Small patients, big challenges

Infection prevention for hospitalized children and neonates in Africa

Dr. Angela Dramowski

Hosted by Paul Webber
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Infection prevention challenges among hospitalized children and neonates in Africa

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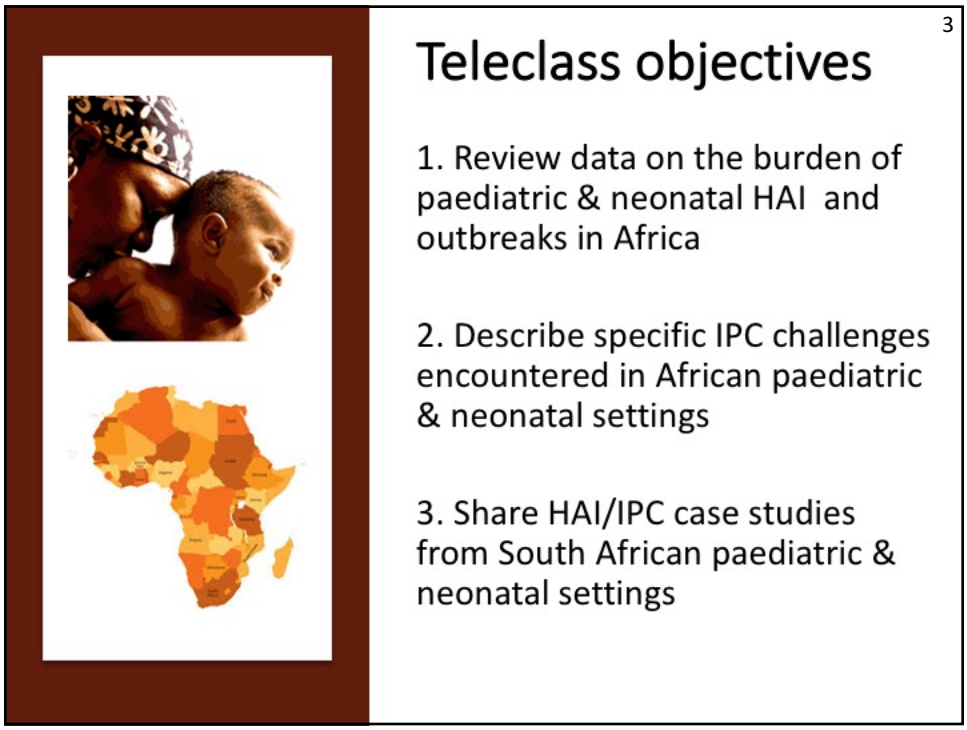
Specialty: Paediatric Infectious Diseases

Disclosures: I have nothing to disclose.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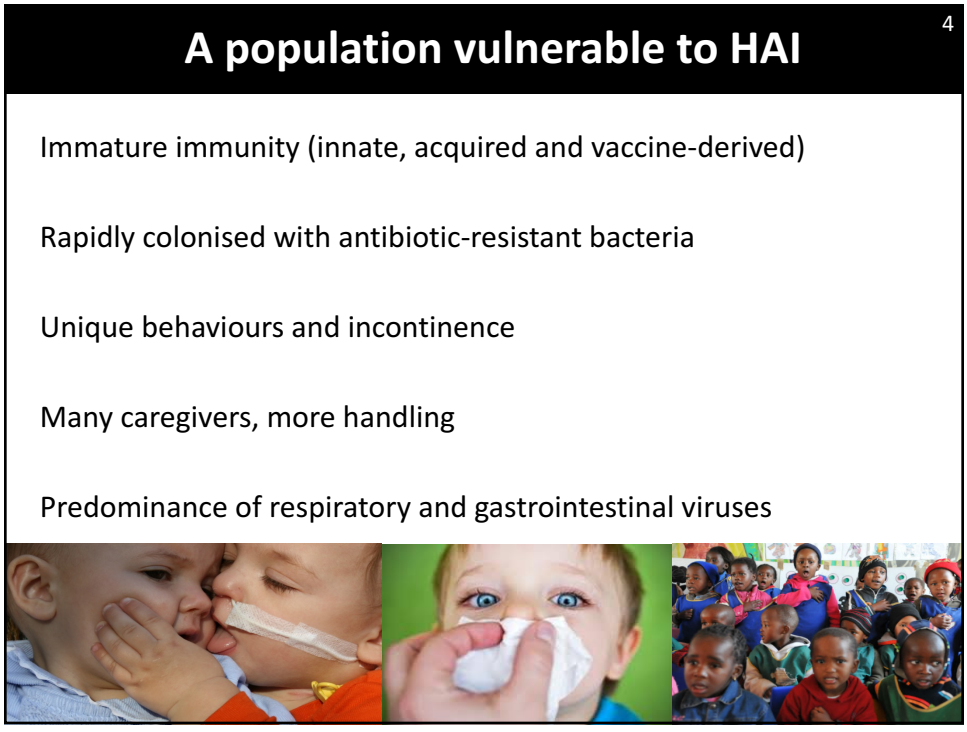
Teleclass objectives
1. Review data on the burden of paediatric & neonatal HAI and outbreaks in Africa
2. Describe specific IPC challenges encountered in African paediatric & neonatal settings
3. Share HAI/IPC case studies from South African paediatric & neonatal settings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A population vulnerable to HAI
Immature immunity (innate, acquired and vaccine-derived)
Rapidly colonised with antibiotic-resistant bacteria
Unique behaviours and incontinence
Many caregivers, more handling
Predominance of respiratory and gastrointestinal viruses

What's different about infection prevention in Africa?

