

**Neonatal Sepsis: A 2006 Update**  
**Dr. Anne Matlow, Hospital for Sick Children, Toronto**  
**A Webber Training Teleclass**

**Neonatal Sepsis**  
**2006 Update**

Anne Matlow MD FRCPC  
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Hospital for Sick Children, Toronto

Hosted by Jackie Daley  
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A Webber Training Teleclass [www.webbertraining.com](http://www.webbertraining.com)

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**Objectives**

1. Identify risk factors for health care associated infections in the NICU
2. Discuss recent advances in the prevention of bloodstream infections in the NICU

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What is the scope  
of the problem?

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**Infection Rates in the NICU**

- Prevalence: 6-33% of admissions  
: 4.8-22/ 1000 patient days
- NNIS Jan-Jun 2004 (m rates/ 1000 pt d)

	BSI	VAP
■ <=1000 g BW =	9.1	3.5
■ 1001-1500 g BW=	5.4	2.4
■ 1501-2500 g BW =	4.1	1.9
■ > 2500 g BW=	3.5	1.4

AJIC 2004;320:470

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**Infection Rates in the NICU**

- Prevalence 3-40 % !!!!! ★
- NNIS Jan-Jun 2004 (m rates/ 1000 pt d)

	BSI	VAP
■ <=1000 g BW =	9.1	3.5
■ 1001-1500 g BW=	5.4	2.4
■ 1501-2500 g BW =	4.1	1.9
■ > 2500 g BW=	3.5	1.4

★ NNIS definitions < 12 months old

AJIC 2004;320:470

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# Neonatal Sepsis: A 2006 Update

## Dr. Anne Matlow, Hospital for Sick Children, Toronto

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#### Why the variability?

- NICU factors
  - % high risk babies
  - Surgical capabilities
  - Staffing ratios
- Patient factors\*
- Clinical practice variation
- Surveillance: definitions and methods

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#### Infection Rates in the NICU

- 3.2-30 / 100 admissions
- NNIS Jan-Jun 2004 (m rates/ 1000 pt d)

	BSI	VAP
■ ≤1000 g BW =	9.1	3.5
■ 1001-1500 g BW=	5.4	2.4
■ 1501-2500 g BW =	4.1	1.9
■ > 2500 g BW=	3.5	1.4

■ Very Low Birth Weight Infants = VLBW

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#### Incidence of Nosocomial Infection Dutch NICU JHI 2004; 57:321

- Modified definitions → ↑ rates  
rate/1000 pt d

Infections	28.6
Infected patients	20.7
BSI	14.9
Patients with BSI	13.9
Pneumonia	7.5
Pts with pneumonia	6.3

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## Risk Factors for HAI in NICU

- Birth weight
- Gestational age
- Invasive devices
- Duration of device use
- Parenteral nutrition
- Surgery
- Nurse understaffing

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## Key Points re: Risk Factors for HAI

- Birth weight
  - Gestational age
  - Invasive devices\*
  - Duration of device use\*
  - Parenteral nutrition\*
  - Surgery
  - Nurse understaffing\*
- \* modifiable

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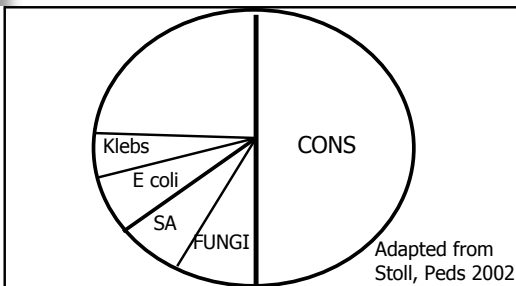
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## Microbiology of Neonatal Sepsis



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Determining the significance of CONS identified in cultures of paired blood specimens from neonates by species identification and clonality

- Paired blood specimens
- Simultaneous
- Peripheral
- 12/13 were identical species with identical genotypes
- Likely true infection

Huang Y-C et al. ICHE 2006; 27: 70-3

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## Risk Factors for BSI

### IN GENERAL

- VLBW
- CVC, duration
- TPN
- IV Lipids and CONS
- prolonged antibiotic therapy

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## Risk Factors for BSI

### CANDIDEMIA

- Catheter days
  - Prior bacterial BSIs
  - GI tract pathology
    - Feja
- PIDJ;2005:147:156

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# Neonatal Sepsis: A 2006 Update

## Dr. Anne Matlow, Hospital for Sick Children, Toronto

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### Risk Factors for BSI

<p><b>IN VLBW INFANTS</b></p> <ul style="list-style-type: none"> <li>▪ ↑ Gram negatives</li> <li>▪ CVC &gt; 10 days, nasal CPAP, H2 blocker/ proton pump inhibitors, GI pathology                             <ul style="list-style-type: none"> <li>▪ Graham PIDJ 2005: 113</li> </ul> </li> </ul> <p><b>CANDIDEMIA:</b> in &lt; 1000g</p> <ul style="list-style-type: none"> <li>▪ Decreasing</li> <li>▪ Rare azole resistance                             <ul style="list-style-type: none"> <li>▪ Fridkin, Pediatrics, 2006:1680</li> </ul> </li> </ul>	
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### Risk Factors for BSI

