission in 22 (26.5%).

Fifty-four patients (33.3%) were intubated prior to transfer; eight (14.8%) of whom were extubated following initial assessment. Seventy patients (43.2%) were ventilated for a mean of 5.9 days (1-93, median 2.5 days). Twenty one (13.0%) required inotropes, three (1.9%) total parenteral nutrition (TPN) and four (2.5%) renal replacement therapy (RRT). Six patients were transferred to Great Ormond Street Hospital, three for RRT. Mean length of stay was 7.4 days (1-108). Three patients (1.9%) died.

**Conclusion:** Paediatric data from St. Andrew's Centre for Burns is precluded from entering the Paediatric Intensive Care Audit Network (PICANet) database which, inevitably, has led to an underreporting to the PICU community. We hope our data can provide further insight into this specialist population.

## OP2



### SLOW ADVANCEMENT OF ENTERAL FEED VOLUMES TO PREVENT NECROTISING ENTEROCOLITIS IN VERY LOW BIRTH WEIGHT INFANTS (SYSTEMATIC REVIEW)

J. Morgan<sup>1</sup>, L. E. Young<sup>2</sup>, W. McGuire<sup>1</sup>

<sup>1</sup>Hull York Medical School & Centre for Reviews and Dissemination, University of York, York, UK

<sup>2</sup>Birmingham Children's Hospital, Birmingham, UK

**Background:** Early enteral feeding practices are potentially modifiable risk factors for necrotising enterocolitis (NEC) in very preterm infants. Observational studies suggest that conservative feeding regimens, including slowly advancing enteral feed volumes, reduce the risk of NEC.

**Methods:** We used the standard search strategy of the Cochrane Neonatal Review Group to find randomised or quasi-randomised controlled trials (to September 2014) that assessed the effect of slow (up to 24 ml/kg per day) versus faster rates of advancement of enteral feed volumes upon the incidence of NEC. We extracted data using the

standard methods of the Cochrane Neonatal Review Group with separate evaluation of trial quality and data extraction by two authors and synthesis of data using risk ratio, risk difference and weighted mean difference.

**Results:** We identified 6 eligible trials in which a total of 618 preterm infants participated. The trials typically defined slow advancement as daily increments of 15 ml/kg to 20 ml/kg and faster advancement as 30 ml/kg to 35 ml/kg. Meta-analyses did not detect statistically significant effects on the risk of NEC (typical risk ratio (RR) 0.96, 95% confidence interval (CI) 0.55 to 1.70) or all-cause mortality (typical RR 1.57, 95% CI 0.92 to 2.70). Infants who had slow advancement took significantly longer to regain birth weight (reported median differences 2 to 6 days) and to establish full enteral feeding (1 to 5 days).

**Conclusions:** The available trial data suggest that advancing enteral feed volumes at daily increments of 30 ml/kg to 35 ml/kg does not increase the risk of NEC in very preterm. Advancing the volume of enteral feeds at slow rates resulted in several days delay in regaining birth weight and establishing full enteral feeds. The applicability of these findings to extremely preterm, extremely low birth weight, or growth-restricted infants is limited. Further studies are warranted.

## OP3



### SURVEY OF OXYGEN DELIVERY PRACTICES IN UK PAEDIATRIC INTENSIVE CARE UNITS

S. Raman, S. Ray, M. Peters, *Critical Care Services, Great Ormond Street Hospital, London, UK*

**Introduction:** Administration of supplemental oxygen is common in paediatric intensive care. Recent evidence suggests hyperoxia may be harmful. This survey explored the practice in the paediatric intensive care in the UK.

**Methods:** The survey set out a clinical scenario followed by questions on oxygenation targets for 5 common diagnoses seen in children admitted to the PICU. The diagnoses addressed were acute respiratory distress syndrome (ARDS), pulmonary hypertension (PHTN), cardiac arrest (CA), sepsis and traumatic brain injury (TBI). The members of the Paediatric Intensive Care Society were requested to complete the survey.

**Results:** A total of 53 respondents completed the survey. Nearly all the units (96.1%) have an alarm target on their oxygen saturation monitor. Three quarters of the units do not have an oxygen weaning protocol for their mechanically ventilated patients.

In the child with moderate ventilatory requirements, 21 respondents (42%) did not follow PaO<sub>2</sub> targets. Of the rest, 21 (42%) targeted the range between 8.1 and 10 kPa. Only 8 (16%) aimed for the normal range of 10.1 - 13 kPa.

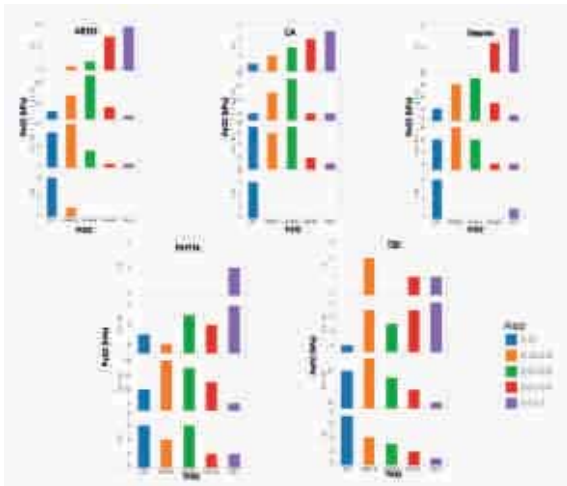
In ARDS, there was a trend to aim for lower PaO<sub>2</sub> as the FiO<sub>2</sub> increased. Conversely, in TBI and PHTN, respondents aimed for normal PaO<sub>2</sub> even as the FiO<sub>2</sub> increased. In CA the majority aimed for lower PaO<sub>2</sub> as the FiO<sub>2</sub> increased. (Figure 1)

Clinicians' response to no improvement after 24 hours of intensive care followed a similar trend as the initial management. Responses were equivocal for the need for a randomised control trial (RCT) with tight arterial oxygenation targets.

**Conclusion:** The survey suggests that the opinions regarding oxygen delivery practices vary. However, clinicians aim for low PaO<sub>2</sub> with

increase in FiO<sub>2</sub> in ARDS, CA and sepsis. No oxygen weaning protocol exists in majority of the units.

Figure 1: Oxygen delivery practices in various clinical settings



## OP4



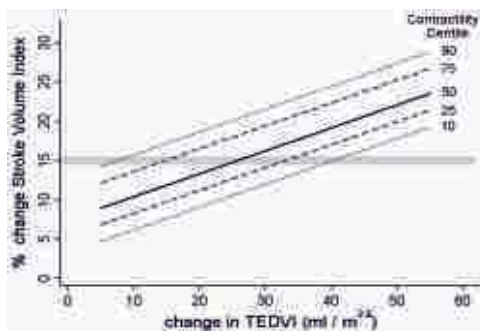
### PREDICTING FLUID RESPONSIVENESS IN 100 CRITICALLY ILL CHILDREN: THE EFFECT OF BASELINE CONTRACTILITY

R. Saxena, A. Durward, S. Steeley, I. A. Murdoch, S. M. Tibby  
PICU Evelina London Children's Hospital, St Thomas' Hospital, UK

**Introduction:** To evaluate the predictive ability (stroke volume increase >15% after fluid bolus) of novel and established volumetric and dynamic hemodynamic variables, and assess the influence of baseline contractility on response.

**Method:** Eight advanced hemodynamic variables were assessed using two commercially available devices. Contractility was measured as the maximum rate of systolic arterial pressure rise (dp/dtART). We assessed 142 volume loading episodes (10 ml/kg crystalloid) in 100 critically ill ventilated children, median (interquartile) weight 10 (5.6 – 15) kg.

**Results:** Overall, predictive ability was poor, with volumetric variables performing better than dynamic (area under receiver operating characteristic curves ranged from 0.53 to 0.67). The best predictor was total end diastolic volume index (TEDVI); however this did not increase in a consistent way with volume loading, with change post volume being weakly related to baseline values ( $r = -0.19$ ,  $p = 0.02$ ). A multivariable linear regression model quantified the importance of contractility on stroke volume response (figure). Children with high baseline contractility, (> 75th centile), typically achieved a positive stroke volume



response (grey line in figure) when total end diastolic volume values changed by 10 to 15 ml/m<sup>2.6</sup>, whereas patients with low contractility (< 25th centile), typically required end diastolic volume increases of 35 to 40 ml/m<sup>2.6</sup>.

**Conclusion:** Current paediatric predictors of volume response perform poorly; prediction may be improved if baseline contractility is taken into account.

## OP5



### ENDOTOXAEMIA IN CRITICAL ILLNESS

B. Cheesebrough, S. Nadel, Imperial College NHS Trust, London, UK

**Introduction:** Endotoxin, a constituent of the cell wall of Gram-negative bacteria is a potent initiator of systemic inflammation. It is commonly found in the bloodstream of critically ill children<sup>1</sup> and is probably derived from bacteria colonising sites such as the gut or possibly the lung. The impact of this endotoxaemia is not understood.

**Methods:** We conducted a prospective, observational cohort study of all children admitted to the Paediatric Intensive Care Unit (PICU) at St. Mary's Hospital over a 1 year period.

Blood was taken within 24 hours of admission and then at 48-72 hour intervals. It was tested for endotoxin using the endotoxin activity (EA) assay.

**Results:** EA levels in the first 24 hours of admission were significantly higher in patient samples (n= 104, mean EA 0.72) than in healthy controls (n=20, mean EA 0.49)  $p=0.0005$  regardless of the reason for admission. These levels are higher in both healthy children and in critically ill children than previously reported in adults<sup>2</sup>

EA did not correlate with severity of illness in the first 24 hours. However, after the first 24 hours, EA correlated with length of stay in PICU, PELOD organ dysfunction scores, days ventilated and days on inotropic support.

**Conclusions:** After the first 24 hours endotoxaemia is associated with increased severity of illness and length of stay in PICU.

**Discussion:** Innate anti-endotoxin factors may play a role in moderating endotoxin within the first 24 hours making an association between endotoxin and severity of illness less clear during this time period.

**References:**

1. Dholakia S, Inwald D, Betts H, Nadel S. Endotoxaemia in pediatric critical illness--a pilot study. *Crit Care*. 2011;15:R141.
2. Marshall JC et al; Diagnostic and prognostic implications of endotoxaemia in critical illness. *J Intensive Care Med* 2004; 19:527-34.

## OP6



### INTRATRACHEAL RHDNASE WITH PHYSIOTHERAPY IN ACUTE SEVERE ASTHMA

A. Nyman, S. Colthurst, S. M. Tibby, I. A. Murdoch, A. Durward, Evelina London PICU, UK

**Introduction:** Acute severe asthma may be life threatening and accounts for 3% of UK PICU admissions.<sup>1,2</sup> Diffuse airway plugging is a recognised contributor to airflow limitation.<sup>3</sup> Since 2004, we have employed mucolytic administration (intratracheal rhDNase) combined with physiotherapy in mechanically ventilated children refractory to conventional medical management. We report the efficacy of intratracheal rhDNase in this cohort.

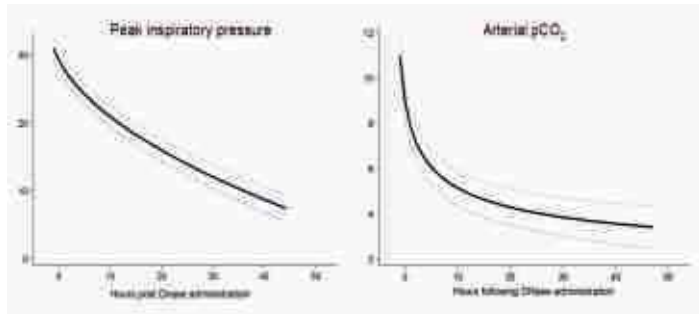
**Methods:** Retrospective cohort analysis. Fifty four children received intratracheal rhDNase with physiotherapy (50% of ventilated asthmatics Jan 2004 – Apr 2013, Table)

**Results:**

- The median (IQR) time to rhDNase following PICU admission was 2.9hrs (1.9 – 8.6)
- Median PIP was 29 cmH<sub>2</sub>O (27 – 34, max 45), pH was 7.20 (7.06 – 7.30, min 6.94) and pCO<sub>2</sub> 8.4 kPa (5.8 – 11.6, max 15.5)

- rhDNase was associated with improvement in ventilation indices (Figure) and a decrease in intravenous salbutamol; only 3 patients remained on salbutamol at 30 hours (0.5mcg/kg/min)
- Median length of ventilation was 26hrs (16 - 39).
- Therapy was tolerated with no profound hypoxic episodes (median fall in O<sub>2</sub> saturation 4%), sustained hypotensive episodes or air leaks
- No patient required extra-corporeal membrane oxygenation and there were no deaths

**Figure:** Graphs derived using generalised estimating equations.



**Table:** Demographics

	DNase (n=54)
Weight (kg)	20 (13 – 30.0)
Age (months)	61 (25 – 118)
PIM2 mortality risk	1.2 (0.8 – 1.5)
Male	64%
Weight (kg)	52 (35 – 64)
Age (months)	27 (16 – 39)

**Conclusion:** Intratracheal rhDNase with physiotherapy is effective therapy for refractory ventilated patients with acute severe asthma. This compares favourably with UK mortality of 4.7% in ventilated asthmatics.

**References:** <sup>1</sup>Kuyper LM. Am J Med 2003 <sup>2</sup>www.picanet.org.uk  
<sup>3</sup> Durward A. Crit Care Med 2000

## OP7

### REDUCING BLOOD TESTING IN PICU, A QUALITY IMPROVEMENT PROJECT

S. Sundararajan, J. Lumsden, *Paediatric Intensive Care Unit, Leeds Children's Hospital, Leeds Teaching Hospitals NHS Trust, UK*

**Introduction:** Critically ill children are at significant risk of repeated blood sampling for laboratory testing. We aimed to optimise blood testing and associated costs in PICU without adversely impacting patient safety and outcome.

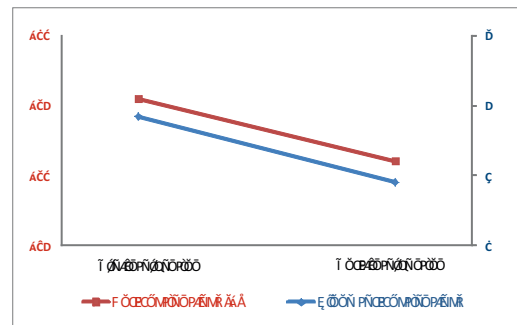
**Methods:** As part of quality improvement initiative we introduced a bed side guideline for common blood tests based on a patient stratification system, along with regular education of PICU medical and nursing staff. We prospectively measured compliance to the guideline in a randomly selected subset. We compared the total number of blood tests requested and their costs per patient-day in three month-blocks pre-intervention (Oct-Dec 2013) and post-intervention (Oct-Dec 2014).

**Results:** Prospective audit showed compliance to the guideline in 81 of 103 (78.6%) patient-days studied. On a further 17 (16.5%) patient-days there was documented or clinical indication for additional tests. The total number of tests decreased from 6530 to 5952 (8.9%) in the post-intervention period. Patient-days had increased from 1348 to 1521 (11.3%) in the corresponding period. The proportion of patients needing level 3 and 4 care was higher in the post-intervention period (55.2% vs. 48.7%). The average number of tests per patient-day decreased from 4.84 (95% Confidence interval: 4.73 - 4.96) to 3.91 (95% CI: 3.81 - 4.01) post-intervention, a 19.2% reduction (Figure: 1). The average cost per patient-day decreased from £25.46 (95% CI: £24.88 - £26.10) to £21.06 (95% CI: £20.52 - £21.59) post-intervention, a 17.3% cost saving. The total saving during the three

month post-intervention period was £6,692.40. The savings over 12 months would be £24,565.20 based on 5583 patient-days in 2014-15. There were no adverse events reported due to lack of blood results.

**Conclusion:** Blood testing rates can be safely reduced in critically ill children.

Figure 1



## OP8

### TEMPERATURE AND LYMPHOCYTE COUNTS IN PATIENTS WITH SEPSIS IN PICU

C. Wilson<sup>1,3</sup>, S. Ray<sup>1,2</sup>, S. Connaire<sup>4</sup>, N. Klein<sup>1,2</sup>, S. Nadel<sup>3</sup>, M. J. Peters<sup>1,2</sup>  
<sup>1</sup>Institute of Child Health, University College, London, UK  
<sup>2</sup>Great Ormond Street Hospital NHS Trust, London, UK  
<sup>3</sup>Imperial College Healthcare NHS Trust, London, UK  
<sup>4</sup>Cardiff University School of Medicine, UK

**Introduction:** Recent work from patients with sepsis in adult intensive care suggests hypothermia is associated with a significant increase in 28-day mortality and is predictive of persistent lymphopenia, a known feature of sepsis-induced immunosuppression.

In a cohort of children admitted consecutively to two Paediatric Intensive Care Units (PICU) with resistant septic shock we aimed to evaluate whether hypothermia within 24 hours of admission was associated with increased mortality and whether there was an association between initial hypothermia and lymphopenia.

**Methods:** 318 children admitted during 2010-2013 were identified. Hypothermia was defined as a minimum temperature of less than 36°C within 24 hours of admission and persistent lymphopenia was defined as an absolute count of less than 1.2 cells/ L x 10<sup>3</sup> on day four.

**Results:** Median age was 17 months (IQR 3 – 66 months). 67 children (21%) died.

Day one temperature was available for 304 children, of whom 128 (42%) were hypothermic. There was a two-fold increase in odds of death in those who were hypothermic compared to normothermic (OR 2.0, 95% CI 1.12 – 3.6, p=0.017). Persistent lymphopenia was associated with a 2.5-fold increase in odds of death (OR 2.57, 95% CI 1.08 – 6.06, p=0.025). There was no association between hypothermia and persistent lymphopenia (OR 1.06, p=0.85).

Risk of death from neither hypothermia nor persistent lymphopenia remained after multivariate analysis.

**Conclusions:** In this group there was no significant association between death and hypothermia or persistent lymphopenia after accounting for other factors. However of the 67 deaths, 39 (58%) occurred before or on day four perhaps weakening any potential relationship between temperature and adaptive immunity in children compared to adults.

**Reference:** 1. Drewry AM, et al The Presence of Hypothermia Within 24 Hours of Sepsis Diagnosis Predicts Persistent Lymphopenia\*. Critical Care Medicine. 2015 Jun;43(6):1165-9.





**THE IMPACT OF COLLABORATIVE WORKING ON ORGAN DONATION, WITHIN THE REGIONAL PICU, BELFAST**

D. McKimm (NHSBT), H. Tough (PICU), M. Hackett (NHSBT), P. Glover (NHSBT)  
 The Royal Belfast Hospital for Sick Children, UK

**Introduction:** A strategy was devised to develop collaboration between PICU and the Organ Donation Team to ensure the choices and rights of families, wishing to donate their children's organs, will be respected and upheld.

**Method:** Specialist Nurse: Organ Donation (SNOD) will; participate in PICU handover and safety-brief, ensure awareness of donor identification and referral protocol, be included in planning for breaking bad news and end of life care, facilitate education for PICU staff and review potential donors to identify obstacles to referral

PICU representation at Trust and Regional Organ Donation Committee meetings with feedback of KPI's to Committee.

Outcomes measured

- Referral.
- Collaborative working.
- Consent.
- Organ donation.
- Feedback from staff and service users.

**Results**

Outcome rates (%) 2010-15

	Donation after Brain Death (DBD)			Donation after Circulatory Death (DCD)					
	Referral	Approach	Collaborative approach	Consent	Referral	Approach	Collaborative approach	Consent	Deport
2010-11	96	100	100	85.7	0	0	0	0	0
2011-12	100	0	0	0	44.4	22.6	0	0	0
2012-13	100	100	100	100	100	100	100	100	100
2013-14	100	100	100	100	100	100	100	100	100
2014-15	100	100	100	100	100	100	100	100	100

PICU increased in all outcomes. 2014-15 DBD rates were 100%, DCD referral and approach rates reached gold standard rating. The first paediatric DCD in N Ireland.

Satisfaction is reported by donor families. One family stated "we take some comfort knowing that his heart still beats on in someone else". Another family expressed gratitude for extra time to say goodbye to their baby. PICU staff evaluation is extremely positive.

**Conclusion:** The potential for DBD and DCD is now an integral part of end of life care for children and their families in PICU.



**MAJORITY OF ALARMS ARE FALSE AND NON-ACTIONABLE IN A WARD ENVIRONMENT**

A. Macdonald, S. Sultan, R. Loughhead, B. Fule, L. Akerele, R. B. Matam, H. Duncan, Birmingham Children's Hospital, UK

**Introduction:** Widespread utilisation of monitoring technology in healthcare is making wards become increasingly noisy. Noise pollution, stress, discomfort, alarm fatigue are major consequences of false alarms. Nurses spend hours of their shift responding to false alarms. Subsequent alarm fatigue risks vital and valid alarms being missed due to increasing response time. To date, alarm studies have been conducted in critical care with few alarm studies conducted in a ward environment.

As part of a large wireless monitoring study (RAPID), aiming to develop

smart alarms, we observed the frequency of monitor alarms in 2 paediatric cardiac wards.

**Method:** Using a specially devised data collection tool, we collected type, cause and response time of alarms, from four easily visible bed spaces, over two 24-hour periods. Using set criteria, every alarm was categorised into valid, false or technical. Parents were given verbal and written information about the study. Consent was not required.

	TOTAL NO OF ALARMS IN 24 HRS	VALID ALARMS	VALID AND ACTIONABLE	FALSE	TECHNICAL	TOTAL ALARMS REQUIRING ACTION
WARD 1 (3 years)	363	34(26%)	31(22%)	206(57%)	61(17%)	36(10%)
Alarms per patient per day	31	28	7	51	15	9
WARD 2 (13 years)	82	33(34%)	20(25%)	42(42%)	10(12%)	28(32%)
Alarms per patient per day	28	7	5	30	4	5

**Conclusion:** There is a high incidence of non-actionable alarms. Similar to >90% alarms in paediatric ICU and >70% alarms in adult ICU being non-actionable, 42-57% of alarms on the paediatric cardiac ward are false and 70-90% non-actionable.

Better alarm management and development of smart, accurate, adaptive, individual alarm limits for each patient could reduce avoidable stress, discomfort for the patients, their families and the bedside team.



**ENTERAL FEEDING PRACTICES BEFORE AND AFTER CONGENITAL DIAPHRAGMATIC HERNIA REPAIR: A 10 YEAR RETROSPECTIVE REVIEW**

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**Introduction:** Congenital Diaphragmatic Hernia (CDH) affects around 3-4/10,000 live births. The introduction of enteral feeding before CDH repair is often dependent on individual clinician, and there is no convincing evidence to support withholding feeds until after surgery. We investigated whether timing of enteral feeding was clinically relevant in patients with CDH.

**Methodology:** In a 10 year retrospective single-centre study, of children admitted to the intensive care unit for CDH repair, the effects of feeding before surgical correction were assessed and compared with those children who had only been fed after the CDH surgery. Outcomes measured included length of stay, weight gain and time to first feed after surgery.

**Results and observations:** Demographic and clinical variables were summarized by standard descriptive statistics. We were able to retrieve the records of 80 children with Congenital Diaphragmatic hernia. 86% were born at term gestation and the rest 14% were pre-term with a male:female ratio of 1.5:1. 52% were fed prior to corrective surgery of which 50% tolerated full feeds (defined as >= 100 mls /kg/day). The median time to start first post operative feeds was 2 days in those patients who had already been fed preoperatively compared with 4 days in whom preoperative feeds were withheld. Similarly, the time required to reach full feeds postoperatively was 5 days in the early feeding group compared with 8 days in those where preoperative feeds were withheld. 6 patients died pre-operatively before repair and 5 patients died following repair giving an overall mortality of 13%.

**Conclusion:** Delaying feeding can result in several detrimental bowel changes such as villus atrophy, delayed enteric mucosa maturation, and mucosal thinning. Our results have shown that introduction of enteral feeds prior to CDH repair reduced time to full feeds postoperatively compared with those for whom feeding was withheld pre-repair.





## VAP – IS IT OR ISN'T IT?

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**Introduction:** Reported rates of ventilator associated pneumonia (VAP) in children vary from 1-7/1000 ventilator days. Differences in categorisation/reporting mean dissemination of quality improvement initiatives is challenging. Centers for Disease Control and prevention (CDC) new adult definitions define Ventilation Associated Conditions (VAC), with a subcategory of infection related ventilator associated complication rate (IVAC).

We aimed to compare VAP rates using 4 different methods -3 clinical and 1 microbiological.

Clinical:

- Original CDC criteria
- New CDC IVAC criteria (modified for paediatrics)
- Antibiotic therapy with a clinician diagnosis of VAP

Microbiological:

- Children with a positive bronchoalveolar lavage (BAL) result.

**Methods:** Over a 7 month period (June–December 2014), daily PICU patient review took place by one of two clinicians establishing whether VAC criteria were met. Clinical notification from bedside clinicians of suspected cases was done via a modified paediatric critical care minimum dataset form. Cases meeting either new/old criteria were discussed and validated at the monthly PICU health care associated infection meeting. Over the same time period, all laboratory BAL samples were reviewed. Patients with microbiological evidence of VAP, were retrospectively analysed to see if they met clinical criteria.

**Results:** 796 admissions with 3650 ventilator days.

	"Old" definitions	"New" definitions	Clinical diagnosis	Positive BAL result + clinical correlation
Number	5	1	31	7
Rate / 1000 ventilator days	1.4	0.3	8.5	1.9
% admissions	0.6	0.1	3.9	0.9

of 210 BAL samples, 60 were positive. Only 7 had clinical signs of VAP.

**Conclusions:** Rates vary widely meaning that agreement on definitions is critical if VAP rates are taken as a quality indicator. Clinical diagnosis alone leads to excess and potentially inappropriate antibiotic use.



## PROSPECTIVE EVALUATION OF A FEEDING GUIDELINE BASED UPON GASTRIC EMPTYING

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**Introduction:** To determine whether introduction of a feeding guideline, whereby feed frequency is individualised to each patient's gastric emptying time (GET), results in a sustained increase in enteral feeding for PICU patients.

**Method:** The guideline (introduced Mar 2008) involved a naso-gastric bolus test feed of 2ml/kg as soon as possible after admission, followed by 2hrly gastric aspirations (with volumes returned). GET was defined when aspiration volume was < 50% of original bolus, and was used to set feeding frequency. Feeding was commenced immediately after GET derivation, using the full allowable volume. Three prospective, one-month audits of feeding practice were undertaken: one before (Mar 2007) and two after (Mar 2009, Apr 2013) guideline introduction.

Overall, 242 patients were audited (median age 9.5 months) over 14,672 patient hours. Outcome variables were: time to establish full feeds (TEFF), number of lost feeding hours and reasons for non-feeding. Results were analysed using multiple linear regression and one-way ANOVA.

**Results:** Post guideline introduction, there was a decrease in mean TEFF, which was sustained over time: 27.6hrs (2007), 16.6hrs (2009), 16.2hrs (2013),  $P=0.0001$ . These differences persisted after adjusting for weight, sex, mortality risk, inotrope use and diagnostic group (cardiac vs general). The proportion of total admission hours where enteral feed was not given decreased from 53.4% to 47.1%, (95% CI for diff: 4.3 to 8.3%,  $P<0.0001$ ). However after excluding potentially non-modifiable factors (e.g. peri-procedure, suspected abdominal pathology, etc), the proportion of feeding hours lost to modifiable factors (e.g. adherence to feeding guideline) approximately halved from 21.2% (2007) to 11.2% (2013), (95% CI for diff: 8.5 to 11.5%,  $P<0.0001$ ).