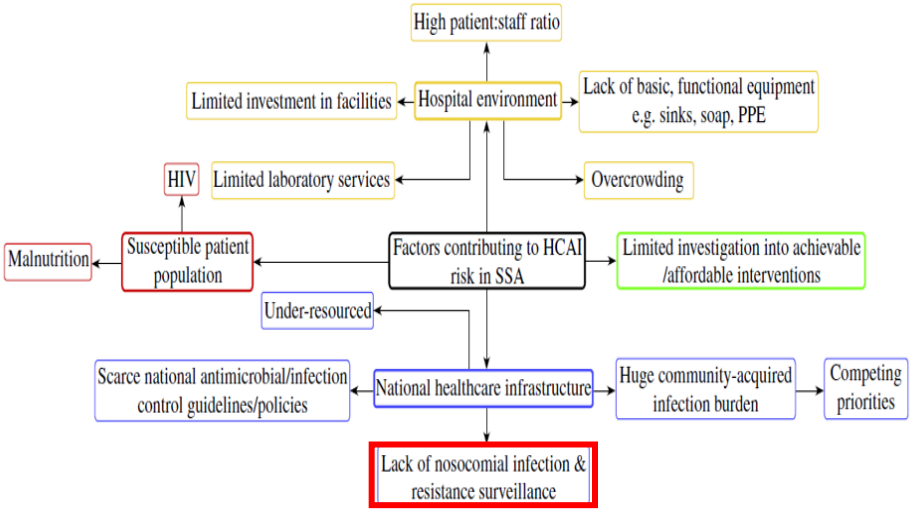
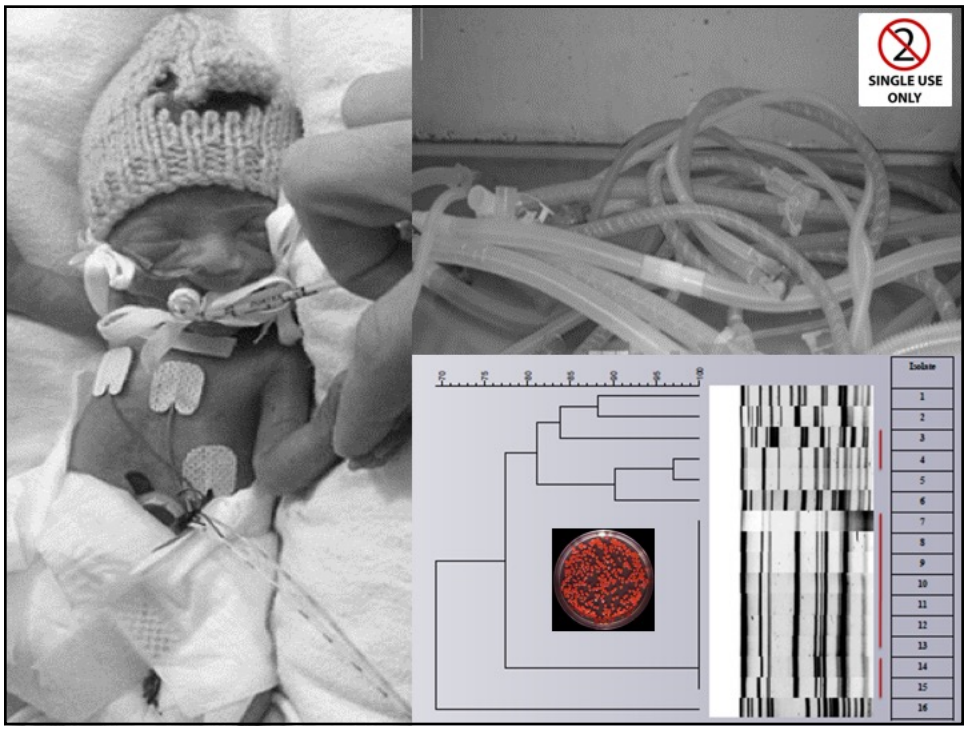


Figure 2. Risk factors contributing to healthcare-associated infection (HCAI) in sub-Saharan Africa (SSA). HIV, human immunodeficiency virus; PPE, personal protective equipment.

