# What happens in childhood sepsis in the UK now?

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## Plan of presentation

- What is the clinical problem?
- How good are we at delivering basics?
  - Define current UK practice of early management of sepsis – focus on pre-PICU management – community acquired infection
  - Identify any deficiencies in current practice
- What can we do to improve the situation?

## What is the clinical problem?

## Sepsis

A syndrome of systemic toxicity resulting from the presence of infectious agents, or their products in the bloodstream

# Meningococcal bacterial DNA load at presentation correlates with disease severity



Hackett SJ et al, Archives of Disease in Childhood, 2002;86:44-46

## **Therapeutic implications**

- Disease recognition antibiotics kill the bugs
- Recognition and management of shock
- Airway management
- Ventilatory management
- Circulation management
- Specific (clever) therapies?

## Specific (clever) therapies?

- Haemofiltration
- ECMO
- Modulators of coagulation
  - rh-APC
  - Protein C
  - Protein S
  - AT III
  - r-tPA
- Anti-endotoxin strategies
  - Polymixin
  - Anti-endotoxin antibodies (HA-1A)
  - rBPI<sub>21</sub>
- Prostacyclin

Current management

 A - Airway B - Breathing **C** - Circulation How good are we at delivering the basics?

### Ninis et al

The role of healthcare delivery in the outcome of meningococcal disease in children: case-control study of fatal and non-fatal cases

BMJ 2005;330:1475

## Ninis et al

- Case-control study of childhood deaths from meningococcal disease (MD)
- Children <17 years who died from MD (cases) matched with 3 survivors (controls)
- 143 cases and 355 controls
- 3 factors associated with an increased risk of death
  - looked after by a doctor without paediatric training
  - failure of sufficient supervision of junior staff
  - failure to administer inotropes
- OR for death was 8.7 (95% CI 2.3 to 33) with two failures, increasing with multiple failures

Confidential Enquiry into Maternal and Child Health



#### Why Children Die: A Pilot Study 2006

May 2008 England (South West, North East & West Midlands), Wales and Northern Ireland

Pearson, G A (Ed) Why Children Die: A Pilot Study 2006; England (South West, North East and West Midlands), Wales and Northern Ireland. London: CEMACH. 2008

# Why Children Die

#### Aims

- To identify all deaths aged 28 days to 17 years 364 days in selected regions in 2006
- To identify avoidable factors via MDT panel review of a subset
- To inform on feasibility of conducting national confidential enquiry into child deaths

#### Why Children Die

- 5 regions in UK: SW, WM, NE, W, NI
- Total of 957 cases
- 75% deaths were "natural"
- In 29% infection was an important contributor
- "Avoidable factors" present in 26% of cases

#### Why Children Die - notable findings

- 1) Data collection method feasible
- 2) Some areas of good practice
- 3) Recognition and management of serious illness in children
- 4) Missed appointments
- 5) Response to the recognition of life limiting illness
- 6) Need for further epidemiological review of deaths
- 7) Complexity of child death
- 8) Role of primary care

### Key Finding 3- recognition of serious illness in children

- Care in non-paediatric unit
- Failure to take history and examine
- Inadequate observation
- Failure to anticipate/recognise complications
- Failure to follow national guidelines
- Errors by very junior and unsupervised staff
- Parents over-reassured

#### 2008 Child Death Review Process

- From April 2008 mandatory data collection on all child deaths and investigation of all unexpected deaths
- Child Death Overview panel
- Identify patterns of death so preventable and avoidable hazards can be identified and reduced

## The PICS sepsis audit

Inwald DP, Tasker RC, Peters MJ, Nadel S; Paediatric Intensive Care Society Study Group (PICS-SG). <u>Arch Dis Child</u>. 2009;94:348-53



#### Carcillo JA et al, Crit Care Med. 2002;30:1365-78

## Inclusion/exclusion criteria

- Children accepted for PICU within 12h of arrival in hospital
- Sepsis "SIRS in the presence of or as a result of suspected or proven infection" needing PICU
- Exclusion criteria: those in whom sepsis/suspected sepsis is not a discharge diagnosis

# Methodology

- 6 months December 2006 May 2007
- Most UK PICUs participated
- Clinical severity at presentation
- Interventions
- Infectious agents
- Outcome
- Web based data collection system
- Data anonymised no consent needed

## Patients

- 200 patients
- 139 (70%) shocked on referral to PICU
- 107 (53%) shocked on arrival to PICU
- Median age 1.13 yrs (IQR 0.24 3.17)
- 85 female, 120 male
- PIM2 predicted mortality 10% (5-16)
- 34 (17%) died
- 184 (92%) ventilated
- 138 (69%) required inotropes
- 24 (12%) required RRT

## Bugs



#### 108/200 patients with positive bacteriology

## Fluids

- Arrival in A&E to PICU
  - -5.4 (3.0 11.6) hours elapsed
  - Total of 50 (20-90) mls/kg fluids given
  - Overall change in BE from –11.9 to 10

# **Binary logistic regression**

- Excluded 7 who died pre PICU
- Outcome death in PICU
- Predictors
  - Total fluid
  - Inotropes used during retrieval
  - Shock at PICU admission
  - Duration of transfer
- ∀ ↑ risk of death if shock present at PICU admission, OR=3.7 (95% CI 1.4-10.2), p=0.008

# Was the algorithm followed?

- ACCM-PALS guideline followed in entirety in only 9/107 (8%) of children shocked on arrival to PICU
- ACCM-PALS guideline followed in relation to fluid and inotrope management in only 39/107 (38%) shocked children

Shocked: 21/107 (20%) not given >60mls/kg fluid Fluid refractory: 16/107 (15%) given no dopamine or dobutamine Dopamine refractory: 25/107 (23%) given no catecholamine

Catecholamine refractory: 32/107 (30%) given no steroid

• WHY?

## What does it mean?

- Systematic patient safety issues in the resuscitation and management of acutely sick children in
  - A&E?
  - Paediatric wards?
  - ICU?
  - In the community?







## Case notes review study

Drs Kim Monroe, in preparation

- 2 year old girl, previously well presented with Group A strep toxic shock
- A&E: Attended A&E 24 h previous with high fever and rash – parents reassured, no antibiotics given
- A&E/Paediatric ward: Presented with clear signs of septic shock, misdiagnosed as gastroenteritis, failure to assess as shock and treat as shock for 12 hours
- Theatres: Inhalational induction despite advice from CATS to contrary - subsequent near-arrest, severe hypotension requiring fluid resuscitation and inotropes

Current management

 A - Airway B - Breathing **C** - Circulation





"If you want to change outcomes on ICU, look at what happens before the patient comes to ICU"

Robert Tasker, PICS conference, Nottingham 2007

## Main sleep agent



- Etomidate
- Fentanyl alone
- Inhalational
- Ketamine
- Midazolam alone
- Morphine alone
- Midazolam/opiate
- Propofol
- Thiopentone

n=119