**Conclusion:** Introduction of a feeding guideline based upon individualised GET has been associated with a sustained increase in enteral feeding.



## ACCURACY OF WIRELESS AND STANDARD PATIENT MONITORS IN CHILDREN

B. K. Fule, A. Macdonald, L. Akerele, S. Sultan, R. Loughhead, R. B. Matam, H. P. Duncan, Birmingham Children's Hospital, UK

**Introduction:** As a part of a wireless monitoring study (RAPID) we looked at the accuracy of standard and wireless patient monitors.

**Method:** We recorded heart rate (HR), pulse rate (PR), respiratory rate (RR) and SpO<sub>2</sub> readings from the following devices:

- Phillips SureSigns: RR, PR, SpO<sub>2</sub>
- Isansys Life Touch (a recently developed paediatric specific wireless ECG monitor): HR, RR
- Nonin Wristox (wireless pulseoximeter) PR, SpO<sub>2</sub>

Direct clinical observations (DO) of pulse rate (PR) and respiratory rate (RR) for 60 sec done by the research team served as gold standard for HR, PR and RR.

Agreement between measurements considered acceptable below percent error of 10% for HR, PR and RR, and below 4 A<sub>(RMS)</sub> (root mean square error) for SpO<sub>2</sub>.

**Results:** 6 patients (2M4F, age 3 months – 13 years) were studied.

HR and PR were within acceptable accuracy for all the measurements. RR did not match accuracy criteria; however the number of observation for SureSigns were low. Difference between Phillips and Nonin derived SpO<sub>2</sub> was out of range (A<sub>(RMS)</sub> 4.4).

	RR (b/min)			PR (b/min)			SpO <sub>2</sub> (blue)	
	PHI	PHI	PHI	NONI	NONI	NONI	DO	DO
Mean (SD)	18.2	18.3	18.4	100.5	100.6	100.7	95.5	95.6
Standard Error	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
95% CI	17.8-18.6	17.9-18.7	18.0-18.8	99.9-101.1	100.2-101.0	100.3-101.1	95.1-95.9	95.3-95.9

**Conclusion:** Wireless monitoring of heart rate and pulse rate is accurate in children. Accuracy of respiratory rate monitoring needs to be improved. Accuracy of Nonin derived SpO<sub>2</sub> needs to be tested against CO-oxymetry in children.



## INCIDENCE AND RISK FACTORS FOR FAILED EXTUBATION: A PROSPECTIVE COHORT STUDY

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**Introduction:** To identify incidence, risk factors, and outcome for failed planned extubation (FPE).

**Methods:** We prospectively recorded all episodes of FPE and potential associated risk factors in our 20-bed PICU for 13,165 mechanically ventilated patients (2000–2014). Only first episodes of planned extubation were included. Exclusions were: tracheostomy ventilation, non invasive ventilation (NIV), and accidental extubation. FPE was defined as requirement for re-intubation <24 hours post extubation. Analysis involved multiple logistical regression.

**Results:** The FPE rate was 8.5% (95% CI 8.0 to 9.0%) among 11,438 planned extubations. Factors associated with FPE occurrence are shown (table). However, overall prediction of FPE was poor: AUROC 0.66 (95%CI 0.64 to 0.68).

Factors associated with FPE	Odds ratio	95% Conf. Interval	p value
Age (months)	0.998	(0.996 to 0.999)	0.008
Cerebral palsy Syndrome	1.93	(1.35 to 2.76)	<0.001
Born <36 weeks gestation	1.26	(1.01 to 1.57)	0.04
Diagnosis: upper airway obstruction	3.27	(2.59 to 4.13)	<0.001
PIM2 score	8.32	(3.82 to 18.11)	<0.001
Ventilation $\geq 7$ days	1.67	(1.23 to 2.26)	0.001
Planned NIV post-extubation	2.29	(1.79 to 2.93)	<0.001
Extubated in daytime	1.76	(1.41 to 2.20)	<0.001
Year of admission	0.99	(0.97 to 1.01)	0.282

The median time to reintubation was 2.5 hours (IQR 0.5-8.5). The four commonest reasons for FPE were: upper airway obstruction (42%), hypoxia (12%), fatigue (12%), and cardiovascular support (12%). The mortality rate for those with FPE was 6% compared to 0.9% of those without FPE.

**Conclusion:** Our incidence of FPE is within published norms, and carries a high mortality. Identification of risk factors for FPE may aid in quality improvement initiatives.

**Reference:** Kurachek. Crit Care Med 2003;31:2657



## OPI6



### SUPPRESSION OF HYPERCORTISOLAEMIA SECONDARY TO ECTOPIC ACTH-SECRETING TUMOUR USING AN ETOMIDATE INFUSION IN A CHILD

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**Introduction:** Etomidate is an anaesthetic induction agent, which causes adrenal suppression resulting in increased mortality in adult intensive care (1). Consequently it is rarely used in routine anaesthesia. It was first used in 1988 for therapeutic adrenal suppression. We describe a case of Cushing syndrome in a child, due to an ectopic ACTH-secreting tumour managed with an etomidate infusion prior to surgical resection of the tumour.

**Case Summary:** A 6-year-old girl presented with a 2-week history of headaches and vomiting on a background of excessive weight gain in the preceding 6 months. She was hypertensive (181/111) and hypoxic with a fluctuating conscious level on admission. She was intubated, transferred to PICU and treated with antihypertensives. She was diagnosed with hypertensive encephalopathy caused by Cushing's syndrome secondary to ectopic ACTH production from a thymic carcinoma. She underwent cortisol secretion blockade & replacement using etomidate, hydrocortisone and fludrocortisone. She was extubated at 48 hours but remained on etomidate for several weeks prior to surgery to remove the ACTH secreting tumour. Residual disease was found on CT a few weeks post-operatively explaining the rising cortisol levels. Subsequently she underwent a bilateral adrenalectomy and chemotherapy.

**Image 1:** ACTH-secreting thymic carcinoma on CT thorax



**Conclusion:** Etomidate is a carboxylated imidazole derivative. It causes inhibition of 11 $\beta$ -hydroxylase and 17 $\alpha$ -hydroxylase causing cortisol and aldosterone levels (2). Side effects include obtundation, depression of respiratory drive and immune suppression. Etomidate may be safely used in spontaneously ventilating patients to suppress cortisol levels.

#### References:

1. Preda et al. Etomidate in the management of hypercortisolaemia in Cushing's syndrome: a review. *Eur J Endocrinology*. 2012; 167:137-143.
2. Allolio B et al. Nonhypnotic low-dose etomidate for rapid correction of hypercortisolaemia in Cushing's syndrome. *Klinische Wochenschrift*. 1988;66:361-364.

## OPI7



### A SYSTEMATIC REVIEW AND META-ANALYSIS OF ANTIFIBRINOLYTICS FOR BLEEDING FOLLOWING PAEDIATRIC CARDIOPULMONARY BYPASS SURGERY

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**Introduction:** To evaluate the efficacy of the antifibrinolytic agents Tranexamic acid (TXA) and  $\epsilon$ -Aminocaproic acid (EACA) compared to placebo in reducing mediastinal bleeding post cardiopulmonary bypass (CPB) surgery.

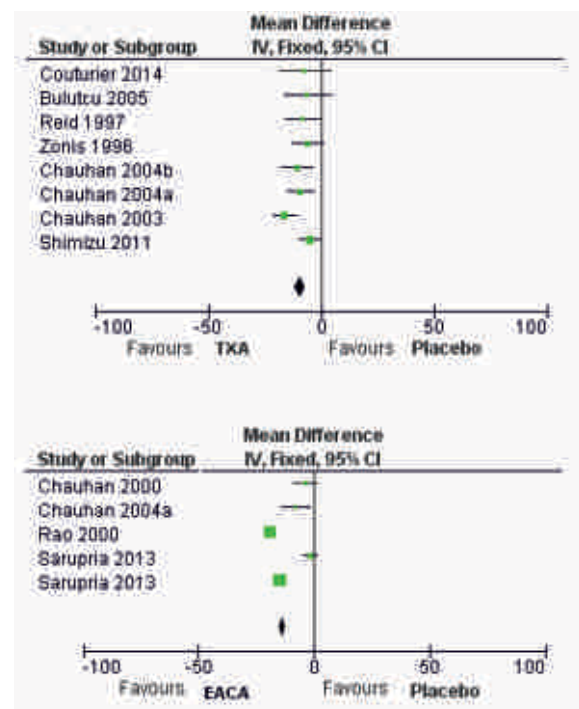
**Method:** Systematic review and meta-analysis evaluating randomised controlled trials 1980-2014. Databases searched included Cochrane Register, MEDLINE and EMBASE. Inclusions: <18years. Exclusions: underlying haematological disorders and non-cardiac CPB surgery. Primary outcome: mediastinal bleeding in first 24 postoperative hours. Secondary analysis: dosing strategies vs Placebo.

**Results:** 12/913 screened articles were included (n = 1267 patients, mean weight 8.6 kg). Trials were reasonably sized (median 110 pts, range 39 - 160).

Both agents reduced mean 24h blood loss compared to placebo: TXA by 9.1 ml/kg [95% CI 6.7 to 11.4] and EACA by 13.6 ml/kg/24h [95% CI 14.75 to 12.45], (see figure).

Two dose ranges of TXA were evaluated versus placebo: < 50 mg/kg and > 50 mg/kg. There was a larger reduction in 24h blood loss for doses <50 mg/kg than for >50 mg/kg (12.5 vs 5.7 ml/kg/24, p = 0.003). Secondary analysis was not possible for EACA.

Study quality was generally good across six domains, with allocation concealment and selective reporting being the two lowest rated areas. Heterogeneity for TXA was low overall ( $I^2 = 38\%$ , p = 0.13), but high for EACA ( $I^2 = 96\%$ , p = < 0.00001).



**Conclusion:** TXA and EACA reduce post-CPB bleeding. For TXA there is a suggestion that lower doses (< 50 mg/kg) may be preferable to higher doses (> 50 mg/kg).





**MECHANICAL PROPERTIES OF TRADITIONAL ELASTOPLAST TRACHEAL TUBE TAPING VS A NOVEL TRANSPARENT TAPE (BLENDERM) IN A MODEL OF INADVERTENT EXTUBATION**

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**Introduction:** Traditional taping of tracheal tubes in our PICU involves the use of DuoDERM dressing applied to the skin and Elastoplast 'trouser-legs' applied using the traditional 'Melbourne' technique. Limitations of Elastoplast include opacity, which obscures tube depth markers, and elasticity which allows stretching to the extent that inadvertent extubation can occur without overt failure of the taping.

We have constructed a standard simulated inadvertent extubation model through increasing traction force and have compared the performance of Elastoplast with a novel transparent tape; Blenderm.

**Methods:** We constructed a standardised extubation model using a prone 5yr-old simulation manikin using standardised patches of DuoDERM dressing and taped with standardized 'trouser-legs'. Tubes were lubricated and inserted via the nostril and taped at the 7cm marker. The tracheal tubes were loaded with 0.75kg (7.4N) and then subsequently loaded with an additional 0.1kg (1N) every 30 seconds. The force and time required to simulate extubation, by withdrawal of the tracheal tube, by 5cm was noted.

**Results:** The forces and times required to simulate extubation are detailed below

	Elastoplast		Blenderm	
	Force; Kg (N)	Time	Force Kg (N)	Time
Experiment 1	1.45 Kg (14.2 N)	4 min: 12 sec	1.45 Kg (14.2 N)	3 min: 55 sec
Experiment 2	1.55 Kg (15.2 N)	3 min: 57 sec	1.35 Kg (15.2 N)	3 min: 23 sec
Experiment 3	1.35 Kg (13.2N)	3 min: 22 sec	1.35 Kg (13.2N)	3 min: 11 sec

There was no difference in the force required to simulate extubation using Elastoplast or Blenderm (Unpaired t test; p=0.6) or in the time required to simulate extubation (Unpaired t test; p=0.65)

**Conclusion:** Blenderm performed as well as traditional Elastoplast taping in this simulated inadvertent extubation model and given its advantages of transparency and reduced elasticity, merits clinical trials as an alternative tracheal tube taping technique.



**CHANGING INFUSION PRACTICE GENERATES SIGNIFICANT EFFICIENCIES IN NURSING TIME AND RESOURCE USAGE IN PAEDIATRIC INTENSIVE CARE**

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**Introduction:** Infusions preparation in English PICUs uses the Rule of Six (ROS) which was developed for administration without infusion devices. This method is inaccurate (1). Regulators recommend standardised approaches to IV infusions to improve patient safety and quality of care (2). Administration set changes also have an association with resource use and central line infections (3). We report the impact of fixed concentration infusions and reduced administration set changes on nursing time and infusion equipment cost.

**Methods:** Sedation concentrations were standardised in September

2014. Direct observation of infusion preparation was carried out before the introduction of fixed-concentration (FC) infusions to quantify the nursing time required to prepare infusions. Administration was prospectively documented using purposive sampling until a population-representative sample for age and weight was obtained. Syringe use and administration set use was calculated. Reducing frequency of administration set changes to 72hrs in accordance with infection control policy was then calculated retrospectively.

**Results:** It takes 40 minutes to prepare ROS syringes and 30 minutes for FC syringes. Syringe use data is presented in table 1. Observed usage was scaled up to predict use over one year.

	Patients (per yr)	Cohort Syringes	Syringes over 1 year	Time (ROS)	Time (FC)	Reduction
MORPHINE	19 (250)	80	1650	1100hrs	825hrs	275hrs
MIDAZOLAM	23 (250)	133	2000	1333hrs	1000hrs	333hrs

Table 1

Mean duration of IV sedation in these patients was 100hrs. The cost associated with replacing administration sets with each syringe was £16,060. By changing every 72hrs, this cost is reduced to £4,400 – a cost saving of £11,660.

**Conclusions:** FC syringes are more efficient than ROS. FC preparations have released 0.5WTE nurses back to patient care. Changing administration sets 72hrly realises significant cost efficiencies.

**References**

- (1) Parshuram C et al. Ped Crit Care Med 2003 31(10):2483
- (2) NPSA 20 "Promoting Safer Use of Injectable Medicines" March 2007
- (3) Loveday HP et al. J Hosp Infect 2013, 86(S1); S1-S70



**CLINICAL COURSE AND OUTCOME OF CHILDREN REQUIRING LONG TERM VENTILATION (LTV) - SINGLE CENTRE EXPERIENCE**

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**Background:** Paediatric LTV has seen a rapid expansion over the last 20 years. We reviewed the longitudinal trends of children started on LTV in a single mixed Paediatric Intensive Care (PICU).

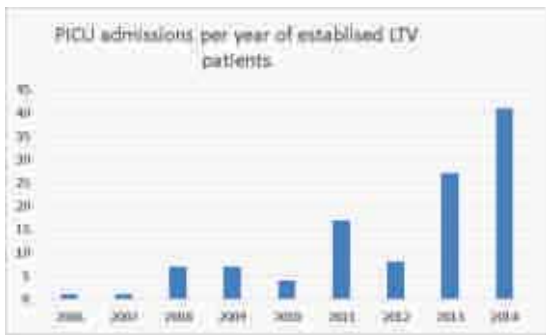
**Methods:** All children who had LTV initiated in PICU via tracheostomy during a nine year period from 2006 were identified from databases and analysed retrospectively

**Results:** During the 9 year period, 29 children were commenced on LTV via tracheostomy in PICU. The mean age of the patients at tracheostomy was 3.6years. 64% of them were males. The median length of PICU stay was 106 days (range 16-305). The median time from tracheostomy to PICU discharge was 49 days (6-300 range). The main diagnostic groups of these patients were neuromuscular (37%), airway malformations (31%), spinal cord lesions (7%) and respiratory (14%).

Over a median follow up period of 3 years (range 0.51-10 years), 3 children (10%) were decannulated, 6 died (21%), and rest 20 (69%) were still receiving LTV: (2 were transitioned to adult, 2 still in hospital and 16 on home LTV).

There is an increase in the number of PICU admissions of established LTV patients due to inter current illness over the years as shown in the chart below.





**Conclusions:** LTV patients have prolonged PICU stay. Careful delineation of their patient pathway is required to identify and rectify factors prolonging their hospital stay. Readmission of this group of technology dependent patient to PICU for inter-current illness/deterioration will pose strain on Paediatric intensive care resources.

## OP21

### SEDATION AND DEATH IN PAEDIATRIC INTENSIVE CARE UNIT: A RETROSPECTIVE DESCRIPTIVE COHORT STUDY

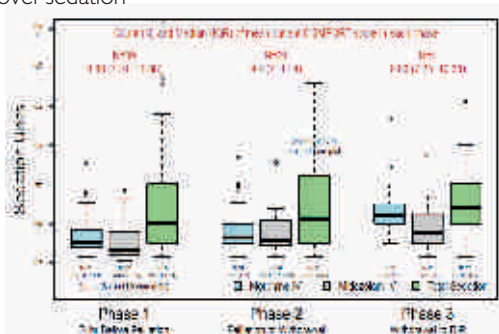
R. Dhar, C. Magner, I. Dawkins, C. Breatnach  
Department of Paediatric Intensive Care, Our Lady's Children's Hospital, Dublin, Ireland

**Introduction:** Although overall crude mortality in paediatric intensive care units (PICU) is decreasing, 5% of children still fail maximum therapy and progress to palliation and withdrawal of life sustaining therapies.

**Aim:** To describe our sedation practices for PICU patients who had a decision of palliation made and subsequent death in our unit over the admission period of 2013.

**Methods:** Data was collected retrospectively from existing electronic medical and nursing records of patients who died following withdrawal of cardio-respiratory support/non-escalation of care. Therapy was followed during three distinct phases; twenty-four hours prior to the decision of palliation, palliation to withdrawal of support and from withdrawal of support to death. To facilitate comparison between different sedative agents, the sum-total exposure of each agent during each phase was translated into sedation units (SU) indexed against the 'usual' daily dose for that agent. Hence a composite 'dose' of different sedatives could be generated; termed Total Sedation Unit (TSU). This aggregate dose (TSU) was then interpreted across each phase alongside the Comfort-B behaviour score that is employed in our Unit to guide escalation/weaning of sedation.

**Results:** 1095 patients were admitted, 44 (4.02%) died of which 40 were palliated; 30 had withdrawal of cardio-respiratory support and 10 died following non-escalation of care. Increased use of analgesia and sedation was observed over the three phases whilst median comfort score remained largely static but reducing and on the cusp of optimal/oversedation



**Conclusion:** Detailed analysis of sedation administration in the context of a validated objective measure of comfort reveals distinct patterns of practice. Such information may be of value in formulating clinical practice guidelines relating to this under-investigated area of care.

## OP22

### AUDIT ASSESSING DO NOT ATTEMPT CARDIO-PULMONARY RESUSCITATION (DNACPR) ORDERS IN PATIENTS WITH LIFE-THREATENING AND LIFE-LIMITING CONDITIONS AT BRISTOL ROYAL HOSPITAL FOR CHILDREN (BRHC)

K. Gadhvi, J. Fraser, Bristol Royal Hospital for Children, UK

**Introduction:** DNACPR orders are useful in avoiding distressing interventions and helping families come to terms with impending loss. At BRHC resuscitation instructions were historically written in a non-standardised fashion in medical notes. We conducted an Audit of existing practice against national standards<sup>(1)</sup>.

**Method :** Inclusion criteria were patients aged 0-16 years with DNACPR orders that suffered in-hospital cardiac arrests or had treatment withdrawn between March 2012 and February 2013. Ten cases were retrospectively reviewed (phase 1). A standardised DNACPR proforma was then introduced. A prospective review of a further 10 patients occurred between March and October 2013 (phase 2).

#### Results

Criteria	Phase 1	Phase 2
Clear visibility	10% moderate 90% poor	60% good, 30% moderate, 10% poor
Clear date	100%	100%
Reason stated	60%	100%
Name legibility	100%	100%
Designation legibility	90%	100%
Family Communication	90%	100%
Healthcare professionals Communication	20%	75%
Review decision	10%	90%

Phase 1 revealed DNACPR orders were poorly visible and inadequately documented. Phase 2 demonstrated improvements but highlighted resuscitation decisions often involved specific instructions such as '*mask ventilation only*' that might be preferentially documented in a 'Personal Resuscitation Plan' (Phase 3). The latter has now replaced all DNACPR instructions.

**Conclusion:** The language of generic Do Not Resuscitate documents is often inappropriate in Paediatrics. It is more common that *positive* action results; namely, a directive to proportionately intervene in certain circumstances. Completing an audit cycle and developing the 'Personal Resuscitation Plan' has led to documentation which more accurately reflects family wishes.

**Reference:** 1. British Medical Association/Royal College of Nursing/ UK Resuscitation Council; October 2007: 'Decisions relating to cardiopulmonary resuscitation'. A joint statement.

## OP23

### HEATED HUMIDIFIED HIGH-FLOW NASAL CANNULA (HHHFNC) - MORE THAN JUST HOT AIR?

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**Introduction:** NWTS has seen an increase in patients referred with respiratory illnesses. We aim to establish if the use of HHHFNC therapy reduces the requirement for mechanical ventilation in respiratory patients.

**Methods:** Case notes were analysed for children with asthma, bronchiolitis, lower respiratory tract infections (LRTI) and viral-induced wheeze.

**Results:** 133 cases were identified for the winter period of 2012, compared to 187 cases in the same season of 2014.

In 2012, bronchiolitis comprised 60%, LRTI 27%, asthma 11%, and viral-induced wheeze 2%. There was a similar distribution of patients in 2014.

In 2012, 20% of asthma patients required mechanical ventilatory support, versus 22.2% in 2014.

In 2012, 61.3% of bronchiolitis patients required mechanical ventilation. This reduced to 47.1% in 2014. This reduction was despite the increase in the total number of patients in 2014. The chi-square statistic was 3.6275, with the P value of 0.05632.

In 2012, 55.6% of LRTI patients required ventilatory support, versus 42.0% in 2014 (P value 0.21436).

Of note, is the reduction in bronchiolitis and LRTI patients requiring ventilation in 2014. One particular difference was the use of HHHFNC in these patients.

Studies have shown improvement in physiological parameters in children receiving HHHFNC therapy. 1 HHHFNC use may be applied to a broader spectrum of patient groups. 2

**Conclusion:** HHHFNC appears to reduce the requirement for mechanical ventilation in bronchiolitis and LRTI.

**References:**

1. Hutchings FA et al. Heated humidified high-flow nasal cannula therapy in children. *Arch Dis Child* 2015; 100: 571–575.
2. Milési C et al. High-flow nasal cannula: recommendations for daily practice in pediatrics. *Annals of Intensive Care* 2014, 4:29

## OP24



### QUANTIFYING DELAYS AND IDENTIFYING BARRIERS TO TIMELY DISCHARGE FROM INTENSIVE CARE

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**Introduction:** Delays to discharges from ICU blocks access for patients requiring intensive care(1). In addition adult studies demonstrated an increased risk of morbidity with out-of-hours discharge(2). This audit quantifies the extent of delays and time of discharge and considers the barriers to timely discharge from Southampton General PICU.

**Methods:** Prospective audit of PICU discharges for the 1st 10 days of January 2015 using a proforma. Length of delay was calculated from the time the patient had been handed over and discharge paperwork completed. Reasons for delays were identified by interrogation of receiving ward staff and through prior consideration of potential barriers.

**Results:** 37 patients identified. Delays greater than 2 hours occurred in 61% (range 0.5–32hr). 78% were ready for discharge before 17:00 however 60% were discharged between 17:00–08:00. Discharge occurred during evening handover in 27%. In 50% delays were attributed to full ward occupancy. Discharges were complicated in 25% by non-invasive ventilatory requirements and in 36% by the need for cubicle or cohort nursing. No patients were denied access to PICU due to delays.

**Conclusion:** A considerable number of patients experience delays to discharge; the main obstacle appears to be a bottleneck of patients awaiting discharge from the wards. Specific issues relate to the need for

cohort nursing or cubicles and the time taken for deep cleaning. Earlier discharge from paediatric wards needs further exploration. In addition we need to address potentially unsafe discharge out-of-hours and need to develop a robust system for ward review.

**References:**

1. Johnson et al. Delay of transfer from the intensive care unit: prospective observational study of incidence, causes, and financial impact. *Critical Care*;2013,17:R128
2. Elliott et al. Factors associated with in-hospital mortality following ICU discharge: a comprehensive review. *British Journal of Intensive Care*;22:(120–125)

## OP25



### AN ASSESSMENT OF CUFF INFLATION PRESSURES AND THE ROLE OF NITRIC OXIDE WITHIN REMOTE ISCHAEMIC PRECONDITIONING

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**Background:** An increasing number of children born with congenital heart disease (CCHD) are surviving into adolescence and therefore are at risk from long-term consequences of ischaemic-reperfusion injury (IRI). Remote ischaemic preconditioning (RIPC) involves sequential arterial occlusion to create transient ischaemia in a distal vascular bed, which through an unknown mechanism may lead to protection against IRI. We aimed to monitor microcirculatory blood flow (MBF) to investigate appropriate cuff inflation pressures within the RIPC protocol. Furthermore, we aimed to assess the role of nitric oxide (NO) as a contributor to RIPC.

**Methods:** Healthy adult volunteers (HV) and CCHD underwent a standardized protocol comprising three sequential 5-minute pressure cuff inflations on the proximal arm targeted at 15mmHg above systolic blood pressure (SBP) separated by 5 minutes of reperfusion. Laser Doppler was used to detect MBF and temperature on both arms, alongside oxygen saturation (SO<sub>2</sub>) and oxygenated (oxyHb) and deoxygenated (deoxyHb) haemoglobin levels distal to the cuff (Moor Instruments UK).

**Results:** 4 CCHD and 12 HV were studied. Significant reduction in MBF, oxyHb and SO<sub>2</sub> and increase in deoxyHb during ischaemia was achieved. No contralateral vasodilation was observed and there was no change in MBF, SO<sub>2</sub> and oxy/deoxyHb baselines before and after the protocol. No changes in NO metabolites were observed in CCHD, however a significant decrease in nitrite/nitrate was seen in HV.

**Conclusions:** We have established a simple method for testing the efficacy of arterial inflow occlusion. MBF monitoring showed ischaemia was achieved using 3 x 5 min occlusion to +15mmHg above SBP. However, this may not be sufficient for RIPC and therefore no firm conclusions regarding the role of NO can be drawn. This may potentially explain negative trial data reported by others using similar protocols. Further work into suitable occlusion pressures appears to be warranted before conducting further clinical trials.

# Poster Presentation Abstracts

P1



## THE IMPACT OF ESTABLISHING A DEDICATED HIGH DEPENDENCY UNIT IN A DISTRICT GENERAL HOSPITAL ON TRANSFER RATES TO PICU

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**Introduction:** Paediatric Intensive Care (PIC) beds are a limited and costly resource. A national database (PICANet) has shown that up to 40% of admissions to PIC are classified as high dependency. With development of dedicated High Dependency Units (HDU) in District General Hospitals (DGH) there is potential to reduce this burden. We examined the effect of a dedicated HDU on PICU transfers.