Rothe J Hosp Infect 2013



2011 Report on the burden of HAI: neonates

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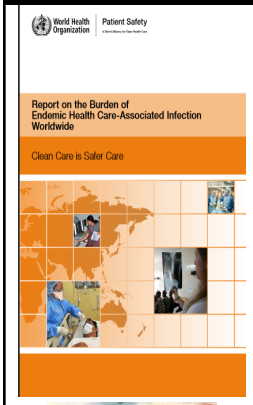

Neonatal infection rates in developing countries 3-20 x higher than in industrialized countries

HAI cause 4-56% of deaths in the neonatal period (majority in SS Africa and SE Asia)

HAI rates in neonatal ICUs are very high with predominance of HA-bloodstream infections and device-associated infections.

VAP and CR-BSI densities were particularly high
VAP = 109 - 143 episodes / 1000 ventilator-days
CR-BSI = 21 - 600 episodes / 1000 catheter-days.

High rates of AMR infections:
- 70% of neonatal BSI not susceptible to an empiric regimen of ampicillin and gentamicin.

African neonatal unit HAI outbreaks

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Hospitalized neonates are vulnerable to infection, with pathogen exposures occurring in utero, intrapartum, and postnatally.

African neonatal units are at high risk of outbreaks owing to overcrowding, understaffing, and shared equipment.

High income neonatal unit experience 10 outbreaks/year;

Burden of neonatal unit outbreaks in Africa is unknown.

Infectious disease exposures and outbreaks at a South African neonatal unit with review of neonatal outbreak epidemiology in Africa

A. Dramowski[a,*], M. Aucamp[b], A. Bekker[a], S. Mehtar[b]

IJID 2016

Tygerberg hospital neonatal unit	African neonatal units 9
Neonatal outbreaks attended by paediatric ID and IPC services from May 2008 - April 2016. - 130 neonatal beds - 6000 deliveries per year - 37% low birth weight rate.	Published reports of neonatal outbreaks in PubMed (January 1996 - January 2016).
Pathogens, outbreak size, mortality, outbreak source, control measures	



Tygerberg hospital neonatal unit	African neonatal units 10
13 outbreaks over 8 years	20 outbreaks over 20 years
148 babies (11 deaths; 7% mortality)	524 babies (177 deaths; 34% mortality)
Viruses: rotavirus, influenza, measles MDR bacteria: *S. marcescens, A. baumannii, MRSA, VRE*	50% of outbreaks were caused by ESBL-producing *K. pneumoniae.*
Source seldom identified; most outbreaks had breaches in IP practices. Outbreaks contained with: stringent transmission-based precautions, staff/parent education, and changes to clinical practices.	

Paediatric HAI prevalence in US, UK = 3-4%

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Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis

Benedetta Allegranzi, Sepideh Bagheri Nejad, Christophe Combescure, Wilco Graafmans, Homa Attar, Liam Donaldson, Didier Pittet

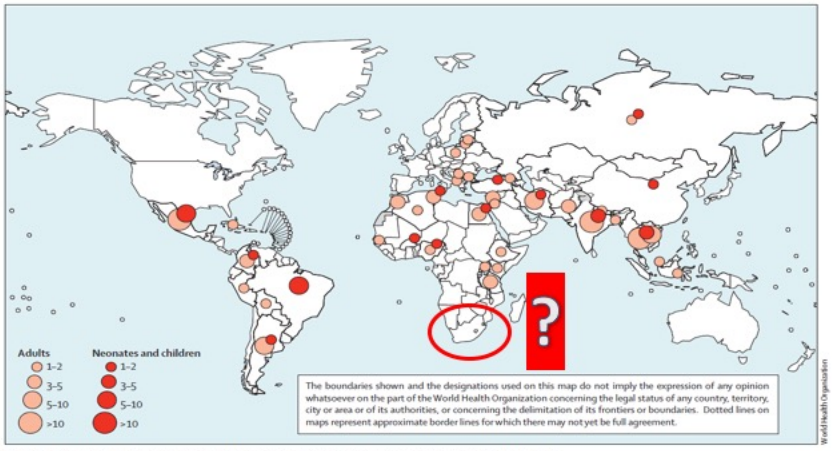

Figure 2: **Number of studies reporting health-care-associated infection in developing countries, 1995–2008**
Size of dots indicates number of studies. Map created with ARCView (version 9.3.1; ESRI, Redlands, CA, USA), using WHO criteria for official borders and disputed borders.