<p><b>IN GENERAL</b></p> <ul style="list-style-type: none"> <li>• VLBW</li> <li>• CVC, duration</li> <li>• TPN</li> <li>• prolonged antibiotic therapy</li> </ul> <p><b>CANDIDEMIA</b></p> <ul style="list-style-type: none"> <li>▪ Catheter days</li> <li>▪ Prior bacterial BSIs</li> <li>▪ GI tract pathology                             <ul style="list-style-type: none"> <li>▪ Feja PIDJ;2005:147:156</li> </ul> </li> </ul>	<p><b>IN VLBW INFANTS</b></p> <ul style="list-style-type: none"> <li>▪ ↑ Gram negatives</li> <li>▪ CVC &gt; 10 days, nasal CPAP, H2 blocker/ proton pump inhibitors, GI pathology                             <ul style="list-style-type: none"> <li>▪ Graham PIDJ 200: 113</li> </ul> </li> </ul> <p><b>CANDIDEMIA:</b> in &lt; 1000g</p> <ul style="list-style-type: none"> <li>▪ Decreasing</li> <li>▪ Rare azole resistance                             <ul style="list-style-type: none"> <li>▪ Fridkin, Pediatrics, 2006:1680</li> </ul> </li> </ul>
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### Impact of staffing on bloodstream infections in the NICU

- 2675 infants admitted to the NICUs in NY
- Main Outcome Measure Time to first episode of healthcare-associated bloodstream infection.
- 224 infants had HAI-BSI
- RESULTS: nursing hours, BSI
- hazard ratio; 0.21 (95% CI, 0.06-0.79)

Cimiotti Arch Pediatr Adolesc Med. 2006 Aug;160(8):832-6

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## Outcome of BSIs in NICU

- Gram positive: 8.7% mortality
- Gram negative: 26.2%
- Candida: 27.6%

■ Makhoul , Pediatrics 2002;109:34-9

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## Central-Line Associated BSI Bundle

100,000 Lives/ Getting to 0 Campaigns

1. Hand hygiene
2. Maximum barrier precautions
3. Chlorhexidine antiseptics (no recommendation < 2 months of age)
4. Optimal catheter site
5. Daily review of central line necessity

Pediatric Affinity Group: AAP, NICHQ, NACHRI, CHCA

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## Multifactorial Prevention Strategy in VLBW: Australia

Andersen 2005;61:162

### Intervention

1. Hand hygiene
  2. Standardized IV (all) insertion with packs
  3. Skin antisepsis: 2% CHX aq or 1% in EtOH
  4. Removal and/ replacement of PIV at 48 hrs
  5. Remove IVs when enteral intake > 120 ml/kg
- BSI rate from 21% → 9%, but  
4 of 36 (11%) infants < 1000 g had severe  
skin irritation from 2% aqueous CHX

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## Vancomycin-heparin lock solution

Heparinized normal saline (43)

vs

heparinized saline + vancomycin 25u/ml (42)

X 2-3 times daily, 20-60 minutes

⇒ 13/43 (30%) vs 2/42 (5%) developed BSI  
= 7.8 vs 2.3/ 1000 catheter days

No vancomycin resistance or detectable blood levels

A vancomycin-heparin lock solution for prevention of nosocomial bloodstream infection in critically ill neonates with peripherally inserted central venous catheters: a prospective, randomized trial.

Garland Pediatrics. 2005 Aug;116

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## Fluconazole Prophylaxis to prevent fungal infections in VLBW

Why? High mortality rate (27.6% for sepsis)

- Cochrane Database Syst Rev. 2004;(1):CD003850
  - 3 studies eligible;
  - Results: may reduce mortality at discharge
  - (1 fewer death/ 9 infants treated but wide confidence intervals)
- Recent review found reduced fungal colonization and progression of colonization to infection with fluconazole
  - Manzoni Peds 2006;117:214

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**Fluconazole Prophylaxis to prevent  
fungal infections in VLBW**

Final verdict still out  
Encouraging data to date, but single centre data only  
Need well designed multi-center study  
Fanaroff Peds 2006

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**Key Points re: Prevention of BSI**

- Bundle concept: a new paradigm
- Emphasize the basics
- Aim for 0

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**Key Points**

1. Risk factors for health care associated infections in the NICU
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## Key Points re: Prevention of BSI

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## Final Comment

Hand hygiene is the number 1 way of reducing the incidence of health care associated infections



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**The Next Few Teleclasses**

**October 12** *The Changing Role of Infection Prevention and Control as Documented by the CBIC Practice Analysis*  
**Free Teleclass** ... with members of the CBIC Board

**October 19** *Hand Hygiene – Improving Compliance*  
... with Dr. John Boyce, Hospital of Saint Raphael

**October 25** *Urinary Tract Infections in Long Term Care*  
... with Dr. Chesley Richards, Atlanta VA Medical Center

**November 2** *Voices of CHICA*  
**Free Teleclass** ... with CHICA-Canada Board and guests

**For the full teleclass schedule – [www.webbertraining.com](http://www.webbertraining.com)**  
For registration information [www.webbertraining.com/howtoc8.php](http://www.webbertraining.com/howtoc8.php)

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