**Methods:** An observational study was designed to compare the rates of transfer to the Paediatric Intensive Care Unit (PICU), in Leeds, from the main DGHs in the Yorkshire and Humber region. The referral rate was calculated by the number of completed transfers to PICU, divided by the total number of Paediatric admissions for that DGH. One DGH in Hull has a dedicated (funded) HDU, the other units provide high dependency within the Paediatric wards. Hull also has the ability to ventilate patients on the adult intensive care for 24 hours (these patients were considered PICU admissions). The number of admissions for each DGH was sourced from the Hospital Episode Statistics database. The number of completed transfers was sourced from the regional PICU. Data collected included age on admission, disease category and PIM2 score, a validated mortality prediction score. Poisson regression was used to calculate incident rate ratios and 95% confidence intervals (CI) for individual hospital transfer rates compared with the regional mean.

### Results:

District General Hospital Trust	Total admissions	Number of transfers	Number of transfers per 1000 admissions	Incident rate ratios (IRR) (95% CI)
Airedale	19438	CD	1.80	1.14 (0.81 – 1.61)
Bradford	45496	113	2.48	1.57 (1.28 – 1.93)
Pinderfields + Dewsbury	57974	88	1.51	0.96 (0.76 – 1.21)
Calderdale + Huddersfield	49151	85	1.73	1.10 (0.87 – 1.38)
Scarborough	13396	22	1.64	1.04 (0.68 – 1.59)
Hull	47077	45	0.95	0.61 (0.45 – 0.82)
York	30730	35	1.14	0.72 (0.51 – 1.02)
Harrogate	16514	19	1.15	0.73 (0.46 – 1.15)

Fig. 1 Key results showing DGH with figures to calculate the transfer rate plus IRR.

The unit with the dedicated HDU had the lowest transfer rate and incident rate ratio (Hull 0.95 per 1000 admissions with IRR 0.61). The leading primary disease category was respiratory (41%) followed by neurological (16%).

**Conclusions:** This study highlights potential to reduce PICU transfers by use of dedicated HDUs in DGHs.

**Reference:** 1. Paediatric Intensive Care Audit Network: 2014 Annual Report – Tables & Figures (published September 2014): Universities of Leeds and Leicester. [Online] Available from: [http://www.picanet.org.uk/Audit/Annualreporting/PICANet\\_2014\\_Annual\\_Report\\_Tables\\_and\\_Figures.pdf](http://www.picanet.org.uk/Audit/Annualreporting/PICANet_2014_Annual_Report_Tables_and_Figures.pdf)



P2



## THE IMPACT OF ERRORS ON PIM SCORES

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**Introduction:** The performance of Paediatric Intensive Care Units is in part judged by their Standardised Mortality Ratio (SMR). The impact of errors in the collection of data used in the calculation of the Paediatric Index of Mortality (PIM) Score can have a dramatic impact on the predicted mortality of a cohort of PICU patients and hence the SMR of that PICU. In order to investigate this effect we examined the accuracy of PIM2r Scores collected for a cohort of patients who died in our PICU during 2012.

**Methods:** We retrospectively calculated the predicted mortality of patients who died in our PICU during 2012. The PIM2r Score was retrospectively calculated and compared to the data that contemporaneously collected and submitted to PICANet for analysis.

**Results:** During the timescale of this project complete data was available for 15 of the 44 patients who had died in 2012. A Wilcoxon Signed Rank test demonstrated that contemporaneously collected PIM2r Score data statistically underestimated the predicted mortality of patients when compared to retrospectively collected data ( $p=0.0061$ ) [Figure 1]. An initial audit into data collection revealed that only 28.8% of PIM2r Score data regarding admissions was completed accurately. This was improved to 55.7% following the introduction of an education tool and organisational restructuring of data collection.



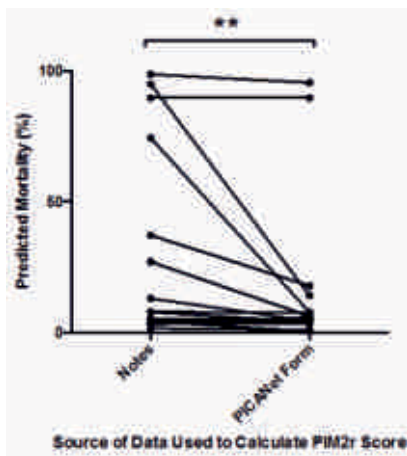


Figure 1: Comparison of contemporaneous Vs retrospective PIM2r Score data

**Conclusion:** Errors in PIM2r Score data collection tend to reduce the apparent predicted risk of mortality. This can have a significant impact of the SMR of that PICU.

### P3

#### LOCAL HOSPITAL EXTUBATION IN PAEDIATRIC STATUS EPILEPTICUS

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**Introduction:** Status epilepticus (SE) is the most common neurological reason for referral to paediatric intensive care (PICU). Practice has evolved over recent years to attempt extubation in local hospitals, avoiding the need for retrieval to PICU. Our aim was to evaluate the extent of this practice within our service and our ability to utilise this strategy successfully.

**Methods:** Retrospective case-note review of children referred to the Children's Acute Transport Service (CATS) with SE between 1st April 2013 and 31st March 2015.

**Results:** A total of 456 patients were referred with SE. Three hundred and fifteen (69%) were intubated. Extubation was advised in 119 (38%). Extubation was attempted in 80 (67%) and was successful in 68 (85%). The main reason for unsuccessful extubation was recurrence of seizures once sedation was stopped. Only two children required reintubation – one for decreased level of consciousness and one for respiratory distress. When extubation was attempted the median time to extubation was 105min (IQR 67.5-160.5) (Figure). Extubation was not attempted in 38 (32%), reasons being local preference, evolving cardiorespiratory compromise and seizure recurrence.

**Conclusion:** Extubation was advised in 38% of children intubated for SE, and attempted in two-thirds of the cases. Although extubation was unsuccessful in 15%, this was mostly due to recurrence of seizures once sedation was stopped (i.e. pre-extubation). True extubation failure occurred in only two cases. When extubation was attempted and successful, over 50% occurred within two hours and 95% within four hours. Further research is required to identify the wider impact of local extubation and understand when the benefits of this practice outweigh the risks.

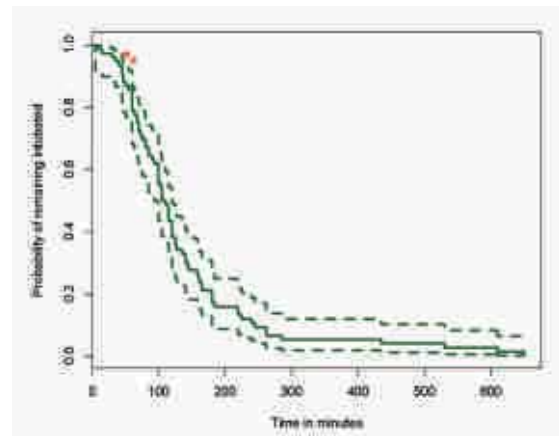


Figure: A Kaplan-Meier curve for the probability of extubation over time in children who were successfully extubated locally

### P4

#### EQUIPMENT OR EXPERIENCE: THE ROLE OF VIDEO LARYNGOSCOPY IN THE HANDS OF INEXPERIENCED USERS

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<sup>2</sup>Child Life and Health, University of Edinburgh, UK

**Aims:** To determine (1) if video laryngoscopy improves intubation success rate in the hands of inexperienced trainees; and (2) if clinical experience among inexperienced trainees affects the success rate of intubation

**Methods:** A prospective observational study of paediatric airway management simulation was conducted. Twenty-two foundation, junior anaesthetic, paediatric and emergency medicine trainees (ST/CT 1-4) participated. A teaching session on paediatric airway management and a practical skills workshop was provided. Following this, they were asked to intubate three manikins, child, infant and infant with Pierre Robin Sequence (PRS) using the video laryngoscopy and the standard laryngoscope. Failure to intubate within 120 seconds was classed as a failed attempt. Relationships between clinical experience, intubation performance, and types of laryngoscopy used were determined.

**Results:** Of the 132 intubation attempts assessed, failed intubation occurred in 15 and 4 attempts respectively in the standard laryngoscopy and video laryngoscopy groups (Fisher's exact test  $p=0.007$ ). Video laryngoscopy significantly improved the success rate in the difficult airway scenario i.e. in the infant manikin with PRS ( $p = 0.007$ ). Video laryngoscopy significantly increased the success rate of intubation amongst junior trainees who were inexperienced with intubation (FY – ST1) ( $p=0.01$ ), but it made no difference to the intubation success rates of the more experienced junior trainees (CT/ST3-4).

**Conclusion:** Video laryngoscopy significantly reduced failed intubation among the junior trainees.

### P5

#### TACKLING PICU STAFF RETENTION: A MATTER OF APPRECIATION?

E. Hood, N. Kelly, A. Plunkett, Birmingham Children's Hospital, UK

**Introduction:** A survey of almost 30,000 NHS employees reported low levels of morale, with 66% reporting that they had seriously considered leaving their current post (1). A Kings Fund report (2) suggests that staff morale is directly linked with feeling appreciated, valued and recognised.

Furthermore, retention might be improved by improving morale and empowering staff in service improvement (3).

**Method:** To understand the factors contributing to enhanced sense of appreciation, Birmingham PICU staff were invited to complete an anonymous survey, including the question: "What would help you feel better appreciated on PICU?", with subsequent thematic analysis.

**Results:** The survey was completed by 228 staff out of 339 in the department, giving a 67% representation of all professional groups on PICU.

Praise, recognition and a simple thank-you proved to be the top methods of enabling staff appreciation and sense of value.

Junior nurses and registrars felt that positive feedback, support and education were most important. Senior nurses cited acknowledgement, feedback and positive reinforcement as key. AHPs and support staff felt that teamwork, inclusion and equality were essential. Interestingly, desire for a pay rise was mentioned only by the consultant cohort (presumably in jest?).

**Conclusion:** Recognition and feedback are simple ways of enhancing morale and appreciation for members of our PICU team, which may also contribute to staff retention. One way in which we can provide this is through the Learning from Excellence initiative, which aims to recognise, share and spread good practice.

#### References:

1. Thomson Reuters. NHS staff survey on pay and conditions. September 2014
2. Finlayson, B. (2002) Counting the Smiles: Morale and Motivation in the NHS. King's Fund. pp. 1-8
3. Meadows, S et al (2000). The Last Straw: Explaining the NHS nursing shortage. King's Fund

## P6

### REDUCTION IN COMMUNICATION DELAYS IN PAEDIATRIC INTENSIVE CARE FOLLOWING IMPLEMENTATION OF HANDS-FREE COMMUNICATION TOOL

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**Introduction:** Verbal communication between professionals in Paediatric Intensive Care (PIC) is often time-sensitive. We hypothesised that implementation of a wireless communication tool (Vocera) would improve verbal communication response times and staff perception of communication delays.

#### Methods:

1. Observational study of response times in communication episodes. Staff categorised as Bedside or Roaming. The following were recorded via direct observation:

- i. Time from initiation to response for verbal queries (Bedside)
- ii. Time seeking staff members for verbal communication (Roaming)
- iii. Time to connect incoming phone calls to intended recipient.

2. Anonymous e-survey of PICU staff.

Study conducted 2 months prior (pre) and 4 months post (post) implementation of Vocera (June 2014).

**Conclusion:** Implementation of Vocera was associated with significant improvement in metrics of verbal communication times, and in staff perception of communication delays. The rate of unsuccessful incoming phone call connections increased slightly post implementation, possibly reflecting incomplete coverage with Vocera units. This study demonstrates measurable benefits from implementation of state of the art technology in the intensive care environment.

#### Results:

Category	Pre	Post	p
<b>Bedside</b>			
Hours observed	169	131	
Median time to response (seconds) [IQR]	60 (0-120)	10 (5.1-18.4)	p = 0.01*
<b>Roaming</b>			
Hours observed	28	52	
Median time to response (seconds) [IQR]	120 [60-255]	9 [7-30]	p < 0.001*
<b>Telephone</b>			
Hours observed	13	23	
Successful connection to intended recipient	64/74 (86.4%)	69/93 (74.1%)	p = 0.06**
Median time to connection (seconds) [IQR]	34.5 (20.0 - 80.0)	10.8 (6.5 - 30.0)	p < 0.001*
<b>Survey question</b>			
When trying to locate PICU staff	Ç 4-5	2 [2-3]	p < 0.001*

\* Mann-Whitney \*\*Chi squared  
Survey response = 205/361 (56.8%).

## P7

### TAKING THE "HINT & HOPE" OUT OF ESCALATION

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**Introduction:** Good communication is essential for effective clinical care. Failures in communication have been identified as a causative factor in >50% of serious incidents. In PIC escalation of concerns and information sharing occurs between many members of a multidisciplinary team. Our PIC incident review highlighted concerns with this escalation process and a pilot project took place to evaluate the reasons and to assess possible interventions.

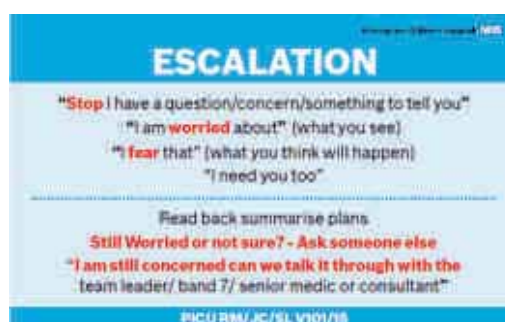
**Methods:** A 3-phase project developing in an iterative fashion:

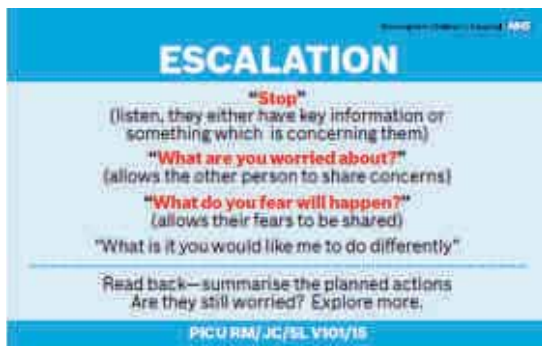
- 1) Observation period watching interactions between health care professionals
- 2) Multidisciplinary focus group work discussing communication challenges
- 3) Development and implementation of escalation language

**Results:** Observation highlighted that we often transmit information without voicing our fears – the "what we think may happen". We rely on the receiver hearing the underlying hint. When this does not happen the transmitter feels frustrated and the receiver is either unaware there is a problem or perplexed as to why the same question is being asked again. This was highlighted in the focus group work with medical / ANP staff describing "white noise" obscuring important messages and the nursing staff feeling their concerns were not heard.

A two way structure was developed to allow staff not only to share their concerns but also their fears – "What do we fear will happen" and for the receiver to process this – "what do you need me to do" and "what are you worried about?"

This credit card reminder is given to all staff to carry as part of an education package within PIC.





**Conclusions:** Communication breakdowns can have a profound impact on the safety and quality of the care we deliver. Encouraging verbalization of actual fears and concerns may reduce miscommunication between health care professionals. This project is currently being evaluated for its impact on practice and staff resilience.

## P8

### SORBITOL AND MALTILOL INTAKE OF PAEDIATRIC INTENSIVE CARE PATIENTS

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**Introduction:** Sorbitol and maltitol are common sweeteners added to liquid formulations to minimise dental cavities by avoiding the use of sugar. Both are sugar alcohols (SA) which, when given in sufficient quantities, can cause osmotic diarrhoea and other unwanted abdominal effects. Polypharmacy in PICU can expose patients to these untoward effects.

**Study aims:** to quantify sorbitol and maltitol intake and determine if large SA intake causes adverse effects in the PICU patient.

**Method:** Age, weight, enteral drug intake and bowel habits were recorded. SA content of formulations was determined by contacting the manufacturers. SA content for each patient was converted to lactulose equivalent.

**Results:** Thirty-three out of 36 patients were receiving 122 enteral prescriptions. Of the 122 prescriptions there were 36 drug formulations containing a SA. Twenty seven out of 38 liquid preparations kept as stock drugs on PICU contained SA. Most individual formulations contain a relatively low SA content, however cumulating therapies led some patients to having high lactulose equivalent doses.

The median lactulose equivalent was 1.2ml/kg/day, with 15 (45%) receiving above the BNFC recommended dose for that age. Six of the 33 (18%) patients receiving SA containing formulations were documented as having loose stools.

Formulations contributing considerable SA intake included diazepam 2mg in 5ml (manufacturer Actavis) and paracetamol 250mg in 5ml (manufacturer McNeil/Johnson) liquids.

**Conclusions:** Whilst individual liquid formulation may appear to have low sorbitol or maltitol content, a PICU patient can have significant intake as a result of multiple prescriptions of enteral drugs. This can be associated with untoward gastrointestinal side effects which could be minimised by changes in formulations or strengths of formulations.

## P9



### EXCELLENCE REPORTING IN PICU: A DESCRIPTIVE STUDY OF A NEW SAFETY PARADIGM

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**Introduction:** Safety in healthcare has traditionally focussed on reducing harm by learning from adverse events. This approach may miss opportunities to learn from episodes of excellence practice.

An Excellence Reporting system (ER) has been operating in our institution's PICU since April 2014. Episodes of excellent practice are identified and reported online by individual staff members. Reports are categorised in 2 domains: excellence category and clinical context. Selected reports are investigated to identify ideas for service improvement. Reported individuals receive formal notification of their citation via Trust governance department and learning points are shared with the department through weekly e-bulletins.

We undertook a descriptive study of this initiative to date, to describe categories of ER and temporal reporting trends. Staff perceptions on the impact of the initiative are reported elsewhere.

**Methods:** ER categories and numbers of reports were calculated as overall and monthly totals.

**Results:** Total reports: 209 (mean 14.9 reports/month). Reporting rates rose during the study period: (11 to 49 reports/month over 14 months). 23 excellence categories and 28 clinical context categories were identified: the most frequently reported categories are shown in the table:

EXCELLENCE CATEGORY	NUMBER OF REPORTS	CLINICAL CONTEXT	NUMBER OF REPORTS
1. General unit operation	16	1. Peer support	21
2. Resuscitation	15	2. Teamwork	16
3. Communication with families	11	3. Thoroughness	14
4. Sepsis	9	4. Going the extra mile	13
5. Medication	9	5. Knowledge	12

**Conclusions:** This is the first documented description of ER in healthcare, which demonstrates that peer-delivered excellence is identified and reported within a wide-range of contexts. The rising trend of reporting rates suggests sustained engagement, implying acceptance of potential utility. Further investigation of the impact of this initiative in terms of patient and staff outcomes is required.

## P10



### IMPACT OF AN ELECTRONIC INFUSION CALCULATOR

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**Introduction:** Medication errors, including infusion prescription errors are a major public health concern, especially in Paediatric patients<sup>1,2</sup> There is some evidence that electronic or web-based calculator could minimise these errors.<sup>2,3</sup>

**Objective:** To evaluate the impact of an electronic infusion calculator (EIC) on the frequency of infusion errors in Paediatric Critical Care Unit (PCCU).

**Methods:** We devised an EIC that calculates the appropriate



concentration, rate and dose for the selected medication based on the recorded weight and age of the child and then prints into a valid NHS prescription chart. EIC was implemented from April 2015 in PCCU. A prospective study, three months prior and three months after implementation of EIC was conducted. Data on the following variables were collected onto a proforma: medication dose, infusion rate, volume, concentration, route, legibility, and missing or incorrect patient details.

**Results:** 72 hand written prescriptions were reviewed prior to EIC implementation and 69 EIC prescriptions were reviewed after EIC implementation. Hand written prescriptions had higher error rate (34.7%) as compared to EIC prescriptions (1.4%) with a p-value < 0.002. EIC prescriptions had no errors on dose, volume and rate calculation as compared to hand written prescriptions, hence warranting few pharmacy interventions.

**Conclusion:** Use of EIC for infusion prescription significantly reduced the total number of infusion prescribing errors in PCCU. Our study, although small provides data to support the use of EIC for infusion prescription in PCCU.

#### References:

1. Kaushal R, DW B, Landrigan C, et al. Medication errors and adverse drug events in pediatric inpatients. *JAMA*. 2001;285(16):2114-2120.
2. Potts AL, Barr FE, Gregory DF, et al. Computerized Physician Order Entry and Medication Errors in a Pediatric Critical Care Unit. *Pediatr*. 2004;113(1):59-63.
3. Lehmann CU, Kim GR, Gujral R, et al. Decreasing errors in pediatric continuous intravenous infusions\*. *Pediatr Crit Care Med*. 2006;7(3).



## COMPARISON OF BLIND BAL VERSUS ENDOTRACHEAL ASPIRATE ON VENTILATED PATIENTS IN PICU

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**Introduction:** There is currently no gold standard for diagnosis of pneumonia in ventilated patients. In our unit we use endotracheal aspirate (ETA) results to aid diagnosis. Significant respiratory failure in paediatrics is frequently caused by viral infection. In this study we aim to compare results from Blind BAL (Broncho-aveolar lavage) with ETA in ventilated patients. Our belief is that positive ETA culture may not reflect bacterial presence in the distal airway. We are also concerned that we over utilise antibiotics in this group.

**Method:** We prospectively selected ventilated PICU patients with respiratory related illnesses or sepsis of unknown source and sent simultaneous Blind BAL and ETA samples. All specimens were sent for culture and sensitivity. Antibiotic data was collated.

**Results:** Specimens from 56 patients were analysed. Blind BAL was positive in 10 (18%), ETA were positive in 21 patients (38%). Of the 10 positive BAL results, 7 patients tested positive for the same organism in ETA. 100% of patients had treatment with antibiotics intravenously, 5 patients (9%) had 48hrs of antibiotics (All BAL -ve), 13 had <7days, 38 had >7days.

**Conclusions:** We have shown that ETA detect bacteria twice as often as BAL samples. Blind BAL has previously been shown to be as specific, with similar sensitivity, as BAL under direct vision in detection of bacteria in distal airways. We have demonstrated poor specificity of ETA secretions in reflecting distal airway bacteria. Integration of Blind BAL into PICU practice could significantly improve antibiotic stewardship.

**Reference:** 1. Comparison of bronchoscopic and non-bronchoscopic techniques for diagnosis of ventilator associated pneumonia. Khilnani et al. *Indian Journal Critical Care Medicine* 2011 Jan 15 (1) 16-23

P12



## DESCRIPTIVE EPIDEMIOLOGY OF ADMISSIONS TO PICU OF CHILDREN LESS THAN 2 YEARS OLD WHO WERE BORN POST-TERM IN THE UK AND REPUBLIC OF IRELAND, 2003-2014

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**Introduction:** Post-term birth, defined as gestational age of 42+0 weeks and onwards, is associated with increased risk of mortality and morbidity compared to children born at term. We compared the demographic and clinical characteristics of Paediatric Intensive Care Unit (PICU) admissions in the first two years of life for children who were born at term (37-41 +6 weeks) with those born post term.

**Methods:** Data were abstracted from the Paediatric Intensive Care Audit Network (PICANet) database. Chi-squared ( $\chi^2$ ) was used to evaluate differences in demographic and clinical characteristics between post-term and term children.

**Results:** There were 59,787 admissions of children <2 years old, 58,381 (97.65%) born at term and 1406 (2.35%) post term. There was no difference in severity of illness on admission measured using the Paediatric Index of Mortality ( $p=0.17$ ); those children resident in England and Wales had similar socioeconomic status, based on the Index of Material Deprivation (IMD) ( $p=0.91$ ). Post-term children had significantly higher weight-for-age z-scores than term children (12.7% vs. 7.7%,  $p<0.001$ ). The most common primary diagnoses for both groups were cardiovascular (34.6% and 41.2% respectively), but post-term had more gastrointestinal (8.3%) and neurological (11.2%) diagnoses compared to term (5.9% and 8.1% respectively). The rate of meconium aspiration syndrome, a possible complication of post-term birth, was three times higher in the post-term children (3.2% vs. 0.9%) ( $p<0.001$ ). Both groups received similar levels of clinical intervention including tracheostomy, renal support and use of an intracranial pressure (ICP) device.

**Conclusion:** The characteristics of term and post-term children admitted to PICU do not differ markedly and thus do not explain the increased risk of mortality and morbidity of children born post term. Long-term follow-up of these children via linkage with routine healthcare data or direct contact with their parents would provide more information on their health trajectories following PICU admission.

P13



## AUDIT OF REFERRALS TO THE ORGAN DONATION TEAM

L. Carone<sup>1</sup>, S. Alurkar<sup>2</sup>, P. Kigozi<sup>2</sup>

<sup>1</sup>University of Nottingham, UK

<sup>2</sup>Nottingham Children's Hospital, UK

**Introduction:** Approximately 2% of those on the organ transplant list in the UK are children, and many children require a transplant from child donors. Early identification of donors and required referral to organ donation teams (ODT) has increased the success rate of consent and the number of organs retrieved. The objective of this audit was to evaluate the referrals for organ donation on the Paediatric Critical Care Unit (PCCU) against the NICE and NHS Blood and Transplant Guidelines<sup>1,2</sup>.

**Methods:** A retrospective review of case notes of all children aged 0-18 who died on PCCU between the years 2009-2014. 107 deaths were identified and 100 notes were examined. Data was analysed year-wise to ascertain if age, sex, religion, reason for admission, length of stay and

reasons behind PCCU admission impacted on referral and consent for organ donation.

**Results:** 86% met the early identification criteria for potential donors, 46.5% were referred to the ODT. Of those referred, 82.5% of families were approached regarding donation and 63.6% consented to donations. 41 organ and tissue donations took place.

**Conclusions:** Despite the majority of children meeting early identification for potential donors, many are still not being referred. All children who fulfil early identification criteria should be referred, and perceived unsuitability is not a reason to not refer.

**References:**

1. National Institute for Health and Clinical Excellence (December 2011). Organ donation for transplantation: improving donor identification and consent rates for deceased organ donation. Available at: <http://guidance.nice.org.uk/CG135>
2. NHS Blood and Transplant. Timely Identification and Referral of Potential Organ Donors: A Strategy for Implementation of Best Practice. Available at: <http://www.odt.nhs.uk/pdf/timely-identification-and-referral-potential-donors.pdf>

## P14

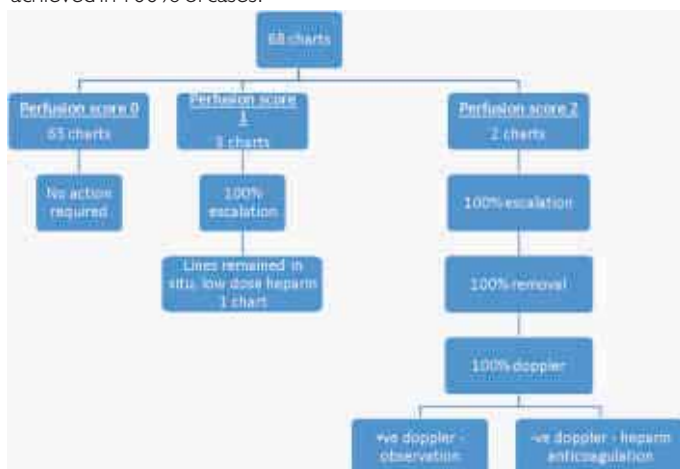
### AUDIT EVALUATING AN ARTERIAL LINE ASSESSMENT ALGORITHM ON THE PAEDIATRIC INTENSIVE CARE UNIT (PICU) AT BRISTOL ROYAL HOSPITAL FOR CHILDREN (BRHC)

K. Gadhvi, S. Dean  
*Bristol Royal Hospital for Children, UK*

**Introduction:** In 2012 a child at BRHC underwent a below knee amputation for an acute ischaemic limb secondary to a femoral arterial line. Root cause analysis revealed no formal documentation of arterial line site and limb perfusion prompting the implementation of an arterial line assessment algorithm. PICU observation charts were specifically adapted to aid nursing documentation. We audited this documentation using the algorithm as our standard.