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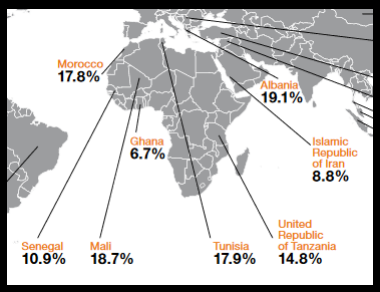
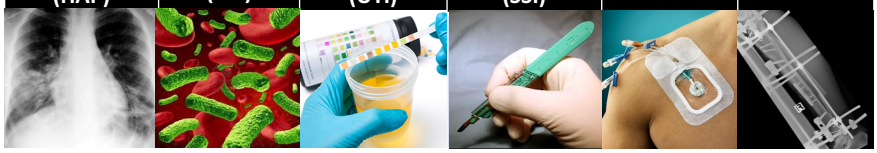


HAI point prevalence studies in Africa:

- **HAI prevalence 10 – 19%**
- **Profile of paediatric infections differs**
- **HAP, BSI and UTI predominate**
- **Less focus on device-associated infections**
- **Very limited evidence base – more research needed!**

Hospital – acquired pneumonia (HAP)	Bloodstream infection (BSI)	Urinary tract infection (UTI)	Surgical site infection (SSI)	Device-associated infection	Others: ENT Gastro Bone/joint



Hospital-acquired bloodstream infections (BSI)

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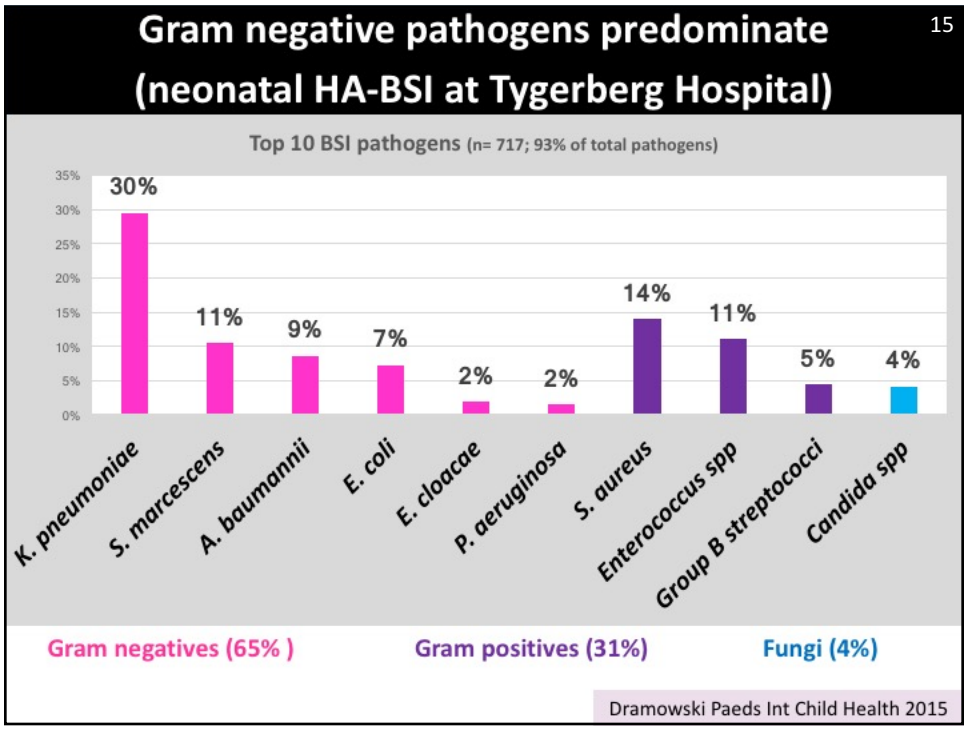
Paediatric HA-BSI:

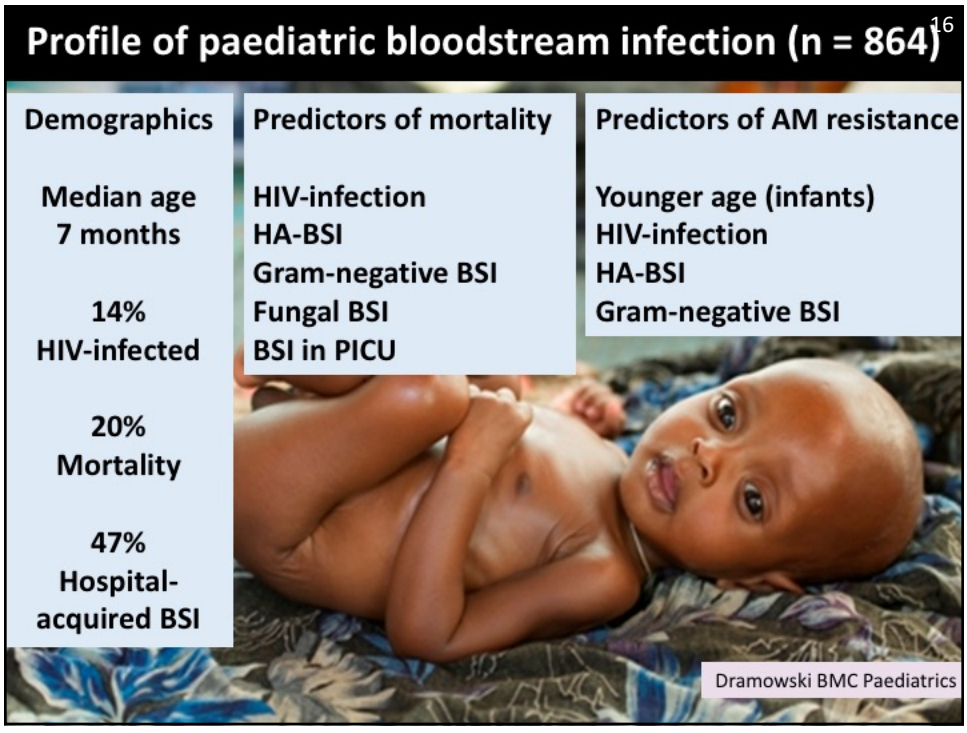
Aiken (Kenya)	1.0 / 1000 patient days (PD)
Dramowski (S. Africa)	1.6 / 1000 PD

Neonatal HA-BSI:

Maoulainine (Morocco)	18 / 1000 PD
Gadallah (Egypt)	14 / 1000 PD
Ballot (S. Africa)	14/ 1000 PD
Spicer (S. Africa)	7 / 1000 PD
Dramowski (S.Africa)	4 / 1000 PD
Landre-Peigne (Senegal)	3 / 1000 PD

Mortality varies by study 20 – >70%


Gram negative pathogens predominate
(neonatal HA-BSI at Tygerberg Hospital)
15
Top 10 BSI pathogens (n= 717; 93% of total pathogens)
35%
30%
25%
20%
15%
10%
5%
0%
30%
11%
9%
7%
2%
2%
14%
11%
5%
4%
K. pneumoniae
S. marcescens
A. baumannii
E. coli
E. cloacae
P. aeruginosa
S. aureus
Enterococcus spp
Group B streptococci
Candida spp
Gram negatives (65%)
Gram positives (31%)
Fungi (4%)
Dramowski Paeds Int Child Health 2015


Profile of paediatric bloodstream infection (n = 864)
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Demographics
Median age
7 months
14%
HIV-infected
20%
Mortality
47%
Hospital-
acquired BSI
Predictors of mortality
HIV-infection
HA-BSI
Gram-negative BSI
Fungal BSI
BSI in PICU
Predictors of AM resistance
Younger age (infants)
HIV-infection
HA-BSI
Gram-negative BSI
Dramowski BMC Paediatrics

Device-associated infections in LMIC countries

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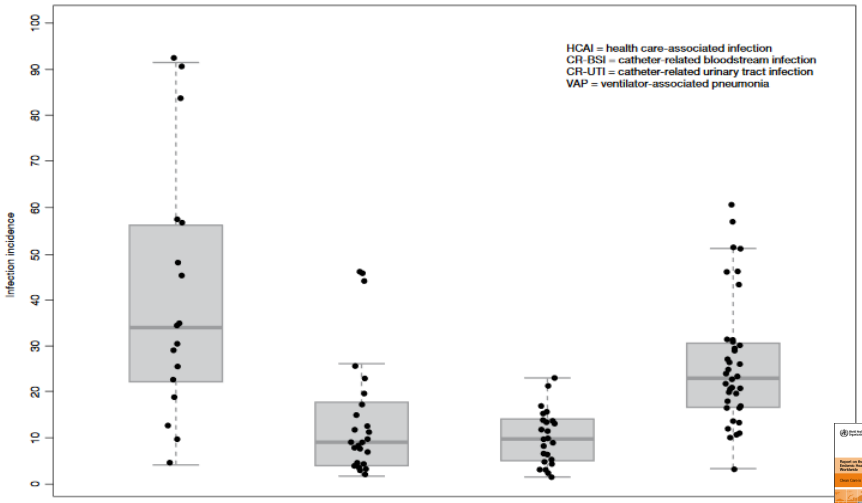
Figure 4.3
Incidence of overall health care-associated infection and device-associated infection in high-risk patients in low- and middle-income countries, 1995-2010



Device-associated HAI at Tygerberg hospital paediatric ICU

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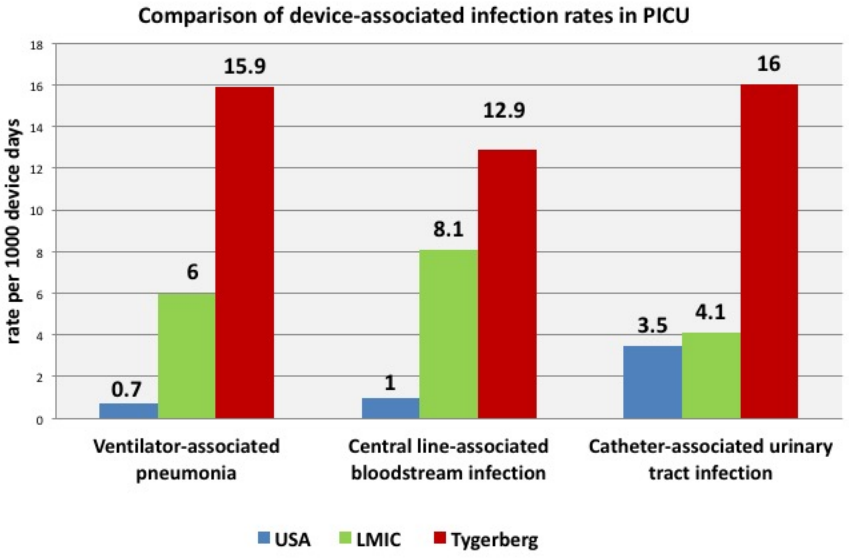