**Method:** Hourly documentation of arterial line sites and limb perfusion on PICU observation charts were checked over one month in May 2015. If any scores of 1 (limb blanching on line flushing or dampened waveform) or 2 (pale or cold limb, prolonged capillary refill time or absence of distal pulses) were identified medical notes were examined to assess the recording of medical team escalation and subsequent actions against the algorithm.

**Results:** Sixty eight charts were assessed. Hourly documentation was achieved in 100% of cases.



A reason for why a patient was started on low dose heparin for a limb perfusion score of 1 was not stated. Formal ultrasound of the patient who started treatment dose heparin revealed no abnormality. No adverse events occurred.

**Conclusion:** Our anticoagulation guideline at BRHC is currently being revised to refine the role of heparin with regard to arterial lines. This

audit confirms the use of a robust documentation system for the assessment of all arterial lines in children admitted to PICU at BRHC. Ongoing use of the arterial line assessment algorithm will continue to aid the early identification of reduced limb perfusion associated with arterial access so that early escalation and action occurs before permanent damage is sustained.

## P15

### EVALUATION OF THE USE OF LIMITATION OF TREATMENT AGREEMENTS IN CHILDREN WHO DIE FOLLOWING PICU ADMISSION

P. Young, J. Longden, A. P. Mayer  
*Sheffield Children's Hospital, UK*

**Introduction:** Limitation of Treatment Agreements (LOTAs) have unique clinical, legal and ethical value where it is agreed that certain life-sustaining treatments are not in the best interest of the child. Guidelines advocate that families should be supported in choosing the place where their child dies<sup>1</sup>

**Methods:** Retrospective audit of case notes from all patients who died following admission to our PICU in 2011-2014. Data were analysed in Microsoft Excel using non-parametric methods when appropriate.

**Results:** 78 patients were identified with 73 case notes available. 34 deaths occurred in <1 year olds. The commonest mode was withdrawal of intensive care (n=40). 33 children died within the first day of admission.

40 patients had an active LOTA; median 6 days between admission and LOTA discussion. Median time from LOTA initiation to death was 2 days. 12 families were offered choice in place of death; in 8 cases this was facilitated. 6 families expressed their wish for intensive care to be withdrawn at a local hospice.

Organ donation was discussed in 12 patients with consent obtained in 8. 5 children donated organs or tissues; 3 were DCD donors and 2 BSD donors.

**Conclusions:** As part of end of life discussions LOTAs could be used more readily. Parental choice in place of death is an integral part of end of life care; as clinicians we should support parents with this. Additionally organ donation should be considered. Facilitating these processes can improve the quality of care we offer to children and their families.

**References:**

1. Together for Short Lives (2012). Care of children and young people before death, at the time of death and after death. Together for Short Lives, Bristol.

## P16

### WIRELESS MONITORING IN CHILDREN CAN BE ACHIEVED OVER THE MAJORITY OF INTENDED MONITORING TIME

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*Birmingham Children's Hospital, UK*

**Introduction:** Accuracy of patient monitoring is a significant aspect of patient care. In a feasibility study of paediatric wireless monitoring we identified the following issues:

- Breakdowns in data transmission
- Noisy data
- Double counting of ECG heart rate (HR)
- Participant compliance

After redesigning our system and launching our paediatric wireless study (RAPID) we reassessed the quantity and quality of transmitted data.

**Method:** We recorded heart rate (HR), pulse rate (PR), respiratory rate (RR) and SpO<sub>2</sub> readings from the following wireless devices on two cardiology wards.

- Isansys LifeTouch (a recently developed paediatric specific wireless ECG monitor): HR, RR

- Nonin Wristox (wireless pulse-oximeter) PR, SpO<sub>2</sub>

We compared the fractions of data transmission and of normal transmission to our historical data.

**Results:** We observed a marked improvement in data quality and quantity (Table). Majority of data loss was secondary to server / gateway malfunction, shutting down and battery lifetime (Nonin).

	Feasibility	RAPID
N (subjects)	41	6
Study duration (hours)	1818	1742
HR transmitted (% of monitored time)	81	74
HR normal (% of monitored time)	28	66
Pulse transmitted (% of monitored time)	27	55
PR normal (% of monitored time)	n/a	40

**Conclusion:** Wireless monitoring of physiology can be reliably done in children.

Multipronged approach and focussed iterative cycles helped us to improve sensors, network and patient compliance. This resulted in significant improvement in data quantity and quality when compared to our paediatric feasibility study and similar adult studies.

We will continue to work towards improving the coverage and spread of good quality data transmission.

## P17

### COMPLIANCE WITH DEPARTMENT OF HEALTH (DOH) GUIDANCE ON ANTIMICROBIAL STEWARDSHIP USING AN ELECTRONIC (PAPERLESS) PRESCRIBING SYSTEM

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*St Mary's Hospital, London, UK*

**Introduction:** 2015 Department of Health guidance for antimicrobial prescribing highlights the stewardship measures required to curtail future antimicrobial resistance. Whilst detailing antimicrobial indication and duration on a prescription chart have been adopted and audited by most centres there is minimal guidance on how this practice works in a paperless prescribing system.

**Methods:** Single centre cross-sectional consecutive data was collected from a busy paediatric intensive care unit that has been using a paperless medical note system with an integrated electronic prescribing. Mandatory antimicrobial indication and duration is not an in-built feature of this software.

In phase 1, Electronic prescriptions (n = 56) were reviewed for documentation of a valid antimicrobial indication and an antimicrobial review date. In Phase 2, we implemented Consultant-led antibiotic stewardship (verbal and written reminders) on our daily ward round for all new and existing antimicrobial prescriptions. The two data sets were analysed to identify whether this intervention improved antimicrobial stewardship when using an electronic prescribing system.

**Results:** Prior to any intervention 57% of the fifty-six prescriptions had an indication documented. However, a proportion of these (12.5%) were not considered valid indications. Only 3.5% had a review date documented. In Phase 2 the number of recorded indications and review dates documented were considerably higher, although still not 100%.

**Conclusions:** Whilst antimicrobial stewardship measures can be improved by direct verbal prompting and written reminders, it does not provide a gold standard measure. We would advise that change be

instituted at the software programming level to make antimicrobial duration and time to review recording mandatory. This software feature should be taken into consideration when units are considering which paperless prescribing package to employ.

## P18

### AN AUDIT OF EMERGENCY RE-ADMISSIONS TO PICU

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*Great Ormond Street Hospital, London, UK*

**Introduction:** The emergency readmission rate is a quality indicator of ICU performance and may be a reflection of the care provided.

We hypothesized that children whose initial discharge from PICU is delayed, may be at greater risk of subsequent emergency readmission, due to a lack of medical focus on the child who has already been deemed fit for discharge.

Our objective was to evaluate the emergency admission rate and identify which proportion of these children were delayed initial discharges.

**Methods:** We conducted a retrospective audit of all emergency readmissions to a tertiary 18 bed general PICU between May 2011 and July 2014. This was defined as an admission within 48 hours of discharge from PICU.

Data collected included number of emergency readmissions, number of delayed discharges from PICU, interventions required upon readmission, and an assessment of preventability based on retrospective review of the case notes.

**Results** Between December 2012 and July 2014 there were 25 emergency readmissions to PICU, of which 16 (64%) were delayed discharges (13/16 < 24hr delay, 3/16 > 24hrs delay).

Interventions required upon emergency readmission included respiratory support, inotropy, fluid resuscitation, chest drains, surgical interventions.

In 7/25 patients (28%), readmission was potentially preventable by PICU. 71% of these occurred in the delayed discharge group (5/25).

**Conclusion:** A significant proportion of emergency readmissions between December 2012 and July 2014 were delayed discharges from PICU (64%).

A significant proportion (71%) of potentially preventable emergency readmissions occurred in the delayed discharge group.

Delayed discharge from PICU may represent a risk factor for subsequent emergency readmission to PICU.

## P19

### THE IMPACT OF FIXED CONCENTRATION SEDATION INFUSIONS ON FLUID OVERLOAD IN CRITICALLY ILL CHILDREN

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<sup>2</sup>Paediatric Intensive Care Unit, Royal Manchester Children's Hospital, UK

**Introduction:** Fluid overload of 10% at 48hrs (100ml/kg additional fluid) is strongly associated with morbidity in critically ill children (1). Contributors include fluid resuscitation, acute kidney injury, and administration of intravenous drugs. Acute Kidney Injury has been observed to be more prevalent in infants (2). Drug infusions are historically prepared according to bodyweight to run at relatively large volumes to facilitate end-of-bed calculation and administration. We report the impact of using standardised concentrations on fluid overload in critically ill children in a tertiary general PICU.



**Methods:** Administration of sedation infusions was prospectively documented using purposive sampling until a population-representative sample for age and weight was obtained. Infusion volumes were calculated in ml/kg/day for different weight groups – 0-5kg, 5-20kg and >20kg – and compared with equivalent volumes for weight-based infusions.

**Results:** 33 patients received sedation infusions over a 5 week period. Overall drug volumes were reduced by 50.3% (41.3 to 58.7%) from 5.19ml/kg to 2.65ml/kg. Greatest reduction was seen in the smallest patients (table 1)

J NOP group	Av Dose (mcg/kg/hr)	Morphine(Range)		Change	Av Dose (mcg/kg/hr)	Midazolam(Range)		Change
		Old	New			Old	New	
0-5kg	19.1	6.43ml/kg (4-10.52)	3.23ml/kg (0.98-4.5)	-49.8%	88.55	10.29ml/kg (1.38-21.56)	2.13 (0.38-5.32)	-79.4%
5-20kg	23.76	2.17ml/kg (1.68-3.12)	1.43ml/kg (0.85-1.82)	-34.2%	191.3	6.52ml/kg (2.75-8.34)	3.82ml/kg (1.92-6.65)	-41.5%
>20kg	21.74	0.45ml/kg (0.14-0.72)	0.41ml/kg (0.14-0.63)	-9.9%	79.95	0.75ml/kg (0.11-1.55)	0.95ml/kg (0.2-1.53)	+26.6%

**Conclusions:** Weight based sedation infusions may contribute to fluid overload related morbidity, especially in infants. An infant on morphine and midazolam at standard doses (20mcg/kg/hr and 90mcg/kg/hr respectively) will receive 16.7ml/kg/day (33.4% fluid overload at 48hrs) when using weight-based infusions. Using standard concentrations reduces this volume to 5.36ml/kg/day (10.7% fluid overload at 48hrs).

**References:**

- (1) Sinisky L et al. Ped Crit Care Med 2015; 16:205-209
- (2) McCaffrey J et al. Pediatr Nephrol 2015, April 15th

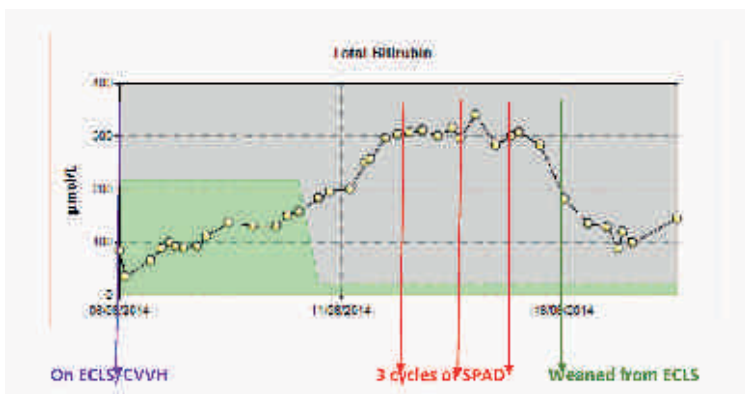
## P20

### SINGLE PASS ALBUMIN DIALYSIS: A CASE REPORT

R. Phillips, M. Farley, D. Smith, P. Nayak  
Birmingham Children's Hospital, UK

**Introduction:** Birmingham Children's Hospital (BCH), Paediatric Intensive Care Unit (PICU) is a 31 bed tertiary referral centre. Continuous renal replacement therapy (CRRT) is delivered to a 50-60 children per year.

**Case Summary:** The patient was delivered at 38 weeks by Caesarean section. Within an hour of delivery she developed severe respiratory failure requiring mechanical ventilation. A diagnosis of persistent pulmonary hypertension of the new born (PPHN) was made. In the following twenty four hours she developed multiple tension pneumothoraces, shock and hypoxia. Venous-arterial (VA) Extracorporeal Life Support (ECLS) was started for severe respiratory failure. Continuous Venous-venous Haemofiltration (CVWH) was also initiated via the ECLS circuit for management of acidosis and fluid balance. During the ECLS course, her bilirubin began to rise. Her total bilirubin at its peak increased to 341 µmols. On day 7 of ECLS, the patient received a Single Pass Albumin Dialysis (SPAD) with the aim to reduce the bilirubin.



Hyperbilirubinemia can occur in critically ill children receiving CRRT and/or ECLS. SPAD is an intermittent veno-venous albumin haemodialysis where human albumin solution (HAS) is mixed with a dialysate solution. This solution runs counter-current to the patient's blood flow across a dialysate membrane. The albumin within the dialysate removes protein bound toxins via diffusion. The bilirubin reduced following 3 cycles of SPAD. She weaned successfully from ECLS and CVWH, and discharged back to the referring centre.

**Conclusion:** The use of SPAD will be considered in future patients presenting with hyperbilirubinemia.

**Reference:** Boonsrirat U, Tiranathanagul K, et al (2009) Effective bilirubin reduction by single-pass albumin dialysis in liver failure. Artificial Organs. Vol 33, issue 8, pp 648-653

## P21

### A RETROSPECTIVE ANALYSIS OF REINTUBATION RATES ON A PAEDIATRIC INTENSIVE CARE

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**Introduction:** Failed extubation is a recognised problem in a Paediatric Intensive Care Unit. The incidence of failed extubation has been reported between 2.7-22%. (1) The purpose of this study is to determine the incidence and causation of reintubation on PICU.

**Methods:** A retrospective cohort study in a paediatric intensive care unit (PICU) involving all children who were intubated between April 2014 and April 2015.

**Results:** There were a total of 259 ventilated patients during the one-year study period. The rate of reintubation after extubation failure occurring within 24 hours was 7.7% (20 out of the total 259 patients). Only one patient was reintubated more than once and they required a tracheostomy.

The commonest diagnosis in the children who failed extubation was bronchiolitis (13 children, 62%).

Failed extubation was commoner in younger infants with 13 (65%) of the patients being less than 1 year.

14 (70%) of these patients required reintubation due to post-extubation stridor and increased work of breathing.

The average increase in ventilator days was 3.5 days.

14 out of the 20 patients who failed extubation had been intubated with a cuffed endotracheal tube.

**Conclusions:** The re-intubation rate was significantly higher in the younger age patients with a diagnosis of bronchiolitis. Multiple failures is an uncommon event in PICU.

**Reference:** Kurachek S, Newth C, Quasney M, et al: Extubation failure in pediatric intensive care: A multiple-center study of risk factors and outcomes. Crit Care Med 2003;31:2657-2664

## P22

### MONITORING AND REVIEW OF ALL EMERGENCY '2222' CALLS LEADS TO GREATER UNDERSTANDING OF HUMAN FACTORS AND SYSTEMS FAILURES RELATING TO THE DETERIORATING PATIENT

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Nottingham Children's Hospital, UK

A safety culture is where staff within an organisation have an active awareness of the potential for things to go wrong. Both staff and the organisation acknowledge mistakes, learn from them to put things right. 'Failure to Rescue' is recognised as one of the largest causes of harm to patients in hospital.

In an effort to enhance the safety culture in Nottingham Children's Hospital all emergency ward events are reviewed.

The aim of this review is to understand characteristics of these events and any antecedent issues relating to them, identifying episodes of 'Failure to Rescue', systems errors, communication failures and highlighting evidence of good practice

This poster presents 4 years' data.

**Setting:** A Children's Hospital with 110 beds within a large teaching NHS Trust, a tertiary referral centre for many specialities including a Paediatric Emergency Department and an Intensive Care Unit.

**Method:**

- Standardised data collection tool to capture all events.
- Timely follow-up of all calls – reviewing notes, results, drug charts and observations/PEWS,

**Results:**

- January 2011 – December 2014, 191 emergency events reviewed.
- Evidence of potential 'failure to rescue' using descriptors from the NPSA, found in 26 of 191 emergency episodes.
- There has been a year on year decrease in Failure to Rescue events from 23% of events in 2011 to 4.4% in 2014.

Key themes identified included

- Failure to recognise the deteriorating patient,
- Poor recording of observations and PEWS
- Failure to escalate
- Communication and systems errors

**Conclusion:** Through the sharing of incidents relating to 'Failure to Rescue' staff are given the opportunity to learn from such events, reflect on their own practice, improving confidence in the early recognition and initial management of the seriously ill child.

**P23** 

**FROM BIG TO SMALL: CHANGING A WORKFORCE CULTURE**

S. Quigg, C. Timmins, K. Taitt, Y. Heward, A. Jones  
*Birmingham Children's Hospital, UK*

**Introduction:** The Paediatric Intensive Care (PIC) at Birmingham Children's Hospital (BCH) is a 31-bed unit with approximately 350 staff. Managing a workforce of this magnitude is complex. Feedback from new nurses revealed it was difficult to settle in: rarely working next to the same person or a mentor and feeling that continuity of care was compromised. In addition, from 2013-14 increased staff turnover made it clear that organisational change was needed – to make our large team feel small again!

**Method:** An E-Roster IT specialist was employed and a Band 7 nurse taken off-line to complete this project. The workforce was divided into 3 disciplines: frontline bed-opening, clinical essential and support and subdivided into 5 'kingdoms': see Table 1

1. <b>GOOP ON EN</b> Bed-Opening	4. <b>GOOP</b> Clinical Essential	5. <b>GOOP ON</b> Support
1. <b>MAHONNOO</b> 2. <b>E OOH MHOONOO</b> 3. <b>GOR OOR O GOONR</b>	Nurses: Band 7 Housekeeping Orderlies Tech Team	Management Advanced Nurse Practitioners Research Team Admin & Clerical Family Liaison
Nurses: Band 5&6 Clinical Support Workers HCAs		

Band 7 nurses from within Epcott line-manage Support Groups of about 25 staff housed within the front-line Magical, Animal and Downtown Disney Kingdoms.

The unit itself is divided into 3 zones: A, B and C. Each 'kingdom' works in

a different zone rotating every 4 weeks. In a 3-month period they have all worked in each zone but with the same team.

**Results:** Preliminary findings show that staff benefit from working in smaller 'kingdoms'. They get to know their colleagues, particularly their support group and team leaders, strengthening teamwork and support. Limitations include differences in management style between the kingdoms and an uneven balance of annual and study leave.

**Conclusion:** Management of the BCH PICU workforce is complex, however proactive organisational change, creating smaller teams within the larger one, has optimised staff retention and morale.

**P24** 

**PARENTS AND FAMILY FEEDBACK FOR A PICU TECHNICAL SUPPORT TEAM**

K.Theophilus

*Birmingham Children's Hospital, UK*

**Introduction:** The Birmingham Children's Hospital Technical Support Team (Tech Team) offers advanced, experienced nursing support to the Paediatric Intensive Care Unit (PICU). The team facilitates the transport of critically ill children between PICU and other clinical areas and provides assistance to medical staff during emergency events.

During these critical times the Tech Team interacts closely with the parents and carers of critically ill children and provides crucial information on the care that has been given and the immediate plan of action.

**Method:** In order to investigate the perceptions of parent and carers of the Tech Team, a simple feedback form was devised. Feedback was collected from April 2015; each form was distributed by a Tech Team member where appropriate following scans, transfers, chest closures and after other procedures.

The feedback questions were:

- 1) Did the Team introduce themselves?
- 2) What did Tech Team do well?
- 3) What could we do better?
- 4) Are there any other comments you would like to make?

**Results:** 50 feedback forms were given out and collected either the same or following day. There was a 100% response rate.

Question 1 100% positive response

Question 2 Example; "Preparation for scan and communication brilliant"

Question 3 100% said there was nothing we could do better

Question 4 Example; "They work well with staff and families"

**Conclusion:** The Technical Support Team not only assists the medical and PIC team in caring for critically ill children, but also provides emotional support to families through the communication of vital information during a potentially stressful event. It is essential that we continue to gather feedback from families thus ensure that, our service continues to develop and, during the acute critical stage, families are always informed.

**P25** 

**INCREMENTAL GAINS: A SMALL CHANGE TO IMPROVE PERFORMANCE IN PAEDIATRIC INTENSIVE CARE TRANSPORT**

T. Billyard, A. Kashyap, M. Montgomery

*KIDS Intensive Care and Decision Support, Birmingham Children's Hospital, UK*

**Introduction** For busy intensive care transport services there can be multiple demands on the team. Time in excess of the necessary spent with patients or managing equipment can prevent a timely response to

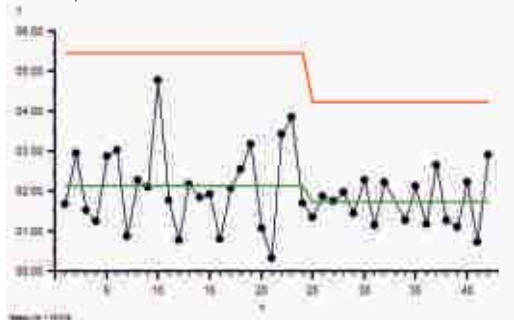
subsequent referrals, potentially compromising their care. Unfamiliarity with equipment can cause delays, particularly when there is a high turnover of staff within the service. We hypothesised that improving the ease of navigation of our equipment bags would have a positive impact on turnaround times.

**Method:** Data were prospectively gathered on on-scene stabilisation time and time from team return to base until the kit bag was restocked ready for use. Following the collection of baseline data, labels were added to the equipment bags which clearly showed what was in each pouch. Following this, data collection was repeated.

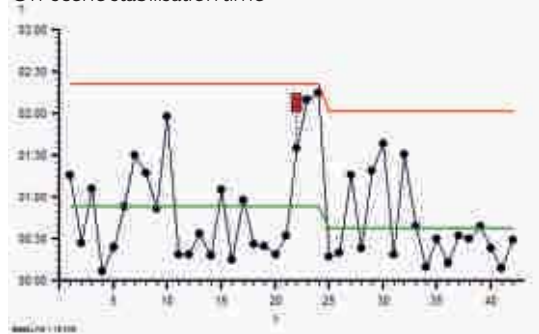
## Results

42 sequential transfers were examined.

Before/after run charts for intervention



On-scene stabilisation time



Kit bag restock time

**Conclusion:** Our results show that making the equipment bag easier to navigate has had a positive effect. The run charts show that both the on-scene stabilisation time and the bag restock time have improved following our intervention. As the KIDS team has a high turnover of staff making the equipment as easy to use as possible is a high priority for ensuring both safety and efficiency.

We have shown that a simple change, clearly labelling the equipment bags, can make a real difference to the efficiency of our team and hence our ability to meet the needs of critically ill children in our region.

## P26



### THE USE OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN NEONATES WITH SYSTEMIC HERPES INFECTION: AN ETHICAL DILEMMA

D. Smith, R. Phillips, M. Farley, P. Nayak  
*Birmingham Children's Hospital, UK*

**Introduction:** Disseminated herpes with central nervous system involvement is rare in neonates. A mixed 30-bedded PICU in a tertiary children's hospital treats only 1-2 cases per year. Herpes Simplex presents with seizures, severe coagulopathy, liver dysfunction and pulmonary involvement and critical care support includes CRRT. CRRT is normally initiated to correct metabolic acidosis and manage fluid overload. Most of these neonates are commenced on CRRT prior to a definitive diagnosis of herpes. No definite treatment consensus or guidelines exist for this group of patients either in the UK or internationally.

**Method:** A retrospective analysis of patient diagnosis and outcome was undertaken of our CRRT electronic database from 2009-2014. The neonatal period for the purpose of this review is up to 28 days. Their CRRT treatment parameters and survival outcomes were studied.

**Result:** Nine neonates with a definitive diagnosis of systemic herpes had CRRT as part of their management. All had severe metabolic acidosis with cardiovascular instability requiring inotropes and fluid resuscitation. 89% presented with seizures in the emergency department, all of who died within 48 hours of diagnosis. An ethical dilemma prevails whether to commence CRRT in those patients with suspected herpes with CNS involvement. The one survivor without central nervous involvement went on to receive a liver transplant.

**Conclusions :** Neonates with central nervous system herpes are shown to have a very high mortality, despite advanced critical care support including CRRT. Due to the small sample size seen by an individual hospital, limited conclusions can be drawn. Due to the low incidence of this disease, we would recommend a multicentre data collection to elucidate the national picture for treatment and survival.

## P27



### IMPLEMENTATION OF CLOSED ENDO-TRACHEAL SUCTION; AN ANALYSIS OF POTENTIAL HEALTH ECONOMIC BENEFITS

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*University Hospital Southampton, UK*

**Introduction:** A recent change was made to hospital policy as a result of a critical incident made the use of face masks and goggles for all open suction events mandatory. On PICU we had concerns about this policy change:

- (a) Due to the speed at which suction has to be implemented in the unstable ventilated child, there was likely to be poor compliance
- (b) We identified potentially significant cost implication.

**Method:** A literature review was conducted looking at the use of closed versus open suction techniques in ventilated patients and a cost evaluation comparing the two forms of treatment was performed.

A trial using closed suction on all intubated patients on the PICU was proposed and permission sought through the Clinical Practice Group. After agreement from the Consultant Team this trial was conducted over a 6 week period during October and November 2014

**Results:** The literature review suggested significant benefits of using closed suction vs open suction including:

- (a) A statistically significant reduction in Gram- negative airway colonisation
- (b) Greater ease of use for nursing staff
- (c) Less time consuming
- (d) Better tolerated by patients

A cost analysis demonstrated a saving of £34,000 per annum

Despite some initial concerns within the Consultant team after a six week trial, closed suction was accepted and implemented as normal practice on PICU.

**Conclusions:** The use of closed suction in ventilated children has a significant health economic benefit in the PICU and its implementation has led to complete compliance of that infection prevention guidelines for both staff and patients.

**Reference:** Cordero, L. et al. Comparison of a Closed With an open Endotracheal Suction in Small Premature Infants. *Journal of Perinatology*. 2000; 3: 151-156





## INADVERTANT HYPOTHERMIA MIMICKING BRAIN DEATH

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**Introduction:** This case demonstrates a potentially fatal problem encountered with a body cooling system used to manage traumatic brain injury (TBI).

**Case summary:** A seven year old was admitted with an isolated head injury. CT showed subarachnoid and intraparenchymal haemorrhage with midline shift. Standard head injury management in Paediatric Intensive Care Unit (PICU) was initiated, including intracranial pressure (ICP) monitoring and cooling with a Criticool© system, maintaining temperature at 34-35C.

Despite medical management the ICP rose to 64 mmHg, his pupils were 2-3mm equal and reacting and his heart rate 100/min. Urgent CT was undertaken. For transfer the body suit was drained of water but left in situ, as per manufacturer's instructions. Temperature monitoring was discontinued during transfer. CT showed increased brain swelling and midline shift. On arrival in theatre for decompressive craniectomy his temperature was 26C, heart rate was 45/min and unresponsive to atropine.

Following surgery the pupils were fixed, dilated and unresponsive. The wound was explored to exclude haematoma. The brain was slack, pulsatile with no haematoma. CT showed no evidence of brainstem coning. In PICU he was re-warmed over 12 hours. At 34C the pupils became reactive to light and the heart rate rose to 100/min. The following day he regained consciousness and at 28 days he was discharged with no neurological deficit.

**Conclusion:** This case highlights how severe hypothermia can mimic brain death. Despite following manufacturers advice the patient's temperature continued to fall after draining the body suit. Within one hour the temperature had fallen by eight degrees. Profound hypothermia put the patient at risk of major haemorrhage and dysrhythmia and mimicked brain stem ischaemia. We discuss the use of cooling in paediatric TBI, change in local guidelines for use of the Criticool system and risks associated with major surgery in the presence of profound hypothermia.



## MOUTH CARE IN THE VENTILATED CHILD WITH MUCOSITIS

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**Background:** Effective mouth care in the Paediatric Intensive Care Unit (PICU) is a vital factor in reducing the prevalence of Ventilator Associated Pneumonia. Current Oral Assessment Guides (OAGs) utilised on the PICU at Bristol Royal Hospital for Children (BRHC) do not advise the PICU team of the multiple components of oral hygiene in mucositis care. As a specialist, regional PICU, practitioners must understand the principles underpinning mouth care in the immunocompromised child and implement evidence-based treatment and management strategies to prevent deterioration in the child's oral health (1).

**Methodology:** A literature review was undertaken using BNI, Cinahl,

Ahmed and Embase databases. OAGs from three paediatric centres were evaluated and mouth care protocols and national clinical guidelines analysed. An audit of thirty PICU nurses at BRHC was undertaken to identify knowledge gaps in the provision of mouth care in ventilated children with mucositis. Closed-ended questions were selected to ensure comparability of responses and to facilitate analysis (2).

**Results:** There is currently both an absence of national evidence-based clinical guidelines governing the provision of mouth care to ventilated children with mucositis and a significant deficit of knowledge within the BRHC PICU nursing team. This may result in the provision of incorrect treatment or management of mucositis and reduce the quality of life for the child.

**Conclusion:** The formulation of mouth care guidelines for ventilated children with mucositis combined with education of the PICU team will ensure professionals are providing a high standard of evidence-based care.

### References:

- (1) Malkin, B. (2009) The importance of patients' oral health and nurses' roles in assessing and maintaining it. *Nursing Times*. 105 (17): 24-26.
- (2) Polit, D.F., Beck, C.T. (2006) *Essentials of Nursing Research: Methods, Appraisal and Utilization* (6th ed.). Philadelphia. Lippincott Williams & Wilkins.



## A YEAR IN PAEDIATRIC INTENSIVE CARE, A CHILD PROTECTION TEAM PERSPECTIVE

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**Introduction:** Birmingham Children's Hospital (BCH) is a tertiary referral centre with a 31-bedded PICU. All staff are trained and empowered to make child protection (CP) referrals - NHS England commissioning guidelines 2013 require that 'Staff understand the signs of abuse and raise concerns when these signs are noticed'. The PICU CP Team support the staff in this and in 2014, of 1366 admissions to PICU, 45 (3.29%) were referred to the BCH CP Department, by PICU staff with concerns.

**Method:** Analysis of referral data was undertaken to provide evidence of the work the PICU team does in making referrals, and where concerns for a child's safety are raised that processes are in place to ensure they are acted upon with the safety and best interests of the child as paramount.

The PICU CP team reviewed trust data to look at the consistency and accuracy of the documentation. Age, gender, locality and CP categories were reviewed (categories include physical, emotional, neglect and sexual).

### Results

- 55% (n=25) were aged < 1 year.
- 20% (n=9) were related to accidents.
- 91% (n=10) of Birmingham referrals lived in a Super Output Area, within top 1% of the index of deprivation in the whole country.
- 11% (n=5) resulted in death.
- 67% (n=30) did not have category completed.

### Conclusions

- Most of the referrals are for young babies.
- Many are related to accidents in and around the home.
- There may be a correlation with locality.
- The paperwork is not consistently completed, this may be because the category referral wasn't defined or it may have fallen into more than one category.
- Staff report finding the referral process and completion of paperwork stressful following a previous training needs analysis.
- As a department we have put changes in place to improve the support given to our staff making CP referrals.



## TRANSPORT SERVICE GUIDANCE AND DIABETIC KETOACIDOSIS MANAGEMENT - RECENT OUTCOME

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**Introduction:** The leading cause of morbidity and mortality in children with Diabetes Mellitus is diabetic ketoacidosis (DKA). Mortality in young children is mainly related to cerebral oedema with high mortality rate of 24% [1]. DKA management can be challenging.

**Method:** Retrospective study evaluating management and outcome of patients with DKA referred to NWTs between July 2012 – April 2015.

**Results:** 66 patients (32 boys / 34 girls) were included. Median age was 10.5 years. Most common reason for referral was neurological symptoms suggestive of possible cerebral oedema (n=35). 10/35 had CT scan Brain but none showed any radiologic evidence of increased intracranial pressure. Other frequent reasons for referral were: first presentation (n=25), severe acidosis (n=21), dehydration or poor perfusion (n=19) and concerns about inadequate respond to treatment (n=7).

Average initial pH was 6.99 (n=64). Electrolyte imbalance was noted in 31 patients.

Most advices were given regarding fluid (n=33) and neuro management (n=24). 14 patients received osmotherapy (12 cases 2.7% NaCl vs 2 cases Manitol).

From 14 transferred patients 7 went to HDU in another DGH and 7 intubated patients with low GCS were admitted to tertiary centers (10.6%). Severe sepsis as underlying condition was reported in 2/7 (28%) of these cases.

One patient died without therapy escalation after poor response to initial therapies. No neurologic problems were reported in patients managed solely at DGH.

**Conclusion:** Majority of sick patients with DKA can be successfully managed at DGH HDU settings. Specialist advice could be highly valuable in these scenarios.

·Most common reason for transfer to tertiary center was neuromorbidity (100% in our group), but also other pathologies may be concomitant (e.g. sepsis – 2/7 patients in our group).

### Reference:

[1] Edge JA, Hawkins MM, Winter DL, Dunger DB. The risk and outcome of cerebral oedema developing during diabetic ketoacidosis. *Arch Dis Child* 2001 ;85:16–22.



## AN INNOVATION TO IMPROVE THE DELIVERY OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN A LARGE AND BUSY PAEDIATRIC INTENSIVE CARE UNIT (PICU) - THE CVWH NURSE CHAMPIONS

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**Background:** PICU at BCH is a 30-bedded mixed unit with approximately 1400 admissions per year. Approximately 60 patients require CRRT annually. Historically the senior charge-nurse of PICU oversaw the delivery of this extracorporeal treatment. In 2013, 64 patients received CRRT with a total of 378 treatment days. Stress levels of bedside nurse were higher whilst patients were on CRRT. The role of

'CRRT champion' was developed to improve the delivery of a safe and sustainable CRRT service.

**Method:** The CRRT champions are experienced PICU nurses who are given an intensive two day package of theory and clinical practise in 'lining and priming', trouble shooting and managing fluid and solute removal. A more experienced CRRT nurse mentors them during their preceptorship. This includes competency documents, wet labs and individual practical assessment.

There is a CRRT or 'filter' nurse allocated each shift. They will not have their own patient. They completely manage the CRRT circuits and also support and advise the bedside nurse. If no patients are receiving CRRT, they are a general resource-nurse within PICU.

**Results:** This innovation has produced a motivated, knowledgeable and proficient team who ensure treatment is delivered accurately, consistently and with minimum 'circuit down time'. It has led to longer circuit life due to improved monitoring of anticoagulation, fewer adverse events where the vascular access has been lost and fluid removal is more accurate. There has been a reduction in stress and anxiety in the bedside nurse who now has access to a skilled and knowledgeable resource. Bed capacity is not altered down regardless of the number of CRRT patients.

**Conclusions:** We have demonstrated service improvement both quantitatively and qualitatively in the CRRT provision since 'CRRT Champions'. CRRT delivery is more reliable and safe. We recommend formation of smaller 'specialised teams' with PICU for targeted specialised treatments.



## 3 P'S AND A POD: PRACTICAL PREPARATION AND PLANNING FOR TIME CRITICAL NEONATAL CARDIAC TRANSFERS

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**Introduction:** Congenital heart disease is one of the most common birth defects with approximately 25% them being considered 'critical', requiring surgical intervention soon after birth. Such infants require 'time critical transfer' due to significant risk of rapid deterioration. Transport of these high-risk, critically ill newborns requires specialized teams. 'In house' delivery would be ideal as severe desaturation may occur rapidly after birth if the mixing of blood at the atrial level is restrictive. However, very few paediatric cardiac centers in the UK have on-site obstetric services.

KIDS is a regionalized, paediatric intensive care retrieval service based in the UK Midlands, transporting around 800 critically ill infants and children every year.

Preparation and planning of all the practical elements of such transfers is the critical element to undertaking them in a safe and timely manner.

**Case Summaries:** Three babies with Hypoplastic Left Heart Syndrome with intact/restrictive septum were referred to KIDS ante-natally, born at Birmingham Women's Hospital and transferred to Birmingham Children's Hospital, 4.5 miles away.

Two were born by caesarean section and one by NVD. All three were intubated and umbilical catheters inserted.

Timings were recorded as,

- Baby one born at 13.12, arrived in theatre at 13.38 (26 mins)
- Baby two born at 18.05, arrived in PICU at 18.44 (39 mins)
- Baby three born at 11.50, arrived in theatre at 12.20 (30 mins)

**Conclusion:** Careful planning prior to delivery with the KIDS team, local neonatal and obstetrics teams included; role assignment, prior

preparation of infusions, equipment set up, ready to attach and journey planning.

Planning these practical elements of the transfer gave these babies the best possible chance to get the right treatment as quickly as possible.

**Reference:** Bu'Lock F A. Transporting babies with known heart disease; who, what and where? *Arch Dis Child Fetal Neonatal Ed.* 2007 Mar; 92(2): F80–F81.

P34



Poster Withdrawn

A survey addressing key aspects of care was designed and distributed to staff.

A recent audit of 37 PICU discharges was considered.

**Results:** A single, multi-disciplinary step-down document has replaced the previous separate PICU discharge summary, ward medical staff and nursing outreach reviews.

Key features include:

- Summary of PICU stay by system;
- Clear documentation of
  - o sedation weaning plan and drug timing
  - o lines, drains and insertion dates
  - o handover to relevant medical team
- Incorporation of traffic light system (PEWS based) to stratify patients according to perceived risk;
- Separate page for ward review –including checklist of essential processes to complete including e-prescribing, review schedule, discussion with parents;
- Printing on 'amber' paper to enable easy identification within patient notes.

The document is about to 'go-live'; initial results will be available for presentation at PICS.

**Conclusions:** An integrated document supports patients throughout their entire medical journey, not just during their time on intensive care. The multi-disciplinary process used in the development of the integrated step-down pathway has ensured buy-in from all staff.

We anticipate the document will mean information is more accessible, patients at higher risk of deterioration will be more easily identified and appropriate reviews planned, undertaken and potentially reduce re-admission rates.

**Reference:** High Dependency Care for Children - Time To Move On. RCPCH. <http://www.rcpch.ac.uk/high-dependency-care>

P36



## CAN I COME WITH YOU AND WHY ARE YOU PUTTING IN THAT TUBE?

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<sup>2</sup>Aeromedics and Royal Belfast Hospital for Sick Children, UK

**Introduction:** Safe transfer of children with congenital duct dependent cardiac disease is stressful for parents and children. 9-year retrospective audit was undertaken to determine safety and efficacy of self vs mechanical ventilation

**Methods:** Aeromedics records were examined from January 2006 - December 2014. Antenatal/postnatal diagnosis, age at delivery, mode of ventilation, receiving hospital and parental presence, were noted. Significance was tested with Fisher's Exact Test.

**Results:** All 67 transfers were completed without adverse incident. In 2014, 27 neonates with severe duct-dependent congenital heart disease were transferred by air. 52% self-ventilating and 48% were mechanically ventilated. Notably, all those diagnosed antenatally were self-ventilating during transfer in 2014. (2006-2012, 75% were self-ventilating and 25% were ventilated. 2013, 100% were self-ventilating.) In 2014 there was an association between timing of diagnosis and airway management used (p value= 0.0006). There was no association between term or preterm delivery and need for mechanical ventilation (p value 0.325). Parents were transferred in 81.4% of cases.

**Conclusion:** Ethical and logistical considerations exist for provision of air transfer, particularly in case of bereavement. This audit shows it is safe and possible to transfer parents with children, even in high-risk cases. We have also shown that if diagnosed antenatally it is possible to avoid

P35



## TIME TO MOVE ON: IMPROVING THE SAFETY OF STEP-DOWN FROM PICU

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**Introduction:** Safe, effective, timely discharge from PICU can be facilitated by clear clinical pathways. The development of such systems is advocated in a recent publication<sup>1</sup>.

Within our children's hospital local audit showed 50% of patients discharged from PICU had both outreach nursing and doctor review, resulting in duplicated work and in-efficiencies. Additionally the current paperwork didn't always provide the required information.

**Methods:** A multi-disciplinary group discussed improvements to the process.



mechanical ventilation during transfer.

**References:**

1. Browning Camino K, et Al. Transporting newborn infants with suspected duct dependent congenital heart disease on low-dose prostaglandin E1 without routine mechanical ventilation. Archives of Disease in Childhood Fetal Neonatal Edition 2007;92:F117-F119 doi:10.1136/adc.2006.096305
2. Meckler G, et AL. To Intubate or Not to Intubate? Transporting Infants on Prostaglandin E1. Pediatrics 2009;123:1 e25-e30

## P37

### EXPERIENCE OF BIODEGRADABLE TRACHEOBRONCHIAL AIRWAY STENTS

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**Introduction:** Compression or malacia of the airways in children can add significant morbidity and mortality, with recurrent chest infections, ventilator dependence and cyanotic death spells as frequent symptoms. Metallic airway stents have been used when a surgical solution is not possible or unsuccessful. These stents can embed, fragment, and cause death from vascular erosion. We present our experience with a customised polydioxanone stent (Ella, Prague) with a 12 week lifespan before completely biodegrading in the airway.

**Methods and Results:** Thirteen patients (1.6 kg to 60kg weight range, table 1) were selected for Ella stent following MHRA approval. Indications included death spells, ventilator dependence, recurrent infections or severe exercise limitation. The stents were custom ordered to bronchoscopy and CT derived measurements with deliberate undersizing to avoid granuloma. Stent diameter was 5mm (< 10kg) to a maximum of 8mm (> 40kg). Multiple stents were used (n=7 cases) if a longer stent trial was required. Stents were placed bronchoscopically under fluoroscopic guidance via laryngeal mask (n=4), tracheostomy (n=7) or endotracheal tube (n=1). Twenty three stents were placed (4 tracheal).

Stent placement was safe and uncomplicated in 22 of 23 stent implantations. In Case 2 stent implantation failed due to fixed 3-5mm bronchial stenosis. In all other cases, biodegradable stents had benefit in determining therapeutic pathway with airway or thoracic surgery resolving symptoms or ventilator dependence in 8 patients. Three patients required long term stenting (metal or hybrid silicone-metal). All patients with tracheal stents for prolonged ventilator dependence had successful extubation immediately post stent placement and following corrective surgical trachea-aortopexy,

**Conclusion:** Biodegradable airway stents provide useful diagnostic and therapeutic value and can assist in determining if an airway intervention or surgery would be beneficial.

Table 1

Case	Weight	Primary Diagnosis	Indication stent	Stent	Site	Outcome
1	1.8	CLD, PDA, Mitral Valve abnormality, PHT	PICU:failed extubations, Death spells	2	LMB	Extubated
2	4	Complex cardiac (LMB compression)	Failed extubations and death spells	2	LMB	Withdrawal Care
3	4	AVSD (post op) Trisomy 21 PHT	Multiple failed extubations	4	LMB/RMB	Long term stent
4	4	Double arch	Multiple failed extubations	1	Trachea	Home
5	5	Double arch	Multiple failed extubations	1	Trachea	Home
6	5	Recurrent Trachyoesophageal fistula	Failed extubations, death spells	2	Trachea	Home
7	8	Severe malacia, PHT and death spells	Failed extubations and death spells	1	LMB	Home
8	10	Coarctation Aorta (repaired)	Trachy LTV: recurrent infections	3	LMB	Long term stent
9	10	Coarctation Aorta (repaired)	Recurrent chest infections	2	LMB	Airway surgery
10	30	Fontan, LMB compression by PA stent	Exercise limitation/cyanosis	2	LMB	Long term stent
11	40	Failed Kasai, Pulmonary AVM	Exercise limitation/cyanosis	1	LMB	Liver transplant
12	41	Post scoliosis repair	Multiple failed extubations	1	LMB	Pectus Repair
13	60	TGA, VSD coarctation (Post repair)	Exercise limitation/cyanosis	1	LMB	Awaiting surgery

Reference: Filler et al, J Pediatr Surg. 1995 Jul;30(7):1050-5; discussion 1055-6.

## P38

### SAFETY THROUGH FRIENDSHIP: BFF-DAISY

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**Introduction:** PICU ward rounds require effective communication; detailed information must be shared with the multi-disciplinary team efficiently. We introduced a novel checklist 'BFF-DAISY' to improve ward-round communication. This checklist covers Bloods, Fluids, Feeds, Drugs, Alerts, Infection, Sedation, Y-Why is the patient still in PICU. "Daisy" is an established advocate of patient safety within our unit. BFF-DAISY is an extrapolation of the "Daisy movement" providing a light-hearted approach to patient safety.

**Methods:** A pre-implementation prospective audit was performed over a two month period to ascertain the baseline level of communication. This was followed by a post-intervention non-blinded observational audit. Our initial aim was to use the checklist for 70% of patients. A questionnaire was designed to assess implementation of BFF-DAISY.

#### Results

Category	✓ checklist (mentioned) % (n=199)	✓ checklist (plan made) % (n=199)	✓ checklist (mentioned and plan) % (n=191)	✓ checklist patients having all section completed (n=169)
E-bloods	88	88	88	100
G-fluids	88	50	88	100
F-feeds	45	41	88	100
D-drugs	59	44	88	100
A-alerts			88	100
I-infection	43	36	88	100
S-sedation	34	28	88	100
Y- why is pt still in PICU	38	36	88	100

Table 1. Table showing percentage of patients with completed BFF-DAISY Checklist

All questionnaire respondents found the checklist helpful and would like BFF-DAISY rolled out permanently. Comments included: 'enables concerns to be highlighted' and 'actively involves the nurse in the round'.

**Conclusion:** This project developed a checklist using a light-hearted but robust mnemonic. Early results indicate team engagement with BFF-DAISY. Communication surrounding infection, sedation and plastic has more than doubled since the introduction of this checklist. BFF-DAISY has improved communication and facilitated an improvement in patient care.

## P39

Poster Withdrawn



## THE USE OF SOCIAL MEDIA TO ENHANCE COMMUNICATION WITHIN PIC SPECIALIST TEAMS

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**Introduction:** Within a busy 31-bedded PICU, during Extra Corporeal Life Support (ECLS) emergencies, specialist nurses were contacted randomly by telephone to staff the rota. This was time-consuming, favoured the nurses called first and removed a (usually senior) nurse from duties to make the calls. A more efficient and equitable system was needed.

**Method:** In August 2013, the decision was taken to use a social media application to enhance communication and a WhatsApp (WhatsApp Inc. 2011) group was formed. When a patient is commenced on an extra corporeal circuit, a message is put out to all ECLS-trained staff via the app asking for availability. It is fast, gives all staff an equal opportunity to respond and request shifts and does not remove essential staff from the clinical emergency.

**Results:** This initiative has been very successful. Staff availability is pooled such that the coordinator can allocate shifts with ease, specialists get equitable exposure and those who need more hours can be identified and booked accordingly. The time taken to staff the immediate 24 hr period and subsequent 5 days has been significantly reduced. The rota is posted on the app and outstanding shifts filled as required. The app has the added benefit of being used to update staff on changes (confidentiality maintained) and exchange and share information and ideas.

**Conclusion:** The social media application 'WhatsApp' is a simple and efficient means of communication for specialist teams in the PICU setting. However, it is not without controversy. With guidance – possibly in the form of a Standard Operating Procedure - and monitoring it can be a valuable resource to aid communication and staffing.



## UNPLANNED EXTUBATION, A CONTINUOUS QUALITY IMPROVEMENT INITIATIVE (CQI) IN PICU: ACHIEVEMENTS AND CHALLENGES

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**Background:** Unplanned extubation (UE) is a serious airway complication in PICU which may result in adverse patient deterioration leading to a potentially life threatening event. It is considered a quality of care indicator and the reduction in such events is a priority in CQI initiatives.

**Methods:** PICUs studied have 23 beds, with patients from 26 week gestation to 16 years. Relevant incident forms completed by nursing staff from October 2010 to March 2015 were examined. A comprehensive UE audit form was also introduced in June 2012 to obtain more in-depth information. Information to UE utilising both documents were recorded and further analysed for events/trends.

**Results:** Total of 2.25% ventilated patients (n=81) experienced an unplanned extubation during this period. Ventilated patients (n=3,295) required 19,249 ventilated days. The data is presented utilising standardised incidence (UE / per 100 ventilator days), to allow comparison. UE incidence reduced yearly from: 0.56 events /100 ventilated days (3.9%) in 2011; 0.4 (2.6%) in 2012; 0.33 (2.28%) in 2013 and 0.17 events /100 ventilated days (0.77%) in 2014. This compares with a paediatric incident rate of 0.11 – 2.7 events /100 ventilator days, reported in the literature. Incident reductions of 28.8%, 17.5% and 28.8% occurred in 2012, 2013 and 2014. However from January – March 2015 an unexpected surge in UE events occurred to 0.62 events (2.91%) / 100 ventilated days.

**Conclusion:** UE audit has had a positive effect on patient outcomes with a demonstrated reduction of 75% in UE events. However a 80% increase in UE events January - March 2015 is a major concern. Main issue appears to be lack of compliance with Melbourne strapping securing of endotracheal tubes. An intense educational programme may need to be implemented following further analysis. UE audit has demonstrated effectiveness of strategies employed to date and allows for a timely and rapid response to any increase in UE events.



## MULTI-PROFESSIONAL TEACHING ON THE PAEDIATRIC INTENSIVE CARE UNIT IMPROVES KNOWLEDGE, COMPETENCE AND TEAM MORALE

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**Introduction:** On Paediatric Intensive Care Units (PICU) multi-professional roles overlap (1). Multi-professional team working improves intensive care mortality (2). The large size of the PICU team and the high medical and nursing staff turnover make both understanding each other's responsibilities and trusting professional colleagues a challenge. We introduced a new combined multi-professional teaching session and hypothesised that this would influence knowledge, competence and team morale.

**Methods:** A 30 minutes weekly Doctor/Nurse teaching programme was introduced consisting of a 15 minute theory doctor-led session followed by a 15 minute nurse-led practical session. Seven rotating topics were selected (end tidal CO<sub>2</sub> monitoring, ventilator loops, central venous pressure monitoring, chest drain management, arterial pressure monitoring, train of four monitoring, external ventricular drainage systems and non invasive cardiac output monitoring (LIDCO/USCOM)) Attendees completed a standardised questionnaire.



## FACTORS IMPACTING ON-SCENE STABILISATION TIME IN INTENSIVE CARE TRANSPORT

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**Introduction:** In intensive care transport time at the referring hospital stabilising the child before transport is a careful balance. Excessive time on scene ties up local resource, delays definitive care at the destination unit and prevents the transport team from attending other children. Too little time spent increases the risk of adverse events during transfer and poor outcome for the child.

We set out to explore the effect of different illness types, and team leader seniority, on the stabilisation time.

**Method:** The KIDS referral database for the year 2014-15 was examined. For each transfer the PICAnet diagnosis category was recorded, grade of the team leader (fellow/registrar, advanced nurse practitioner or consultant) and time spent at the referring hospital.

**Results:** Data were available for 526 completed transports.

	Count	Mean	Sigma (measure of variability)	Lower confidence limit	Upper confidence limit
<b>Senior clinician grade</b>					
ANP	147	01:59	01:08	01:25	05:24
Consultant	86	02:12	01:12	01:24	05:49
Fellow	293	02:01	00:53	00:38	04:40
<b>PICAnet diagnosis</b>					
Cardiovascular	80	01:58	01:01	01:06	05:02
Endocrine	5	01:05	00:28	00:21	02:31
Gastrointestinal	68	01:34	00:51	01:01	04:09
Infection	54	02:50	01:33	01:50	07:31
Metabolic	3	03:08	02:23	02:02	10:18
Multisystem	5	02:20	00:39	00:22	04:18
Neurological	67	02:02	00:53	00:36	04:42
Oncology	4	01:24	00:25	00:08	02:40
Other	39	01:53	00:51	00:41	04:28
Respiratory	179	02:01	01:00	00:59	05:03
Trauma	15	02:03	01:00	00:59	05:05

**Conclusion:** Consultants had longer on-scene times. This may reflect the fact that they attend the more complex cases, as well as providing training to new team members. ANPs and fellows had similar mean times but ANPs had a higher variability; this is interesting as the ANPs are a small group with extensive experience of the transfer service.

Differences between diagnostic categories may reflect severity of illness, as well as perceived need to transport the child to definitive care. These will impact the willingness of the team to accept a level of transport risk.



## INTRA-HOSPITAL TRANSFERS: THE TECHNICAL SIDE

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**Introduction:** Intra-hospital transfers of PICU patients pose many risks to patients. Evidence suggests that staff with specialized training and well maintained equipment are essential to avoid/mitigate incidents during transfer [1][2]. At Birmingham Children's Hospital PICU we have a specialist Technical (Tech) Team staffed with experienced nurses from PICU. The team provides expert skill and advice for PICU staff and families. One area of expertise the team has is patient transfer to and from radiology. However, the team is not operational overnight.

**Results:** 18 sessions have been attended by 65 staff. Twenty six questionnaires (response rate 40% 26/65) were returned. 62.5% of Nurses and 80% of Doctors reported enhanced competence in setting up equipment.

100% of Nurses and 80% of Doctors reported enhanced confidence in measuring and interpreting physiological data. All participants reported that the sessions improved morale across the unit whilst providing knowledge of the roles, responsibilities and skills of other professionals within the team.

Criticism include that the range of topics was too narrow and there were time conflicts between the demands of service provision and the opportunity to attend the training sessions. As a result of these conflicts, the session has been cancelled on a number of occasions.

**Conclusion;** Multi-professional teaching on the PICU improved the self-assessed knowledge, competence and morale. Striking a balance between the needs of training and ICU service delivery remains a challenge.