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Burden, spectrum, and impact of healthcare-associated infection at a South African children's hospital

ELSEVIER

Journal of Hospital Infection

Prospective clinical surveillance

applying 2014 CDC HAI definitions

Ward G10
(1 May-31 October 2014)
admission episodes >= 48hrs
(n = 296)

Wards G7, G4 and PICU
(1 May-31 October 2015)
admission episodes >= 48hrs
(n =1051)

Total admission episodes >= 48hrs (n =1347)

Patient demographics
Admissions history
Laboratory investigations
Antimicrobial prescriptions
Information on any HAI event/s

Tygerberg paediatric HAI prevalence vs European CDC

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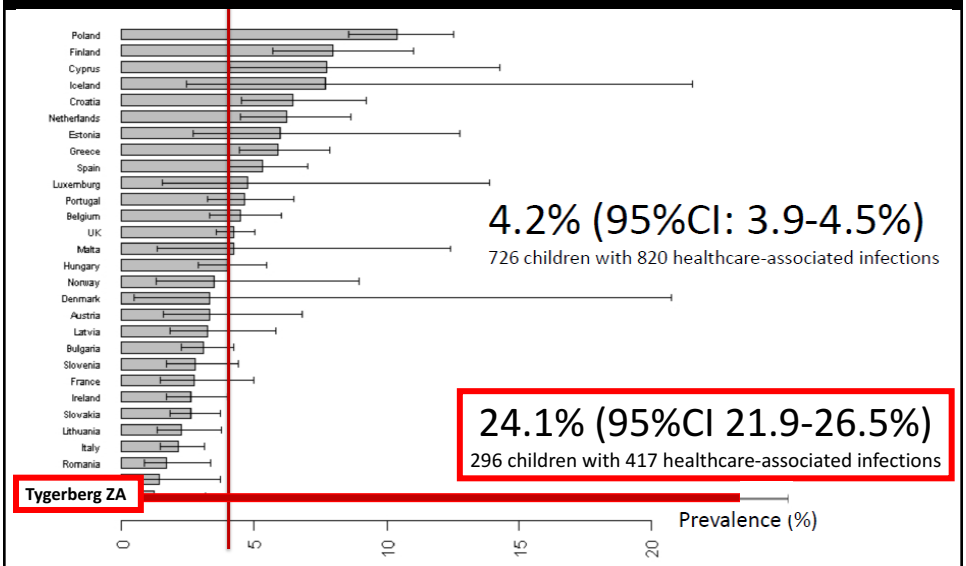

Walter Zingg, Susan Hopkins, Angèle Gayet-Agéron, Mike Sharland

32nd ESPID Conference, 2014, Dublin

HAI burden and spectrum (n = 417 events)

22

Prospective clinical surveillance

applying 2014 CDC HAI definitions

24% HAI prevalence (95%CI 22-27%)

296 children with 417 healthcare-associated infections

Hospital-acquired pneumonia
Presumed HAI
Urinary tract infection
HA-bloodstream infection
Surgical site infection

75%

Skin and soft tissue
Device-associated infection
Other: ENT, bone, gastrointestinal

Clinical predictors of HAI (n = 296 children)

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HIV status
-infected
-exposed

Any PICU stay

Transfer in

Severe malnutrition

Co-morbidities

Indwelling device/s

Outcome and impact of HAI (n = 296 children)

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Re-hospitalisation (21% vs 8%)

Prolonged hospitalization
when compared to 3 ward- and age-matched controls

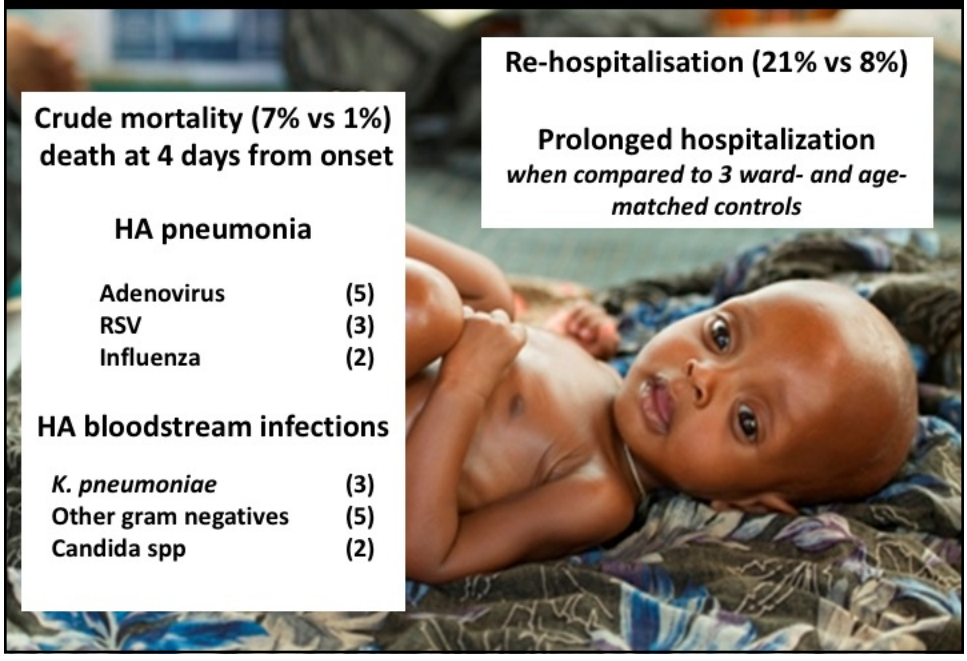
Crude mortality (7% vs 1%)
death at 4 days from onset

HA pneumonia

Adenovirus	(5)
RSV	(3)
Influenza	(2)

HA bloodstream infections

K. pneumoniae	(3)
Other gram negatives	(5)
Candida spp	(2)



Health system impact

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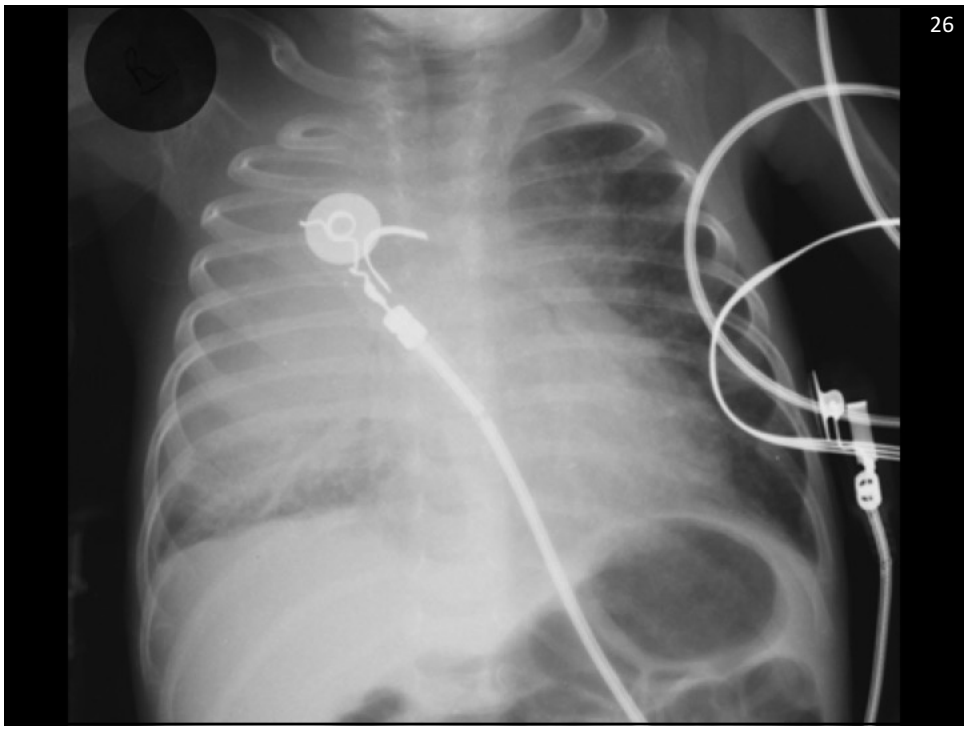
Direct costs*	Hospitalization days	Antimicrobial use	Laboratory investigations
HAP, BSI, UTI, SSI = R5.6 million	2275 excess days	2365 excess Rx days	3575 excess tests
Extrapolation to all TCH wards annually = R60 million	overcrowding inability to admit pathogen reservoir	95% of HAI events = new antimicrobial/s prescription 61% carbapenems	

*Cost calculation = # HAI events x median excess stay x unit cost per patient day (fixed + variable costs: laboratory, radiology, pharmacy)