### References:

1. Van De Cappelle C, Hui Y, Yan A. Interdisciplinary collaboration and relevant perspectives in critical care: suggestions to the medical student. *Univ West Ont Med Journal* 2012; 18(1): 33-35.
2. Kim MM, Barnato AE, Angus DC, Fleisher LA, Fleisher LF, Kahn JM. The effect of multidisciplinary care teams on intensive care unit mortality. *Archives of Internal Medicine* 2010; 170(4): 369-376.



## COLLABORATIVE WEANING ON THE PAEDIATRIC INTENSIVE CARE UNIT

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**Background:** The tertiary PICU at Birmingham Children's Hospital (BCH) provides an in-house, bi-annual Collaborative Weaning Training Course (CWTC) to teach nurses to wean infants and children from mechanical ventilation in collaboration with medical staff. The training team were interested to explore nurses' perceptions on how the ability to collaboratively wean impacted on their job satisfaction.

**Method:** A multiple choice online questionnaire was sent to all nurses (bands 5-8) who had completed the CWTC in the last 2 years. Questions were asked about their job satisfaction in relation to collaborative weaning, and their perceptions of patients' experience and families' satisfaction.

### Results:

- 52% (n=31/60) response rate
- 74% (n=23) reported completing 5 or more 'weans' in the last year
- 97% (n=30) reported improved job satisfaction with reasons given including: improved knowledge of and skills relating to ventilation, greater autonomy in practice and increased empowerment within their job role
- 97% (n=30) believed that collaboration between nurses and medics reduced the time taken for the weaning process
- 94% (n=29) felt that collaborative weaning improved the patient's experience and families' satisfaction during their stay with on PICU

**Conclusion:** Greater job satisfaction and autonomy at work in the PICU nurses trained to perform collaborative weaning show that there is considerable value in the CWT Course. In addition the perception that their participation in the weaning process enhances the patient's experience, reduces time to extubation and improves family satisfaction are important indications that this additional training should continue to be offered and to more of the workforce.

Further research would be useful to reveal whether time to extubation and ventilated days are actually reduced, along with evidence from patients and families themselves that the collaborative wean experience is a positive one.



**Method:** For one month we evaluated the service that the Tech Team provides for the transfer of PICU patients to and from radiology. Questionnaires were completed by bedside nurses, registrars, ANPs and radiographers using a scale (strongly agree to strongly disagree) to rate their general opinion of transfers with and without the Tech Team. Statements included rating confidence, efficiency, safety and patient experience.

**Results:**

- Responses from bedside nurses was 34/70, from the registrar's and ANPs 8/8 and radiographers 6/10. We also gathered free text comments.
- Over 85% of bedside nurses, registrars and ANPs felt confident and that transfers were safer, efficient, providing a positive patient experience with the Tech Team than without.
- 100% of radiographers answered in favour of the Tech Team.

**Conclusion:** The results support continued provision of Tech Team services, suggesting the expertise of the team is appreciated beyond the confines of PICU. They also raise the question as to whether the team should be available 24/7.

**References:**

- [1] Beckmann, U, Gillies, D, Berenholtz, S, Wu, A and Pronovost, P (2004) Incidents relating to the intra-hospital transfer of critically ill patients, *Intensive Care Medicine*, Issue 30 P1579-1585, Published 26/02/2004
- [2] Waydhas, C (1999) Intrahospital transport of critically ill patients, *Critical Care*, Volume 3 Issue 5, R83-R89, Published 24/09/1999

## P46

### ARE SEPTIC SHOCK PATIENTS MANAGED IN ACCORDANCE WITH GUIDELINES?

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**Introduction:** Goal directed management has been shown to improve outcomes of paediatric patients presenting with septic shock. The American College of Critical Care Medicine-Paediatric Life Support (ACCM-PALS) guidelines form the basis of the Surviving Sepsis Campaign and the quality improvement initiative: Paediatric Sepsis 6 (1). We aimed to assess management compliance with these guidelines.

**Methods:** A 2 year retrospective review was undertaken. Patients were identified using the North West and North Wales Paediatric Transport Service (NWTs) database. Data were extracted from the NWTs and Paediatric Intensive Care Unit (PICU) records.

**Results:** 35 of 50 identified cases had records available. The mean PIM2 score was 0.16197 (range 0.01398-0.87541). The following patients had the recommended referral centre diagnostics: blood glucose 89% (31/35), blood gas 89% (31/35), full blood count 83% (29/35) and blood culture 60% (21/35). In terms of therapies received: fluid resuscitation 100% (>100ml/kg 40% (14/35)), inotropes 100% (NWTs commenced 57% (20/35)), broad spectrum antibiotics 94% (33/35), hypoglycaemia corrected 80% (4/5), high flow oxygen 60% (21/35) and hydrocortisone 14% (5/35). Procedures performed: intubation 97% (34/35), intra-vascular access 91% (32/35) and intra-osseous access 9% (3/35). Senior clinician involvement 77% (27/35), presentation time to referral <2 hours 44% (12/27), >6 hours 11% (3/27). PICU diagnostics: central venous pressure 84% (26/31) and mixed venous saturation 52% (16/31).

**Conclusions:** Goal directed therapy is not reliably followed. Interventions are often delayed and goal directed targets, particularly mixed venous saturation is rarely measured. Widespread introduction of quality improvement initiatives are needed to improve management.

**Reference:** (1) Plunkett A, Tong J. Sepsis in children. *BMJ*. 2015;350:h3017

## P47



### CLINICAL USEFULNESS OF CLINICAL PULMONARY INFECTION SCORE (CPIS) IN DIAGNOSIS OF VENTILATOR ASSOCIATED PNEUMONIA (VAP)

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**Introduction:** Ventilator associated pneumonia (VAP) causes an increase in morbidity and mortality in patients requiring intensive care management. The definition and diagnosis of VAP is based on clinical features and is fraught with difficulty. The Clinical Pulmonary Infection Score (CPIS) has recently been proposed as an alternative to the CDC VAP diagnostic criteria to identify patients with VAP. We aim to determine the usefulness and accuracy of CPIS in identifying VAP when compared with the recognised CDC VAP diagnostic criteria.

**Methods:** A retrospective case note review was undertaken on 40 consecutively ventilated patients in a single paediatric intensive care unit (PICU). Using data collected from routine clinical documentation, CPIS was calculated for days one, three and five of intubation, and the CDC VAP criteria was also applied to determine the number of patients who had VAP. Comparison was then made on VAP cases identified using CPIS and CDC VAP criteria.

**Results:** Of the 40 patients studied, 10 fulfilled the CDC VAP criteria, giving a VAP rate of 25% of ventilated patients. However, from many parameters required for calculating CPIS were missing from the routinely collected clinical data making it near impossible to use to diagnose VAP.

**Conclusion:** CPIS is not useful in diagnosing VAP using routinely collected clinical data in our unit. If it is to be implemented for clinical use, additional data from those routinely collected are required.

## P48



### INTERRUPTIONS TO REGISTRARS' TASKS IN PAEDIATRIC ICU

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**Introduction:** Interruption or distractions to task focus and completion by medical staff may affect patient outcomes, but it is unclear how often these happen within our clinical setting. This study aims to determine the frequency and characteristics of interruptions to medical trainees' tasks within a paediatric intensive care unit (PICU).

**Methods:** A prospective observational study was conducted in a single PICU. A single medical student observer shadowed the dayshift registrar, for 8.5 hours a day for a 10 day period, and collected data on interruptions to the registrar's activities using a predesigned proforma. Data recorded pertained to task interrupted, person(s) interrupting and reason(s) for interrupting.

**Results:** Registrars were interrupted a total of 165 times, or a median of 16 times per observation-day. Interruptions were most commonly made during the ward round or a procedure (12.1% each, n=20), during prescribing (10.9%, n=18) or patient discharge (9.7%, n=16). Nurses were the most common source of interruption (45.5%, n=83), followed by PICU consultants (15.8%, n=29). Interruptions were most often made to provide an update of patient condition (19.7%, n=40), request for a prescription to be made (9.9%, n=20) or analyse patient results (5.4%, n=11).

**Conclusions:** Interruptions to registrars' tasks occurred frequently within our PICU and occurred during key tasks. Further studies are needed to assess the impact of these interruptions on patient safety, however our study has identified potential ways to reduce some of these e.g. protected prescribing time after the ward round.

## P49

### HOW OLD IS TOO OLD? – REFERRALS OF PATIENTS AGED 16 AND OVER TO A PICU TRANSFER SERVICE

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**Introduction:** The usual upper age limit for paediatric intensive care (PIC) admission is 15 years; patients aged 16 and over are usually cared for by adult hospital services. Despite this KIDS receives a number of referrals of patients aged 16 and over. We set out to explore the clinical reasons for these referrals.

**Method:** A retrospective search of the KIDS referral database was performed to identify all referrals of patients aged 16 and over. For each case found the transfer notes were analysed to reveal the reason for referral and eventual destination of the patient, as well as any other pertinent information.

**Results:** In five years KIDS received 51 referrals of patients aged over 15. The ages ranged from 16 to 23 years, with a mean of 16.6 years. 34 of these patients were under the outpatient care of a paediatrician at the time of referral.

For 31 cases KIDS's role was to confirm that the patient was best cared for within adult services. In a further 10 cases more detailed clinical management advice was given, and in 9 cases KIDS undertook transfer of the patient; 6 to PIC and 3 to adult critical care units.

**Conclusion:** Young people aged 16 and over with complex health needs can be daunting for adult medical services. Accessing clinical advice and destination care in critical illness can be difficult. This is particularly true when transition of care has not yet occurred.

KIDS provides clinical advice, coordination and transfer where appropriate, regardless of eventual destination, ensuring safe and effective care to these vulnerable patients.



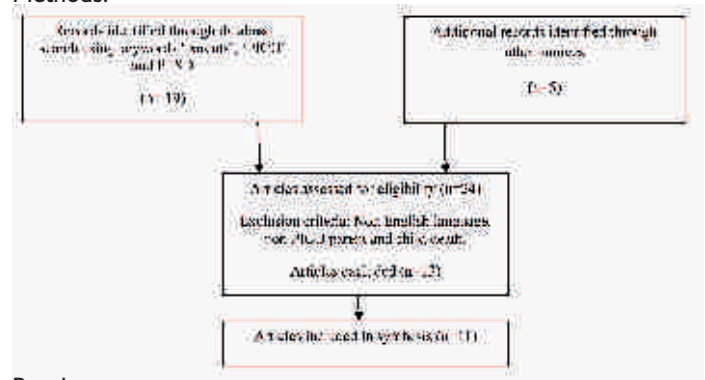
## P50

### WHAT IS THE INCIDENCE OF PSYCHOLOGICAL DISTRESS SYMPTOMS IN PARENTS FOLLOWING ADMISSION OF THEIR CHILD TO PICU? A LITERATURE REVIEW

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**Introduction:** Post Traumatic Stress Disorder (PTSD) is triggered by experiencing a potentially traumatic event. Parents of children with illness or injury severe enough to warrant PICU admission meet this criterion (1). PTSD is associated with impaired life quality (2) and may impair the ability of the family to adapt after the child's critical illness. This review aims to discover the incidence of psychological distress symptoms in PICU parents. Incidence of PTSD in the general population is 3.5%. Screening for PTSD is advocated by NICE in high risk populations (3).

#### Methods:



#### Results

- Incidence of PTSD symptoms in PICU parent population ranges from 12.2% - 83%.
- In the heterogeneous PICU population maternal PTSD was more prevalent. Whereas correlation between maternal and paternal PTSD was found in 75% of the disease specific PICU groups such as hypoplastic left heart syndrome and meningococcal disease.

#### Conclusion

- PICU parents are a high risk population so screening for PTSD is recommended (3) and would identify parents that require further support.
- The non-reporting of attrition in two studies, the attrition rates of >20% in four studies and the small sample size in a majority of the studies impacts upon statistical generalizability. Furthermore, non-Caucasian ethnicities are underrepresented in current research. Future research including a variety of ethnicities would be recommended.

#### References:

1. Balluffi A. et al. Traumatic Stress in Parents of Children Admitted to the Paediatric Intensive Care Unit. *Paediatric Critical Care Medicine*. 2004; 5(6): 547-553
2. Stein M. et al. Full and partial post traumatic stress disorder; findings from a community study *American Journal of Psychiatry*. 1997; 154: 1114-1119.
3. NICE (2005) Post-traumatic stress disorder (PTSD): The management of PTSD in adults and children in primary and secondary care. Available at: <http://www.nice.org.uk/guidance/cg26/chapter/guidance> [Accessed 8th April 2015]

## P51

### I WILL SURVIVE – A NEW MODEL OF TRAINING TO INCREASE STAFF RESILIENCE ON RETRIEVAL

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<sup>2</sup>Survival Wisdom, UK

**Introduction:** The Children's Acute Transport service (CATS) is a stand-alone retrieval service that performs approximately 1200 retrievals each year in the North Thames region. Transfers are primarily by road in a dedicated ambulance, with approximately 50 flights per year (fixed wing and rotary). We perform international retrievals and repatriations.

Training and education has primarily focused on clinical situations and emergencies to ensure staff are prepared for almost any clinical scenario that could occur.

Patient and staff safety is high priority; however, aside from standard safety measures and written protocols, practical training has not focused on staff preparedness for a non-clinical emergency such as an ambulance crash or emergency landing.

**Methods:** In a unique collaboration with Survival Wisdom I (a company owned by ex-military personnel), a 2 day course was designed to provide the core team with the resilience to deal with challenges they may experience on retrieval.

The course introduced principles of survival psychology, risk analysis, provided strategies to enhance situational awareness, safety and security in the UK and during foreign travel.

Practical scenarios included: ambulance crash requiring evacuation from vehicle, arriving at the scene of an accident, Haz Mat training, and open water survival.

**Results:** Design of onsite and offsite components recognising that all staff need some training but off site, high cost training is only sustainable if targeted to certain staff groups.

**Conclusions:** External expertise brought benefits in terms of threat and error analysis/management. The team benefitted from some novel techniques and concepts taught and from analysis by experts from a different discipline.

All staff will now receive training in basic survival concepts on an initial and recurrent basis. Staff employed longer term will receive more advanced practical and theoretical training.

CATS has no pecuniary interest in SW.

## P52

### MIND THE GAP: EXPLORING THE GENERATIONAL IMPACT WITHIN THE PAEDIATRIC INTENSIVE CARE SETTING

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**Introduction:** Birmingham and Solihull LETC undertook project 'Every Student Counts' as part of Health Education England's 'Growing Nursing Numbers' initiative. The work, hosted by Birmingham Children's Hospital evidenced discoveries relating to generational concepts. It identified that Baby Boomers, X and Y generations dominate the NHS workforce, with generation Z entering higher education.

**Methods:** The study engaged over 600 students and early career nurses and midwives by staging an interactive conference, 'Crowdsourcing' and field data collection. Participants were asked to share their views on 3 questions:

- What do we need to stop, start or do differently to ensure you continue to build your nursing or midwifery career in the NHS, and why?
- What factors influence your decision to work in Birmingham?
- What are your expectations of the nursing/midwifery profession?

**Results:** A thematic analysis was conducted on the data, three trends emerged: formal training and support, workload and incentives. The following inform the range of needs and expectations of early career practitioners in the workplace

- Clear, structured career development and progression pathways
- Care and support from leaders and teams
- Team spiritedness

- Feedback, guidance and developmental support
- Flexibility to achieve work-life balance
- Supported to meet the expectations of the patients and public
- Engaged in meaningful work; 'make a difference'

**Conclusion:** For the first time in history four generations will be working together. Research exploring the impact of different generational traits has grown and there is a fundamental need to acknowledge these differences within the NHS

By understanding differing motivational needs employers and education providers can align support to enhance recruitment and retention. The data from a Paediatric Intensive Care Unit (PICU) is compared to an acute hospital Trust and reflect an atypical PICU generational profile.

## P53

### AN INNOVATION TO IMPROVE THE DELIVERY OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN A LARGE AND BUSY PAEDIATRIC INTENSIVE CARE UNIT (PICU) - THE CVWH NURSE CHAMPIONS

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**Background:** PICU at BCH is a 30-bedded mixed unit with approximately 1400 admissions per year. Approximately 60 patients require CRRT annually. Historically the senior charge-nurse of PICU oversaw the delivery of this extracorporeal treatment. In 2013, 64 patients received CRRT with a total of 378 treatment days. Stress levels of bedside nurse were higher whilst patients were on CRRT. The role of 'CRRT champion' was developed to improve the delivery of a safe and sustainable CRRT service.

**Method:** The CRRT champions are experienced PICU nurses who are given an intensive two day package of theory and clinical practise in 'lining and priming', trouble shooting and managing fluid and solute removal. A more experienced CRRT nurse mentors them during their preceptorship. This includes competency documents, wet labs and individual practical assessment.

There is a CRRT or 'filter' nurse allocated each shift. They will not have their own patient. They completely manage the CRRT circuits and also support and advise the bedside nurse. If no patients are receiving CRRT, they are a general resource-nurse within PICU.

**Results:** innovation has produced a motivated, knowledgeable and proficient team who ensure treatment is delivered accurately, consistently and with minimum 'circuit down time'. It has led to longer circuit life due to improved monitoring of anticoagulation, fewer adverse events where the vascular access has been lost and fluid removal is more accurate. There has been a reduction in stress and anxiety in the bedside nurse who now has access to a skilled and knowledgeable resource. Bed capacity is not altered down regardless of the number of CRRT patients.

**Conclusions:** We have demonstrated service improvement both quantitatively and qualitatively in the CRRT provision since 'CRRT Champions'. CRRT delivery is more reliable and safe. We recommend formation of smaller 'specialised teams' with PICU for targeted specialised treatments.

## P54

### SPLENIC RUPTURE MANAGEMENT AUDIT – MAKE THAT CALL ... SAVE A SPLEEN!

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**Introduction:** Splenectomy in children is associated with a 5% life time risk of death from overwhelming post-splenectomy infection (OPSI). Non-operative management of splenic injury in children is accepted safe practice [1,2]. Despite this discrepancies exist in the management of children presenting with splenic trauma [3]. Our audit started following the admission of a girl with a grade 4 splenic injury to a District General Hospital (DGH). A plan for splenectomy had been made without consultation with the regional paediatric surgeons. Embrace Transport Service were called for advice by the local consultant paediatrician. A conference call was arranged with the paediatric surgeons, which resulted in a conservative management plan, a safe transfer to a Paediatric Major Trauma Centre (MTC) and a good outcome.

**Methods:** Identification of common themes from case note review of those managed conservatively compared to surgically was performed to provide clear guidance on the safe management of splenic injuries.

**Results:** No splenectomies performed in MTC. 50% of patients managed surgically in DGH with no clinical indications for splenectomy and no conversations with Paediatric surgeons prior to surgery.

**Conclusion:** Conservative management can be achieved and splenectomy avoided in the majority of patients. Education and early communication between referral, transport, and tertiary teams facilitates safe patient observation with surgical and/or intensive care if required.

**References:**

- [1] Velanovich V, Tapper D. Decision analysis in children with blunt splenic trauma: the effects of observation, splenorrhaphy, or splenectomy on quality-adjusted life expectancy. *J Pediatr Surg* 1993; 28: 179-85.
- [2] Pearl RE, Wesson DE, Spence U, et al. Splenic injury- a 5-year update with improved results and changing criteria for conservative management. *J Pediatr Surg* 1989; 24: 428-31.
- [3] Stylianou S. Outcomes from pediatric solid injury: role of standardized care guidelines. *Curr Opin Pediatr* 2005; 17: 402-406

## P55

### CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN POST OPERATIVE CARDIAC INFANTS ON EXTRACORPOREAL LIFE SUPPORT (ECLS) – A SINGLE CENTRE EXPERIENCE

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**Introduction:** Birmingham Children's Hospital (BCH) PICU is a mixed 30-bedded tertiary referral centre with approximately 1400 admissions per year. 30% of these admissions are following cardiac surgery. The Extracorporeal Life Support Organisation (ELSO) Summary 2014 suggests that 41% of infants requiring ECLS worldwide will also receive CRRT. CRRT involves the use of an extracorporeal circuit with a highly permeable membrane filter to facilitate controlled removal of plasma water and solutes.

**Method:** A retrospective analysis of the fluid balance, acid base balance of infants requiring ECLS and CRRT in PICU during the past 2 years. This group was matched to a control group in the previous 2 years who did not receive CRRT during ECLS. The patients were all post-operative cardiac infants requiring ECLS semi-electively for low cardiac output state or for failure to wean from cardio pulmonary bypass. No ECPR infants were included. Factors influencing removal of fluid whilst on ECLS and mortality & morbidity outcomes were studied.

**Results:** 12 infants met inclusion criteria. The addition of CRRT circuit to the ECLS circuit permitted a predetermined volume of plasma water to be reliably removed each hour enabling a rapid correction of acid base balance. This allowed for easier infusion of blood, blood products and

parenteral nutrition. The CRRT group had much lower net fluid balance compared to the ECLS-only group. During this time frame, the use of CRRT during ECLS had increased from 48% to 90% achieving better outcomes compared to the ELSO registry. There were no added complications and the same specialist nurse looked after both circuits.

**Conclusion:** BCH experience has shown feasibility of using CRRT safely during ECLS. Patients receiving CRRT during ECLS have better fluid balance enabling to quicker weaning off ECLS and better overall treatment. We now have a lower threshold for commencing CRRT in ECLS.

## P56

### INTRODUCING AN ADMISSION PROFORMA TO PICU, A QUALITY IMPROVEMENT?

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<sup>2</sup>Altnagelvin Area Hospital, UK

**Introduction and Aims:** Following a perceived lack of information on some admissions to PICU a new proforma was introduced. We aimed to improve patient safety by standardising the information, reducing the likelihood of mistakes and missing information at admission.

**Methods:** There were no paediatric, FICM or other national guidelines on admission datasets. We used a combination of the PICAnet(1) data collection form and RCP 'Standardising the structure and content of medical records'(2) as our guide to design our proforma. We audited 30 admissions, 10 with traditional clerk-in's, 10 following our first proforma and 10 following our 2nd proforma. User based feedback shaped the second draft to make it more streamlined.

**Results:** More data was included in proforma admissions, with the average number of data points at 99.4 in the final draft (100.7 in 1st draft) compared with 27.3 in the traditional clerk-in.

There were points of data where the proforma has made a significant difference (p-value <0.05, fisher's exact test); recording of weight, birth history and medication history. However, there were areas where things were poorly completed in both admission types; microbiology, vascular access and BM.

**Conclusions:** The new proforma leads to increased recording of information. However, some areas are still being left blank. A follow-up audit has been planned to ensure continuing and improved recording of data and quality of care.

**References:**

- PICAnet Admission Dataset Definitions Manual. June 2014. Available at: [http://www.picanet.org.uk/Documentation/Guidance/PICANet\\_Admission\\_Dataset\\_Manual\\_v5.0.pdf](http://www.picanet.org.uk/Documentation/Guidance/PICANet_Admission_Dataset_Manual_v5.0.pdf). [Accessed on 28/06/15]
- Digital & Health Information Policy Directorate of NHS Connecting for Health and Department of Health. Standardising the structure and content of medical records. July 2013. Available at: <https://www.rcplondon.ac.uk/resources/standards-clinical-structure-and-content-patient-records> [Accessed on 28/06/15]

## P57

### BRONCHIOLITIS – AN UNLUCKY YEAR OR AN EVOLVING MONSTER?

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**Introduction:** Bronchiolitis in our Paediatric Intensive care unit this season proved to be more challenging with a greater number of critically unwell patients than previous years. There were unforeseen demands

on resources, ECMO referrals, one death and eventual out of province transfers due to bed shortages.

**Methods:** We requested PICANET data on ventilation and support for patients with a diagnosis of Bronchiolitis admitted to our unit for period from 1st October 2014 – 1st April 2015, and for same period the previous year. We also collected data on co-morbidity, viral and bacterial culture a selected group of critically unwell patients.

**Results (Table 1):** The numbers of patients with bronchiolitis and mean length of stay were similar for both years. However this season 84% of patients required invasive ventilation compared with 65% the previous year, there were three times more HFOV days and eight times greater inhaled Nitric Oxide requirement. In our selected sample of critically unwell patients, all had co-morbidities such as Trisomy 21 and Chronic lung disease. The most common virus was RSV (50%), and multiple viral infection was present in 50%. None of these patients had bacterial co-infection (all BAL negative).

	2013/2014	2014/2015
Admissions	31	26
Average length of stay	7.8	8.6
Invasive Ventilation	21 (65%)	22 (84%)
Non-invasive ventilation only	7	1
HFOV (days)	8	23
Inhaled NO (days)	6	45
Inotropes (days)	15	22
Referral/discussion with ECMO centre	0	4

**Conclusions:** Although the number of patients was similar for both years, disease severity on the basis of ventilation requirement was indisputably worse this season. It is unclear if this represents the evolution of a more aggressive disease process, or simply an uncharacteristically bad season.

## P58

### EXPERIENCE OF CIRCUIT SURVIVAL IN EXTRACORPOREAL CONTINUOUS RENAL REPLACEMENT THERAPY UTILISING SMALL CALIBRE VENOUS CANNULAE

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**Introduction:** To describe an experience of circuit survival in continuous renal replacement therapy (CRRT) utilising small calibre (< 7 French gauge (Fr)) venous cannulae.

**Methods:** A retrospective observational study conducted in a multidisciplinary, university affiliated, paediatric intensive care unit. A review of all CRRT episodes (1998 – 2010), which utilised vascular access cannulae of an external diameter < 7Fr, was performed

**Results:** 49 patients underwent ECRRT treatment during which circuit blood flow was delivered utilising either 5Fr or 6.5Fr double lumen cannulae. 139 circuits were employed (median per patient 2, IQR 1-3) in providing 4903 hrs of therapy (median duration of therapy 43hrs IQR 22-86hrs), allowing for censoring the median circuit survival time was 40hrs (95%CI 28-66hrs). 81 (58%) circuits failed due to clotting/technical problems, equating to a circuit failure rate of 16.5 (95%CI: 13.3 – 20.5) per 1,000 hours of CRRT. The probability of a circuit surviving 40hrs or greater was 50% with 43% (95%CI 34%-53%) expected to survive 60hrs or more. No significant relationship between circuit survival and the calibre of the cannula deployed was identified; however placement of venous access in an internal jugular

vein was associated with improved circuit survival.

**Conclusions:** Contrary to previous reports, vascular access cannulae of a calibre < 7Fr can support sufficiently prolonged CRRT to make them an effective means of delivering renal support in neonates and small infants.

## P59

### QUALITY IMPROVEMENT IN RESPIRATORY SUPPORT FOR PATIENTS WITH BRONCHIOLITIS

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**Introduction:** Non-Invasive Ventilation (NIV) is a complex treatment increasingly used for acute respiratory failure in children. Achieving consistent high quality & safe care, within multiple daily & weekly changeovers of staff, 6 monthly rotation of middle-grade medical practitioners between trusts whilst introducing new practices is extremely challenging.

The aim was to establish an easy to use clinical pathway to standardise care to best practice, for patients with bronchiolitis requiring respiratory support with Heated-Humidified High Flow Nasal Cannula (HHHFNC), CPAP or BiPAP.

**Methods:** We made a series of flow charts into a pocket guide - a distillation of current evidence base & personal practice. The pocket guide was assessed amongst staff, using a questionnaire before & after its introduction.

**Results:** The pocket guide performed well in a large HDU in a Tertiary Paediatric Centre when trialled by 21 staff. It was found to provide an easy step-wise guide to follow. It covers controversial areas including when a patient should be considered for HHHFNC vs. CPAP, use of antibiotic, sedation and weaning of respiratory support. Questionnaire results prior to the pocket guide showed 27-45% adherence with best practice, increasing to 91-100% after its introduction.

**Conclusion:** We produced pathways for respiratory support in bronchiolitis patients, which has been formalised and is now trust policy. It especially empowers experienced nursing staff to improve doctors' prescribing of sedation & to reduce delays in weaning. This has contributed to the low intubation rate (8% out of 280 patients needing respiratory support) and good outcome that is seen in The Royal Alexandra Children's Hospital, Brighton. An updated version is already being worked on for the next bronchiolitis season.

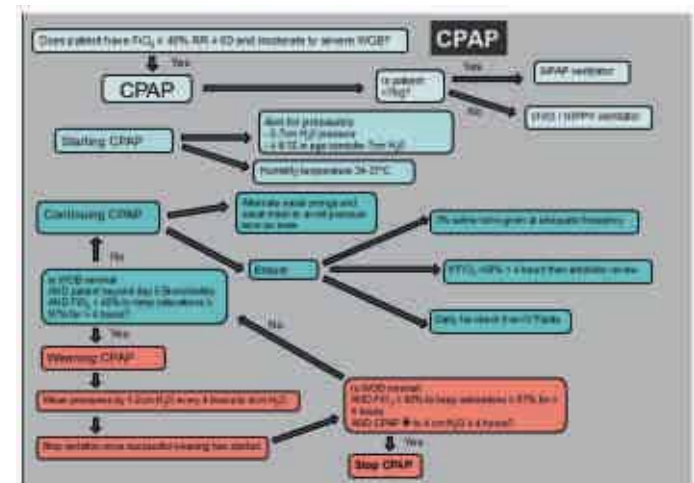


FIG 1: Page 4 of the Pocket Guide - (Management of patients with Bronchiolitis requiring CPAP)



## MEDICATION ON PICU: NURSES' PERCEPTION OF AN INDEPENDENT CHECK

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**Introduction:** A system of double-checking medication has been proposed as a way of minimizing errors. This is very important in Paediatric Intensive Care (PIC) when dealing with very complex medication. Hospital policy is a double checking process carried out by two nurses independently. The responsibility of the second checker is to independently verify the work performed by the first checker. Despite this medication errors still occur.

**Method:** The PIC Medication group asked 72 nurses to complete a confidential questionnaire.

The questionnaire gave the nurses the opportunity to give details on:

- How the checking process is carried out by the nurse providing the second check.
- Responsibilities and roles of the second checker in medication preparation and administration.
- How frequently nurses perceive they identify errors as a second checker.

### Results

- Nurses carried out a double check of drugs but this was not always an independent verification as recommended in the hospital policy.
- Three nurses documented that they carry out an independent check, all of which had been qualified for less than one year.
- The "five rights" (right patient, route, drug, dose and time) were the most commonly documented checks carried out during the second checking process; very minimal other checks were documented in the questionnaire.
- In the weeks preceding the questionnaire being completed the reported perception of identifying errors was 29% weekly and 63% on a monthly basis.

**Conclusion:** The current culture of the 'checking process' on PIC is not always what the hospital policy states it should be. Despite this the 'second checker' is still able to identify errors in the medication preparation and administration process prior to administration to the patient.

Education is needed for PIC nurses on the true role and responsibilities of the 'second checker' whereby a PIC standard can be set. Re-evaluation will then be required.



## A YEAR OF SEPTIC BABIES: WHAT WE DID AND HOW THEY DID

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**Introduction:** NWTS was commissioned in 2010 to coordinate and provide transport for sick children covering a large region of the UK to the nearest PICU bed. The service also provides telephone advice. We sought to identify demographics and risk factors for sepsis in <3 month olds. Data was collected on illness severity indicators along with initial resuscitation.

Treatment modifications were highlighted and microbiology results examined. Outcomes included invasive ventilation days and survival to discharge.

**Methods:** Retrospective case note review of <3month olds referred with 'Sepsis' 1/9/2013–31/8/2014.

## Results

32 babies.  
27 transferred (26 PICU, 1 ward)  
93% transferred patients survived to discharge.

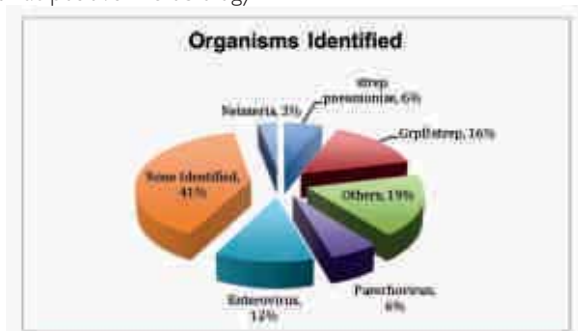
### Risk Factors

Male: female = 2:1  
18/32 (56%) weighed > 3.5kg, 7 (22%) <2.5kg  
Prematurity = 28%. (9/32)  
63% = no documented positive risk factors.

### Inflammatory Parameters at presentation

Hypo/Hyperthermia = 84%.  
Capillary gas Lactate > 2 = 75%  
WCC normal = 71%  
CRP > 20 = 34%.

Central Nervous System infections were most common (41%).  
59% had positive microbiology.



11 combinations of antibiotics initiated, commonly Cefotaxime and Amoxicillin. Clindamycin and Aciclovir popular add-ons.

Analysis revealed a significant association ( $p < 0.05$ ) between microbiology and time ventilated. Positive microbiology correlated with increased time ventilated / death.

**Conclusion** Our data showed low mortality, 6%.

Positive microbiology correlated with increased ventilated days.

Limitations include 1. Retrospective study, just 1 year of patients, 2. Only included patients referred to NWTS. 3. NWTS database is not professionally "built" software, up to 20% inaccuracy with data entry.

### References:

1. [www.nwts.nhs.uk](http://www.nwts.nhs.uk)
2. Antibiotics for early-onset neonatal infection: Antibiotics for the prevention and treatment of early-onset neonatal infection. NICE guideline CG149 <http://www.nice.org.uk/guidance/cg149/chapter/1-recommendations#risk-factors-for-infection-and-clinical-indicators-of-possible-infection-2>



## THE USE OF LOCALLY ADAPTED HEALTHCARE RESOURCE GROUPS (HRGS) TO GUIDE THE RE-DISTRIBUTION OF NURSING STAFF WITHIN A TERTIARY CENTRE PAEDIATRIC INTENSIVE CARE UNIT (PICU)

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**Introduction:** The majority of children admitted to PICU are nursed on a 1:1 ratio. As severity of illness and need for intervention varies so does the level of nursing support. We faced challenges when utilising PICS levels of care (1) to inform redistribution of staff at the bed-side.

HRGs are used to group patients into subsets of varying cost categories (1-2). They were adapted and modified in an iterative fashion to guide staff allocation. A system of cohorting patients - nurse: patient ratio 0.5:1 for lower dependency patients (HRG 1-2) - was implemented and staff re-allocated to support higher dependency patients (HRG 5-7).



## Method:

- Identical time periods evaluated prior/post implementation: July – December 2013 and 2014.
- Number of admissions identified.
- Data regarding patient shift episodes, nursing shifts and cohorted patient shifts collected from the existing PICU database.
- Incidents and near misses (IRI s) reported by staff collected.

## Results:

	July – December 2013	July – December 2014
Admissions	602	694
Patient shift episodes	14223	14383
Nursing shifts	13754	13510
Cohorted patient shifts (%)	938 (6.6%)	1746 (12.1%)
IR1	12	13

**Conclusion:** Despite there being little difference in the number of admissions, patient shift episodes and nursing shifts the number of cohorted shifts has increased by 86%. Interestingly there was no increase in IRI reporting.

Therefore the carefully considered cohorting of patients, when supported by a locally devised dependency assessment, is a safe and effective use of the staff resources available.

## References:

- (1) The Paediatric Intensive Care Society. Standards for the Care of Critically Ill Children. 4th ed. London: The Paediatric Intensive Care Society; 2010.
- (2) National Casemix Office - Introduction to Healthcare Resource Groups. Health & Social Care Information Centre. [Online] Available from: <http://www.hscic.gov.uk/hrg> [Accessed 10th June 2015].

## P63



### FLUID THERAPY AFTER SURGERY FOR CONGENITAL HEART DISEASE – HOW MUCH IS ENOUGH?

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**Introduction:** Paediatric patients with congenital heart disease (CHD) who undergo surgery have several peri-operative innate and interventional risk factors for deranged fluid homeostasis, developing severe interstitial oedema and capillary leak syndrome. We describe the pattern for fluid therapy in this patient population.

**Methods:** Retrospective review of patients who underwent cardiopulmonary bypass (CPB) for CHD surgery between November 2014 and January 2015 at a university hospital paediatric cardiac intensive care unit was performed.

**Results:** There were 64 patients (including 12 neonates) in the study period with median age 10.3 months and median weight 8.85 kg (range 2.5–72.0). Median PIM2 was 2.09 (range 0.29–9.94), and mortality rate was 0.06%. Four patients required ECMO within 4 hours of surgery. Time to first dose of diuretics median 8 hours (range 1 to 24), whilst 2 patients had peritoneal dialysis initiated within 12 hours of surgery. Volumes of intravenous fluid therapy in different patient groups for the immediate postoperative 24-hour period at 12-hourly intervals were 52.7 and 56.9 ml/kg in patients under 5 kg compared to 25.7 and 19.2 ml/kg in patients over 20 kg (all values reported as median). During the subsequent 24-to-36-hour period, patients under 5 kg received 35.4 ml/kg intravenous fluid therapy compared to 7.2 ml/kg in patients over 15 kg.

**Conclusion:** Fluid therapy following congenital heart surgery is highly variable. Infants appear to receive more fluid therapy throughout the postoperative 36-hour period, whilst bigger children received most of

the fluid therapy in the immediate 24-hour period.

- References:** Fluid overload in infants following congenital heart surgery. Hazle MA, et al. *PCCM* 2013;Jan;14(1):44-9.  
Fluid management in critically ill pediatric patients with congenital heart disease. Ricci Z, et al. *Minerva Pediatr* 2011 Oct;63(5):399-410.

## P64



### INCIDENCE OF SIGNIFICANT CARDIOVASCULAR EVENTS POST CARDIAC SURGERY

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**Background:** Congenital heart malformations have a worldwide incidence of 1.5 million a year<sup>1</sup>, and while the mortality after surgery is generally low, there are risks, including cardiac arrest. Evidence regarding the rates of cardiac arrests in this subpopulation are limited, but figures suggest 2-6% of patients undergoing cardiac surgery<sup>2</sup>. Cardiac arrest is extreme and we believe there are many significant cardiovascular events (SCE) that do not end in cardiac arrest.

**Methods:** A prospective cohort study over 5 weeks to determine the incidence of 'significant' cardiovascular events in the first 48 hours post-operatively on the PICU. These were defined as:

- Cardiac arrest (any duration of chest compressions)
- Near cardiac arrest events (IV adrenaline boluses, emergency chest opening, significant hypotension, change in heart rate or arrhythmia)
- Desaturations below 50%
- Any other clinical event deemed significant by the bedside nurse

**Results:** 40 surgeries were carried out over the five weeks. Nine patients had SCE recorded (22.5%) and out of these, only one had a cardiac arrest giving an incidence of 2.5%. Other complications recorded included: severe desaturation below 50%, hypotensive episodes requiring rapid fluid boluses and inotropes, cardiac tamponade with mediastinal exploration and arrhythmias were seen in five patients. Some of the patients had multiple SCEs or one ongoing complication for the entire 48 hours.

**Conclusion:**

The incidence of CPA (cardiopulmonary arrest) is similar to those found in other studies. Far more commonly than CPA though are other SCEs, giving a much higher event rate, upon which to power future trials in this population.

## References:

1. R. Draper. Doctor.co.uk <http://www.patient.co.uk/doctor/congenital-heart-disease-inchildren> (accessed 30/01/15 2015).
2. J. Rhodes AB, H. Seiden, J. Asnes, R. Gross, J. Rhodes, R. Griep, A. Rossi. Cardiac Arrest in Infants After Congenital Heart Surgery. *Circulation* 1991;194-9.

## P65



### EMERGENCY PAEDIATRIC BURNS TRANSFERS – A TALE OF TIME

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**Introduction:** Large paediatric burns are complex life threatening injuries with those most severely affected requiring transfer to a specialised burns centre. We describe interventions and transfer times in those referred to our paediatric intensive care retrieval service over five years.

**Methods:** Children with burns, referred to the Children's Acute Transport Service (CATS), between 1st April 2009 and 30th November 2014, were identified through a local database and all emergency transfers were retrospectively reviewed.

**Results:** From a total of 94 referrals, 47 resulted in emergency retrievals. Mean age was 2.8 years (0.4- 15.7), 28 were males (59.6%). Mean burn size was 29.7% (2-90).

Of the 47 retrievals, 44 (93.6%) were intubated and ventilated, 12 (25.5%) required inotropes, three (6.8%) underwent cardiopulmonary resuscitation (CPR) and one patient (2.1%) died.

The majority of major interventions were carried out by the local team. CATS carried out the following: one (2.8%) intubation/reintubation, five (41.7%) inotrope commencements, six (25.0%) central venous line and seven (24.1%) arterial line insertions.

Mean time from referral to arrival of the retrieval team at the referring hospital was 02:50 (hh:mm; 00:45 to 14:06). Mean time taken for stabilisation was 02:03 (01:00 to 07:45). Mean journey time from referring hospital to tertiary centre was 01:09 (00:15 to 02:25), moving a mean distance of 46.9 miles. Mean total time from referral to arrival at the tertiary centre was 05:57 (02:59 to 16:56).

**Discussion:** A small number of children require emergency paediatric intensive care retrieval following a burns injury. Our data shows local teams carrying out a large proportion of major interventions before arrival of the retrieval team, which took, on average, three hours. The average distance travelled by the child was 47 miles and time taken from initial referral to arrival at the tertiary centre was on average six hours.

## P66

### SEVERE LEFT VENTRICULAR INLET AND OUTFLOW OBSTRUCTION FROM RHABDOMYOMA IN A NEONATE: A CHALLENGING CIRCULATION

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**Introduction:** Rhabdomyoma is the most frequent primary cardiac tumour type in children, with variable course from spontaneous regression to heart failure from outflow obstruction [1,2].

**Case summary:** We report a male neonate with antenatal diagnosis of cardiac rhabdomyoma (images to present) and severe left ventricular (LV) inlet obstruction. He was delivered at 36 weeks of gestation weighing 2.72kg. Due to the obstructive nature of the tumour, haemodynamics were considered as functionally 'single ventricle' and managed with prostaglandin to maintain duct patency. However, adequate systemic perfusion could not be maintained and emergency tumour debulking was undertaken. The tumour was noted to arise from the wall of the LV extending to the mitral valve, as noted on imaging. The tumour could not be fully resected, and the mitral valve could not be salvaged. A duct-dependent univentricular system was therefore created with atrial septostomy and bilateral pulmonary artery banding. Epicardial echocardiography showed moderate-severe mitral regurgitation and no antegrade flow through the aortic valve. Postoperatively, the baby remained in a low cardiac output state and after a period of relative stability developed multi-organ failure and died at 18 days of life. Histology confirmed rhabdomyoma. Post-mortem examination showed severe LV inlet restriction by the tumour displacing the upper postero-septal LV wall, distorting the normal aortic valve which was inseparable from the posterior mitral valve.

**Conclusion:** A rhabdomyoma causing LV inlet obstruction required rescue surgical intervention, with challenges for medical therapy and need to convert an anatomically biventricular heart to a physiologically univentricular heart.

#### References:

1 Myres KA et al: Benign cardiac tumours, malignant arrhythmias. *Can J Cardiol* 2010, 26 (2): 58-61

2 Padalino MA, et al. Surgery for primary cardiac tumors in children: early and late results in a multi-center European Congenital Heart Surgeons Association (ECHSA) Study. *Circulation* 2012; 126: 22-30.

## P67



### PAEDIATRIC OUTREACH TEAM: FLEXING TO MEET SEASONAL DEMAND

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**Introduction:** The increasing acuity of in-patients combined with the shortage of appropriately trained junior doctors has led to a demand for Advanced Nurse Practitioners (ANPs). We have established a Paediatric Outreach Team in University Hospital Southampton that combines the roles of specialist nurses and junior doctors to meet these needs. We describe how we have done this and how we have been able to flex up the service to meet increased seasonal demand using winter resilience money.

#### Methods:

Training & Service Description

Database Review

Critical Incident Review

**Results:** Team members were recruited from PIC, HDU and emergency department backgrounds. The core team consists of a Band 8a coordinator and 2 Band 7 team members. This team was clinically active from April 2014. Two further team members joined from November 2014 until May 2015.

Core training involves history taking, examination and clinical skills and is competency based. It took 3 months for the initial members to be clinically active. The winter expansion team were clinically active in one month.

#### Activities:

MON	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
121	104	122	93	105	160	381	294	169	162	113	122	123

Patients seen by month 2014/15

50% of activities are patient reviews. Other activities are venesection and blood gas taking, cannulation, assistance with transfers, equipment support & clinical decision making support.

There were no significant critical incidents related to the paediatric outreach team in the whole period.

**Conclusion:** Paediatric Outreach activity more than doubled in the winter months. It was possible to deliver an expanded team to meet this demand by early planning, appropriate recruitment and by expediting training with the help of already trained team members.

## P68



### A CASE OF TRANSIENT LACTIC ACIDOSIS IN A PAEDIATRIC PATIENT RECEIVING INTRAVENOUS SALBUTAMOL FOR LIFE-THREATENING ASTHMA

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**Introduction:** Asthma is one of the commonest chronic diseases in childhood. Intravenous salbutamol is frequently used in the treatment of acute severe asthma and lactic acidosis has been associated with its use. This commonly leads clinicians to reduce or discontinue continuous 2-agonists. We present a case of transient lactic acidosis in a 17-year-old asthmatic patient on intravenous salbutamol which resolved spontaneously without intervention.

**Case summary:** A 17-year-old female presented to hospital with acute life threatening asthma. At presentation, she required 8L facemask

oxygen and back-to-back salbutamol nebulisers with minimal response. Treatment was escalated to intravenous salbutamol (3micrograms/kg/min), intravenous aminophylline (0.7mg/kg/hr) and magnesium sulphate (2 grams) and was admitted to PICU. Venous blood gas showed lactic acidosis (pH=7.25, pCO<sub>2</sub>=5.0, BE=-9.8, Lactate=7.1mmols/L). As she remained cardiovascularly stable, salbutamol infusion was continued. Her lactate level improved and normalised within 12 hours without any further intervention or alteration to salbutamol infusion.

**Conclusion:** Lactic acid is produced in tissue hypoxia or hypoperfusion (type A) but also is a metabolic consequence of increased metabolism in hyperadrenergic states (type B) (1). Lactic acidosis has been described with the administration of intravenous salbutamol in asthma treatment in the paediatric population(2-3). The clinical significance of salbutamol-induced lactic acidosis and its management remains controversial(3). The common practice of reducing or discontinuing salbutamol is not evidence-based and could potentially lead to asthma deterioration. In haemodynamically stable patients, lactic acidosis is likely to be transient. Therefore,  $\beta_2$ -agonists don't need to be blindly discontinued in the absence of haemodynamic compromise.

#### References:

1. Dodda VR, Spiro P. Can Albuterol be blamed for lactic acidosis? *RespCare*, December 2012; 57;12:2115-8.
2. Saxena R, Marais G. Salbutamol:beware of the paradox! *BMJCaseReports*2010,Sept 29.
3. Walsh SA, Paget RI, Ramnarayan P. Salbutamol usage and Lactic Acidosis in Acute Severe Asthma. *Pediatr Crit Care Med*. 2013, Jan;14(1):116-7.

## P69

### IMPACT OF EXCELLENCE REPORTING IN PICU: A STAFF SURVEY

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**Background:** A system of Excellence Reporting (ER) has been in place in our PICU since April 2014. ER is a system of peer-reported excellence in practice (described in another abstract).

We aimed to evaluate staff attitudes towards this initiative; with the hypothesis that there would be perceived benefits for learning, patient care and staff morale.

#### Methods:

Electronic survey to all PICU staff, conducted 12 months after launch of ER. Questions focused on staff perceptions in 3 domains:

1. Impact on individual learning
2. Impact on quality of patient care
3. Impact on staff morale

Likert scale (5 point) responses in all domains: 1=strongly disagree / 3=neutral / 5= strongly agree. Median scores and ranges calculated for each response. Statistical significance of differences between response scores in domain 1 was assessed by Mann-Whitney test.

**Results** Response rate: 229/339 = 68% of PICU staff.

QUESTION	Question	Median score (IQR)
1	I learn best from studying good practice	4 (4-5)*
1	I learn best from studying others' mistakes	4 (3-4)*
1	I learn best from reflecting on my own mistakes	4 (4-5)*
2	ER can improve patient care	4 (4-5)
3	ER can improve motivation	4 (4-5)
3	ER can improve staff morale	5 (4-5)

\*Question 2 score differed significantly from questions 1 and 3 (p<0.001).

**Conclusions:** PICU staff perceive that learning from good practice is as valuable as reflecting on individual error, and both are more valuable than studying the errors of others. This has implications for safety and quality improvement (QI) initiatives: future QI interventions should consider modelling good practice in addition to highlighting error. There is also strong support for ER in terms of perceived impact on morale, motivation and patient care.

## P70



### FLYING HIGH WITH HIGH FLOW

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**Introduction:** The use of non-invasive ventilation (NIV) is becoming more widely used in paediatrics. The reduced side effects of NIV vs invasive ventilation make it a favourable option for delivering respiratory support. High-flow nasal cannula (HFNC) is an evolving method of delivering continuous positive airway pressure. Transportation of critically ill children supported by HFNC is becoming increasingly common. However, the high gas consumption associated limits HFNC's usefulness in transport situations.

KIDS is a centralised paediatric transport service based in the Midlands, UK transporting approximately 800 critically ill infants and children per year.

**Case Summaries:** KIDS have recently completed two air transfers from Birmingham to Newcastle Freemans Hospital, with children receiving high-flow of 20 and 25 litres, a distance of 212 miles, taking 3 hours 51 minutes by road.

The journeys by air take approximately one hour. However they have an increased cost, risk and environmental impact.

KIDS ambulances carry 2x F size air cylinders (3,720 litres), with KIDS trolleys carrying 1x E size air cylinders (680 litres).

A child receiving 20 litres/min HFNC will use approximately 5000 litres by road, as opposed to approximately 2500 litres/min by air. Currently there is no power driven device suitable for transport therefore the only way to deliver HFNC is via a flow meter system.

**Conclusion** Although road transfer is the favoured option due to the increased risks, increased costs and logistical complications, air transfers can be undertaken safely and effectively with suitable planning and communication between all team members and the Air Transport company involved (in this case CEGA).

Future developments include 'TrippLite', who are producing a battery pack for use with Fisher and Paykel's Airvo 2™ device, enabling HFNC transport without the need for large amounts of cylinder air.

## P71



### THE USE OF EPOPROSTENOL PREDICTABLE IN CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT)?

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**Introduction:** At BCH, heparin sodium and epoprostenol are used as circuit anticoagulation during CRRT. Epoprostenol is indicated in thrombocytopenia, recent severe haemorrhage or filter hypercoagulability, defined as loss of two circuits in 24 hours.

Previous research has shown that, when compared with heparin sodium, epoprostenol therapy increases the filter life and reduces haemorrhagic complications (1,2). Cost is frequently cited as a reason for not using epoprostenol. This review aims to establish if there are common characteristics amongst past patients who required epoprostenol, in order to inform future decision making.

#### Methods

- A retrospective database review of patients who required CRRT and use of epoprostenol as circuit anticoagulation between January 2013 to January 2015 (Group A) in a 31-bedded tertiary PICU in the UK.
- Group A's demographics were matched with patients who had required CRRT and heparin sodium as circuit anticoagulation (Group B).

**Results:** During this period, 113 patients received CRRT. Group A (12 patients) had a higher inotrope requirement and worse coagulopathy on CRRT commencement, a longer period of CRRT and had a relatively increased mortality rate when compared with Group B.

**Conclusion:** In our experience, patients requiring epoprostenol are sicker at CRRT initiation. Commencement of epoprostenol only as second line anticoagulation may interfere with their seamless treatment with CRRT. Study limitations are the single centre setting and small sample size. A larger study is recommended.

**References:**

1. Fabbri, L.P., Nucera, M., Al Malyan, M. et al (2010) Regional anticoagulation and aggregation for CVH in critically ill patients: a prospective, randomised, controlled pilot study. *Acta Anaesthesiol Scand*, 54 (1): 92-7.
2. Fiaccadori E., Maggiore, U. and Rotelli, C. et al. (2002) Continuous haemofiltration in acute renal failure with prostacyclin as sole haemostatic agent. *Intensive Care Med*, 28(5): 586-59

## P72



### “MORE THAN A NUMBER TEN YEARS ON” INTRODUCING A SKILL MIX TOOL INTO THE PAEDIATRIC INTENSIVE CARE UNITS

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**Introduction:** In May 2005, nurse staffing levels in Paediatric Intensive Care Unit (PICU) were 57% of that recommended by the Paediatric Intensive Care Society guidelines equating to forty whole time equivalent nursing vacancies. This was a source of significant concern from a workforce planning and patient safety perspective. Following aggressive recruitment, nationally and internationally, full staffing was achieved by 2007. The challenge remained in matching nursing skill-set to each specific patient's requirements. The Bristol Enquiry 2001 highlighted that a lack of adequately skilled staff contributed to excessive child mortality.

**Methods:** To assess our current skill-mix we used:

The Benner's Stages of Clinical Competence using adapted criteria for the PICU environment.

Self-assessment Skills Analysis using a training needs analysis tool developed by our PICU Education Team.

**Results:** Results showed our unit was managed on 22% senior staff to 78% Advanced Beginner Novice. The minimum recommended skill mix ratio advised by PICS [UK] is 50:50: novice/advanced beginner to senior.

**Conclusion:** Based on our results, we highlighted the need to achieve and maintain an adequate skill mix to ensure safe practice. The following changes occurred:

- Expansion of the Education Team
- Development of the PICU Foundation Program
- The Expansion of in-service study days.
- Development of the PICU development pathway
- Competency based preceptorship program creation
- Rotation of staff between PICUs

Utilising a skill mix tool identified our staffing issues; it is not just about numbers but more importantly the skills, education and competency of those staff.

Staff skill mix tool has been adopted hospital wide.

Over the last ten years, the Nursing Staff Skill mix tool continues to be used to monitor and pre-empt staffing issues and for future planning.

We have also looked at how demographic and financial changes have impacted on our staffing levels.

## P73



### FAT EMBOLISM IN DUCHENNE MUSCULAR DYSTROPHY

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Fat embolization is a known but often poorly recognised complication of long bone fractures, which are more prevalent following minor trauma in DMD. Presentations may range from asymptomatic to Fat Embolism Syndrome. It's largely a clinical diagnosis (using Schonfeld's criteria) and carries a mortality rate of 5-15%. Management is largely supportive, therefore early identification is key 1, 2.

A 15yr old with DMD presented with difficulty to mobilise following a low impact fall. He was on regular steroids and severely osteopenic. After presenting to his local DGH he was discharged but subsequently presented to a specialist orthopaedic hospital where he was diagnosed with a stable, impacted, left supracondylar femur fracture. After a few hours he developed fever, vomiting, tachycardia, tachypnoea, hypotension and hypoxia. The clinical evidence suggested severe sepsis secondary to pneumonia. He was given antibiotics, intubated, ventilated and received fluid resuscitation and inotrope/vasopressor support. During his 13hr PICU stay he had labile BP requiring significant inotropic support and further fluid boluses. He had a pulmonary haemorrhage and soon after a sudden deterioration with profound hypotension, bradycardia and cardiac arrest. He responded to CPR and one dose of adrenaline. Monitoring displayed signs of cardiac strain and echocardiography confirmed a dilated right ventricle and a slit like left ventricle. The diagnosis of fat embolism was reconsidered. Despite further escalation of care he suffered a second cardiac arrest with no return of spontaneous circulation after 3 cycles of adrenaline.

His presentation retrospectively meets the Schonfeld's criteria. It highlights the importance of a high index of suspicion in considering this diagnosis in patients presenting with acute illness following long bone fractures.

**Reference:** Fat Embolism Syndrome following minor trauma in DMD. McAdam et al. *Neuromuscular disorders*:NMD,Dec2012,vol.22,p.1035-1039.2. Emergency management of fat embolism syndrome. Nissar Shaikh. *Journal of Emergencies, Trauma, Shock*. 2009 Jan-Apr;2(1):29-33.

## P74



### CENTRAL LINES: ADDRESSING THE CHANGES

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**Introduction:** The procedure of changing a short term central line dressing is carried out by nursing staff on a regular basis on the paediatric critical care unit (PCCU). However there is no guidance for staff on the unit to ensure they are providing the most up to date and evidence based care. Central line associated bloodstream infections (CLASBI) is a complication caused by the presence of a central line, with UK incidence of 25.2% in 2012<sup>1</sup>. High standards of care, education and use of insertion and maintenance bundles have proven to reduce the rates of CLASBI.

**Methods:** An audit of nurses' knowledge regarding central line dressing changes was conducted on the unit. Data was collected in the form of a 30 questionnaires which were left in the office for staff nurses to complete anonymously.

**Results:** The response rate for this audit was 28 out of 30. Results showed that 25% of respondents use chlorhexidine to clean the site and that 42.8% change a transparent central line dressing after 7 days, unless visibly wet or soiled which are recommended interventions. It is apparent that current practice on PCCU is not supported by the evidence.



**Conclusion:** Further education is important for staff to minimise the risk of CLASBI, including knowledge of central venous access, infection prevention and demonstration of good aseptic technique. A guideline should be devised to standardise procedures when caring for central venous access and it must be reviewed and updated annually. A maintenance bundle should also be introduced to the unit with compliance audited. Further evaluation of nurse knowledge will be required after the implementation of the above.

**Reference:** Health Protection Agency. English National Point Prevalence Survey on Healthcare Associated Infections and Antimicrobial Use, 2011: Preliminary Data. London. Health Protection Agency, 2012.

P75



## ENHANCING MAJOR TRAUMA TEAM PERFORMANCE USING PAEDIATRIC MAJOR TRAUMA SIMULATION

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**Introduction:** In April 2012, NHS trauma services were restructured leading to the creation of Major Trauma Centres (MTC). Prior to the launch of the MTC in our region, trauma simulations were run to test the new SOPs and to develop roles within the trauma team. Following the simulation training, we noted a reduction in the time taken to drug assisted intubation from 57 to 9 minutes and time to CT in trauma patients from 60 to 20 minutes.

**Method:** In April 2013, funding was secured to expand the paediatric trauma training. A multi-disciplinary education team arranged monthly paediatric trauma simulations within the emergency department (ED). Initially, these simulations concentrated on trauma scenarios with the aim of ensuring key interventions continued to be achieved within national target times and that clinical skill sets, role identification, policy development, standardisation and use of equipment were maintained. These training events allowed the teams to explore the challenging human factors identified in team working; promoted collaborative working with child health and facilitated critical incident reporting, leading to improved governance within the service. We reviewed the paediatric resuscitation room admission data for one year and found that only 11% of admissions related to major trauma.

**Results:** We decided to extend and enhance team training by running scenarios that might present to the medical team but have unrecognised trauma aetiology, for example, status epilepticus as a result of non-accidental injury.

By adding paediatric medical scenarios to major trauma team training, we anticipated greater benefits would accrue to the MDT and patient care in the ED.

**Conclusion:** We believe that a more broad based, regular, point of care, team based simulation programme has improved the care of critically ill and injured children in the ED.

P76



## AN EVALUATION OF PARENTAL SATISFACTION IN NOTTINGHAM PAEDIATRIC CRITICAL CARE UNIT

F. Connell, *Nottingham Children's Hospital, UK*

**Introduction:** To ensure the best possible care is being provided to families of critically ill children and help reduce known high levels of stress and anxiety caused by a PICU admission, appropriate support is paramount.

An audit was undertaken to evaluate parental needs and support in Nottingham Paediatric Critical Care Unit. The findings were compared

with local and national guidance. The aim of the audit was to identify areas of development which could improve parental experience, in line with Paediatric Intensive Care Standards for the support of families in PICU (PICS 2010).

**Methods:** A parent questionnaire was developed using the existing baseline standards from PICS (2010) in which to evaluate adherence to national standards and quality of care. Questions were asked pertaining to five categories of; environment and facilities, information and access, participation in care, provision of support (physical and psychological) and professional attitude of staff members. Questionnaires were distributed face-face prior to discharge from PCCU and confidentiality preserved through the use of a sealed envelope and postal box.

**Results:** A high correlation with the recommended standards was demonstrated from the results obtained, showing predominately a high level of satisfaction from respondents. Some areas for improvements in the service provided have been identified, and an appropriate action plan developed for implementation of future developments.

**Conclusion:** Overall, a useful study to ascertain the views of parents on PCCU and subsequently propose the development of practice where required. The audit has continued as an ongoing evaluation and is proving to be a useful tool for parental feedback and ongoing service development.

**Reference:** Paediatric Intensive Care Society (2010) Standards for the care of critically ill children. 4th Edition. PICS. London. June 2010.

P77



Poster Withdrawn

P78



## OPEN OR CLOSED ENDOTRACHEAL SUCTION IN HIGH-RISK SINGLE VENTRICLE INFANTS AFTER SURGERY

L. N. Tume, P. Arnold, P. Baines, R. Guerrero, R. Johnson, A. Kalantre, S. Lane, R. Ramaraj, P. Ritson  
*Alder Hey Children's NHS Trust and UCLan, UK*

**Background:** Endotracheal suction (ETS) is a high risk procedure in infants with single ventricle physiology and an unstable pulmonary to systemic blood flow, and can lead to considerable instability and potentially cardiac arrest in the early post-operative period. Yet, endotracheal suction is an essential procedure to prevent tube occlusion.

**Aims:** To determine the effect of endotracheal suction in the first 48 hours after high risk infant heart surgery on the ICU and to compare open and closed suctioning techniques in these infants.

**Method:** A randomised crossover trial is being undertaken in a single cardiac surgical centre. In the first 24-48 hours after surgery, infants were randomised to receive closed or open suction method in a different order. Physiological and echocardiographic measurements were taken for non-urgent ETS whilst the infants were sedated and muscle-relaxed.

**Results:** Six infants with single ventricle physiology have been recruited so far, three infants after Norwood-Sano, one modified blalock-taussig shunt and two after pulmonary artery banding, with a median age 7 days (2 - 58). On descriptive analysis there appears to be no marked

difference in heart rate, blood pressure, cerebral NIRS, oxygen saturation or flow velocity on echocardiography between the open or closed suction method. Recovery times from ETS were generally rapid.

**Conclusions:** Recruitment continues for this study to enable a larger sample size to provide definitive results.

P79



### NURSE LED URINARY CATHETER MANAGEMENT TO REDUCE CATHETER ASSOCIATED URINARY TRACT INFECTIONS IN PAEDIATRIC INTENSIVE CARE

*K. Baptiste, PICU, Bristol Children's Hospital, UK*

**Background:** Indwelling urinary catheters are often required by patients in PICU. However, they carry risk of the child contracting a Catheter Associated Urinary Tract Infection (CAUTI). The UK's epic3 guidelines set forth strategies to reduce this risk.

**Method:** To identify where unit practice could be improved by the bedside nurse, results of the NHS safety thermometer for infection control<sup>2</sup> and a snapshot audit were compared against the epic3 guidelines, noting the areas that 100% compliance was not achieved. A literature review established what CAUTI reducing methods are evidenced as effective in paediatrics and how these methods were implemented.

**Findings:** Urinary catheters should only be inserted when appropriate criteria is met and should be avoided if possible. Rationale for insertion should be clearly documented, assisting in identifying when the catheter is no longer necessary. Prompt removal of urinary catheters is accepted as reducing the risk of infection. This can be achieved by ensuring clear individual responsibility for questioning need. It is suggested that this could be a senior nurse acting as a 'champion' for catheter removal.

**Conclusions:** With education, a PICU bedside nurse could be empowered to implement a variety of methods to reduce the CAUTI risk to their patient. The effectiveness of these methods can be audited alongside the NHS safety thermometer.

#### References:

1. Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A et al. epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England. *Journal of Hospital Infection* 2014; 86(S1) pS1-S70
2. Department of Health. Catheters and UTI's Falls VTE Pressure Ulcers Delivering the NHS Safety Thermometer CQUIN 2013/14. London: The Stationery Office; 2013

P80



### DO RED BLOOD CELL TRANSFUSIONS LEAD TO CHANGES IN THE BLOOD GAS PARAMETERS OF CHILDREN ON A PAEDIATRIC INTENSIVE CARE UNIT?

*F. Finch, J. Pappachan  
PICU, Southampton Children's Hospital, UK*

**Introduction:** 15-50% of children on paediatric intensive care units (PICUs) receive red blood cell (RBC) transfusions. Associated complications include metabolic derangements including alterations to the recipients' blood biochemistry. The extent of this change might relate to immunologic changes during RBC storage, and consequent alterations to the RBC unit.

Studies in critically ill adults have reported hyperkalaemia and metabolic acidosis following massive transfusion.

The metabolic consequences of transfusion may be exaggerated in paediatric patients, especially those who are critically ill, due to the larger

transfusion to total circulating blood volume ratio.

This study aims to investigate whether RBC transfusions alter the blood gas parameters of PICU patients, specifically pH and electrolyte levels.

**Methods:** This prospective study included children receiving RBC transfusions whilst on PICU. Arterial blood gas samples, taken 30 minutes prior and 30 minutes post RBC transfusion, as part of routine care, were analysed. A 0.5ml sample was taken from the donor RBC unit and analysed, allowing us to describe the biochemical alterations as a consequence of RBC transfusion.

**Results:** Statistical analysis was focussed on several pre-selected variables: pH, H<sup>+</sup> concentration, potassium, calcium and lactate. The results show that there is a significant difference between the value within the donor RBC unit and the pre-transfusion value of the recipient. However, the significant difference is not shown between the pre-and post-transfusion values, when adjusting for both volume transfused and the donor RBC unit value.

**Conclusion:** Current results do not show a significant difference in any of the tested variables. Further analysis should be performed with a larger, more representative sample size, in order to identify any association between RBC transfusions in PICU patients and consequent alterations in blood gas parameters.

P81



### A PROSPECTIVE OBSERVATIONAL STUDY OF CLINICAL OUTCOMES AND FLUID BALANCE FOLLOWING CARDIAC SURGERY IN CHILDREN WITH CONGENITAL HEART DISEASE

*K. K. Makuloluwa, J. Pappachan  
Southampton Children's Hospital, UK*

**Introduction:** Fluid overload (FO) frequently complicates the post-operative course of paediatric congenital heart surgery (CHS). Although largely attributed to cardiopulmonary bypass (CPB)-related hemodilution and increased capillary permeability, post-operative acute kidney injury (AKI) and aggressive fluid resuscitation may also contribute to FO. Consequently, FO can impair pulmonary, renal and cardiac function. We assessed the influence of the duration of CPB and post-operative positive fluid balance on: LMV, vasoactive-inotrope score (VIS) and LOS in PICU and hospital.

**Methods:** A prospective observational study of 50 consecutive patients  $\leq 18$  years of age undergoing correction/palliation of CHD. Clinical and laboratory data were acquired from patient notes and PICU observation charts.

**Results:** Patients with positive fluid balance on post-operative day (POD) 0 (54%) had longer CPB time ( $p \leq 0.001$ ), longer PICU ( $p < 0.01$ ) and hospital LOS ( $p < 0.01$ ) and higher VIS on all PODs ( $p = 0.055$ ;  $p \leq 0.001$ ;  $p < 0.01$ ;  $p < 0.05$ ). Longer CPB time predicted a larger positive cumulative fluid balance (CFB) on POD 0 ( $p < 0.01$ ) and higher VIS on POD 0-2 ( $p \leq 0.01$ ;  $p \leq 0.001$ ;  $p \leq 0.001$ ). A higher positive CFB on POD 0 was a risk factor for longer LMV ( $p < 0.05$ ). A greater LMV ( $p \leq 0.001$ ) and more positive POD 0 CFB ( $p < 0.05$ ) predicted longer PICU LOS.

**Conclusion:** Post-operative positive CFB and longer CPB-duration is associated with worse outcomes in children after CHS. These peri-operative risk factors could help refine interventions designed to improve short and long term post-surgical outcomes in these patients.



## IMPROVING HUMAN FACTORS IN PICU: INTRODUCTION AND SUBSEQUENT UPTAKE OF AN AIRWAY SAFETY CHECKLIST

M. J. Addin, M. McCarron, C. J. Begg  
Royal Hospital for Sick Children, Glasgow, UK

**Introduction:** Airway procedure safety is essential in anaesthesia and intensive care, and is audited nationally<sup>1</sup>. Intensive care patients differ from elective anaesthetic patients in terms of preparedness and stability for intubation<sup>2</sup>. The PICU population represents a particularly high-risk group. All career trainees in Paediatric Intensive Care Medicine complete minimum 6 months training in Anaesthetics, but most PICM trainees and recently-appointed Consultants are not from an Anaesthesia background.

**Methods:** In 2012, our 22 bedded PICU instituted a safety checklist for all endotracheal intubation procedures. A five-domain list confirms key patient information, equipment information, medication information, team role allocation, planned approach and failed intubation drill.

To assess compliance, we conducted a prospective audit (January-June 2015) using a checkbox in the electronic Clinical Information System records, mapped to the bedside nursing intubation event record to give a denominator.

**Results:** 72 intubations were performed by PICU staff: in 57/72 (79%), the intubation safety checklist was used; 8/72 no reason was documented for non-use. 7/72 documented a reason for non-use: "Consultant Anaesthetist intubating" (3/7); "Used own checklist" (1/7); "emergency reintubation after self-extubation" (1/7); "Emergency Intubation in A&E (2/7)."

**Conclusion:** It is possible to introduce an airway safety checklist in PICU with good compliance. Before introduction, no data was collected on PICU intubation complications. So, while it is not possible to comment on the impact of this intervention, phase two is prospectively auditing such events.

**References:** 1. Cook T, Woodall N, Frerk, C. Major complications of airway management in the United Kingdom (National Audit Project 4). Royal College of Anaesthetists, London, 2011. 2. Simpson GD, Ross MJ, McKeown DW, Ray DC. Tracheal intubation in the critically ill: a multi-centre national study of practice and complications. *Br. J. Anaesth.* (2012) 108 (5): 792-799.



## IMPROVING HUMAN FACTORS IN PICU: STAFF PERCEPTIONS OF AN INTUBATION SAFETY CHECKLIST

M. J. Addin, M. McCarron, C. J. Begg  
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**Introduction:** Airway procedure safety is essential in anaesthesia and intensive care, and is audited nationally<sup>1</sup>. Intensive care patients differ from elective anaesthetic patients in terms of preparedness and stability for intubation<sup>2</sup>. The PICU population represents a particularly high-risk group. All career trainees in Paediatric Intensive Care Medicine complete minimum 6 months training in Anaesthetics, but most PICM trainees and recently-appointed Consultants are not from an Anaesthesia background.

**Methods:** In 2012, our 22 bedded PICU instituted a safety checklist for all endotracheal intubation procedures. A five-domain list confirms key patient information, equipment information, medication information, team role allocation, planned approach and failed intubation drill.

Anecdotally, staff were dissatisfied with the format and wording of the checklist. We therefore conducted a qualitative web-based survey to assess staff attitudes and inform design of a new checklist.

**Results:** 30/119 (25.2%) PICU medical and nursing staff completed the survey, with general agreement on the utility of intubation safety checklists. The majority perceived an improvement in patient safety. Their qualitative comments cannot be reproduced within this abstract, but were analysed using word clustering software for presentation.

**Conclusion:** The response rate to this survey was small, open to selection bias and may not be representative. Among respondents there was support for the idea of an intubation safety checklist and a positive view of its effect on patient safety. Information from this survey will be used to revise and field test version two of our checklist.

### References:

1. Cook T, Woodall N, Frerk, C. Major complications of airway management in the United Kingdom (National Audit Project 4). Royal College of Anaesthetists, London, 2011. 2. Simpson GD, Ross MJ, McKeown DW, Ray DC. Tracheal intubation in the critically ill: a multi-centre national study of practice and complications. *Br. J. Anaesth.* (2012) 108 (5): 792-799.



## THE IMPACT OF DIFFERENT MORTALITY PREDICTION TOOLS ON THE PREDICTED MORTALITY OF A COHORT OF PATIENTS WHO DIED IN PICU

S. D. Playfor<sup>1</sup>, M. Lees<sup>2</sup>

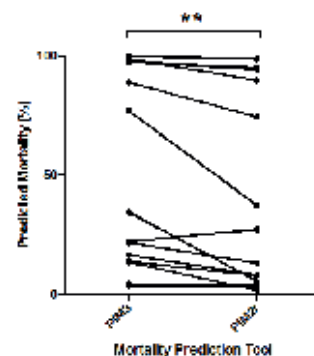
<sup>1</sup>Paediatric Intensive Care Unit, Royal Manchester Children's Hospital, Manchester, UK <sup>2</sup>University of Manchester Medical School Stopford Building, UK

**Introduction:** The performance of Paediatric Intensive Care Units is in part judged by their Standardised Mortality Ratio (SMR). The use of different versions of the Paediatric Index of Mortality (PIM) Score can have a dramatic impact on the predicted mortality of a cohort of PICU patients. In order to investigate this effect we retrospectively calculated the predicted mortality of a cohort of patients who died in our PICU during 2012 using three different versions of PIM; PIM2, PIM2r and PIM3.

**Methods:** 44 patients died in our PICU in 2012. Complete sets of notes were available for up to 40 patients within the timeframe allowed for this study; incomplete records meant that data from a reduced number of patients were available for comparison of some versions of the PIM Score. A retrospective calculation of PIM2, PIM2r and PIM3 scores was undertaken from the clinical records, and the results of these compared.

**Results:** There were statistically significant differences between the predicted mortality of patients comparing each evolution of the PIM Score: Paired t-Test analysis of 40 patients' data demonstrated that PIM2r predicted a significantly higher mortality when compared to PIM2 (P=0.0002). Analysis of 16 patients' data demonstrated that PIM3 predicted a significantly higher mortality when compared to PIM2r (p=0.0021) [Figure 1].

Figure 1.  
Predicted mortality of PIM3 Vs PIM2r



**Conclusion:** Differences in the scoring systems used in each evolution of the PIM Score mean that the same cohort of patients will have a significantly different predicted mortality according to whether PIM2, PIM2r or PIM3 scores are used. This highlights the fact that the changes in SMR of PICUs admitting different populations of patients will vary considerably when PICANet outcome data changes from using one generation of the PIM Score to the next. This should be taken into account when judging unit performance.

# Acknowledgements

## Special "Thank yous"

... go to our conference organiser, Index Communications Meeting Services, all the staff at the International Convention Centre and at Austin Court and of course the many volunteers making everything run smoothly!  
... most importantly to the members of the pre- conference workshop and masterclass faculty, the annual conference scientific faculty, the session chairs and the Organising Committee members who have dedicated their time and expertise to create this conference and be with us in Birmingham.  
... and lastly to all those authors who submitted abstracts and shared their work with us all.

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We help our customers improve patient safety, satisfaction, increase hospital efficiency and productivity through our solutions, which are installed in more than 1,000 hospitals and healthcare facilities worldwide.

Vocera Voice provides voice driven, hands-free, communication across the care continuum driving better outcomes and experiences for patients and care providers.

Vocera Messaging securely enables critical messaging and alerting communication to highly mobile care teams, ensuring faster response to patient needs.

Vocera Alarm Management improves the ability to prioritize and respond to critical alarms by providing contextual evidence such as waveforms and vital signs in real-time on smartphones and tablets. It also improves patient safety and care team satisfaction by empowering the care team to act more efficiently, and make more informed decisions that drive positive patient outcomes.

### Contact Details

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# Sonosite

FUJIFILM SonoSite Ltd



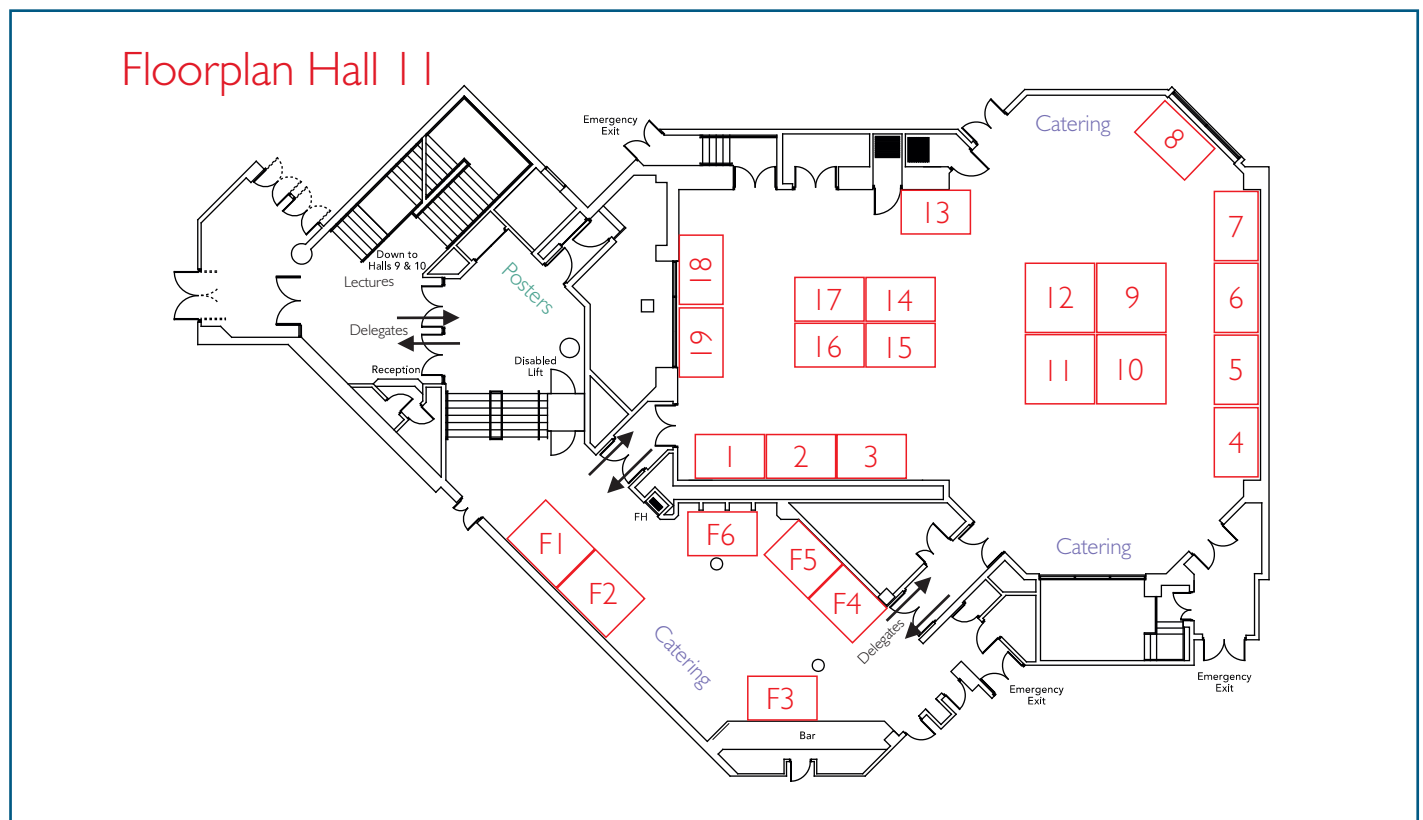
Stand  
**19**

Bedside ultrasound has become a valuable tool for physicians working in critical care environments to obtain immediate clinical information, improve patient safety, increase efficiency, and decrease complications. FUJIFILM SonoSite has been active in critical care ultrasound for many years and has designed its products with extensive input from intensivists. SonoSite's portable, compact, systems are expanding the use of ultrasound across the clinical spectrum by cost-effectively bringing high-performance ultrasound to the point of patient care. For more information, visit: www.sonosite.co.uk.

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## BIOPATCH®

**Protective Disk with CHG**

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*BIOPATCH® is a chlorhexidine impregnated sponge dressing for preventing infection through intravenous access devices: the only antimicrobial dressing to be supported by an evidence base of 14 Randomised Controlled Trials for the prevention of CRBSIs. BIOPATCH® is proven to reduce the risk of these infections by up to 69%. This innovative technology has been awarded a Class B Recommendation from the new EPIC 3 Guidelines, a Category 1B recommendation from the Centres for Disease Control & Prevention (CDC) as well as a 1A recommendation from Health Protection Scotland (HPS) and similar recommendation in SARI guidelines (Ireland). BIOPATCH® has a Class A recommendation from the American Paediatric Surgical Association.*

# Notes

# PICS 2016 Southampton

hosted by

SOUTHAMPTON

Children's Hospital

Save  
the Date

3rd- 5th October 2016  
*The Ageas Bowl, Southampton*

Key themes we are interested in are patient pathways and how PICU is integrated into its wider environment. Emergency and pre-hospital care provide a good illustration of how patients flow into PICU and indeed how PICU can be involved in preparing for that journey and will therefore be a focus.

Southampton's history of research in foetal origins of adult disease and its combined adult paediatric and neonatal medical campus underscore the interconnectedness of modern medical life. We want to see this reflected in our conference by inviting adult speakers from backgrounds of interest to PICU such as adult critical care and GUCH. In addition to the core

fields of PICU activity we also intend to highlight some neglected areas such as sleep and nutrition. Finally given the wider financial and political environment we operate within, we hope to be in a position to field some speakers who can give us some insight into the political side of planning and delivering paediatric critical care.

We hope there will be something for all and that we can deliver a truly multi-disciplinary conference in a wonderful location on England's beautiful south coast

*Chairman of organising committee: Dr Iain Macintosh  
Chairman of scientific committee: Dr John Pappachan*