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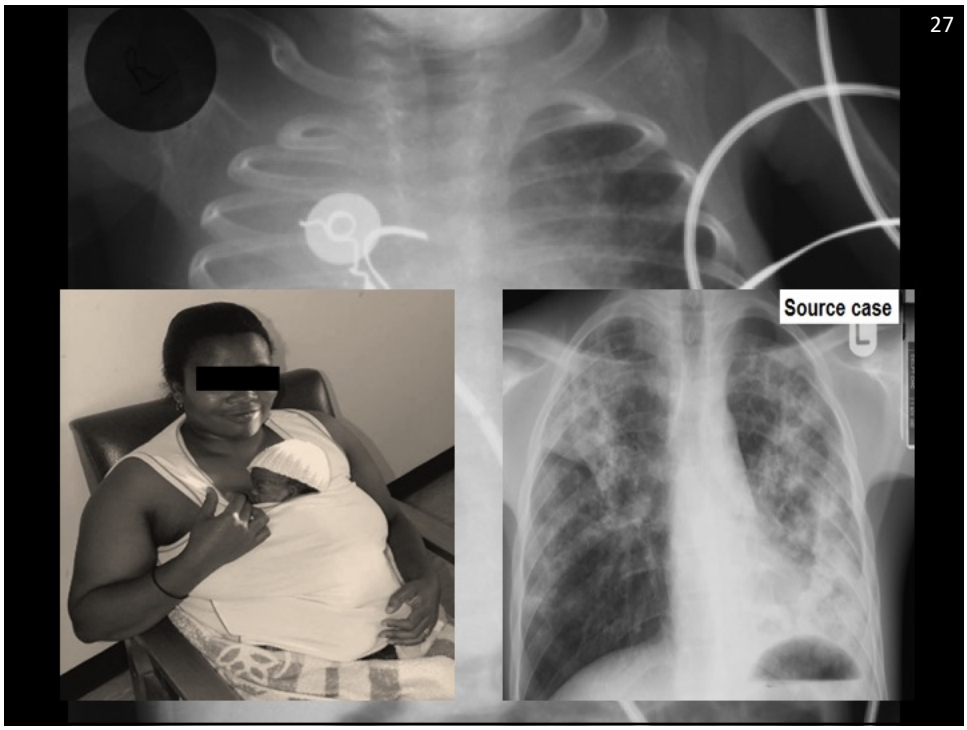

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Dramowski et al. Antimicrobial Resistance and Infection Control (2015) 4:36
DOI 10.1186/s13756-015-0078-z

ANTIMICROBIAL RESISTANCE & INFECTION CONTROL

RESEARCH Open Access

Utilization of paediatric isolation facilities in a TB-endemic setting

Table 1 Paediatric isolation room utilization

Variable	Total	Percentage
Discrete patient isolation episodes	335	100
Median patient age (months)	17	-
Median stay in isolation room (days)	4	-
Indication for isolation		
- infection control (IPC) purposes	260	78
- nursing care	46	14
- palliation/privacy	13	4
- other[a]	16	4
Transmission-based precautions[b] applied	260	100
- airborne precautions	136	52
- droplet precautions	57	22
- contact precautions	67	26
	Mean	Minimum
Isolation room occupancy rate[c]	2172/3294	225/540
	(66 %)	(42 %)

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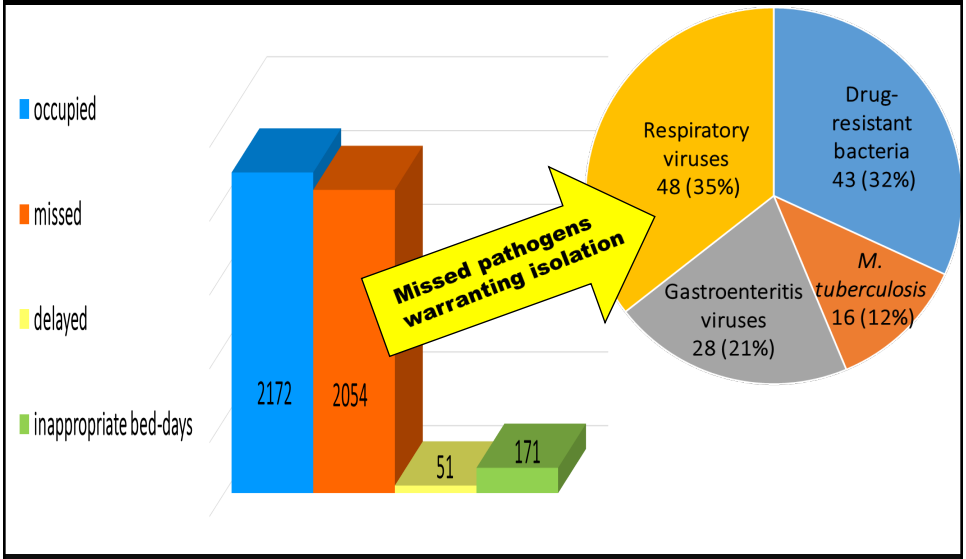
Proportional utilization of isolation bed-days



*missed isolation = laboratory identification of pathogens requiring isolation but patient not isolated

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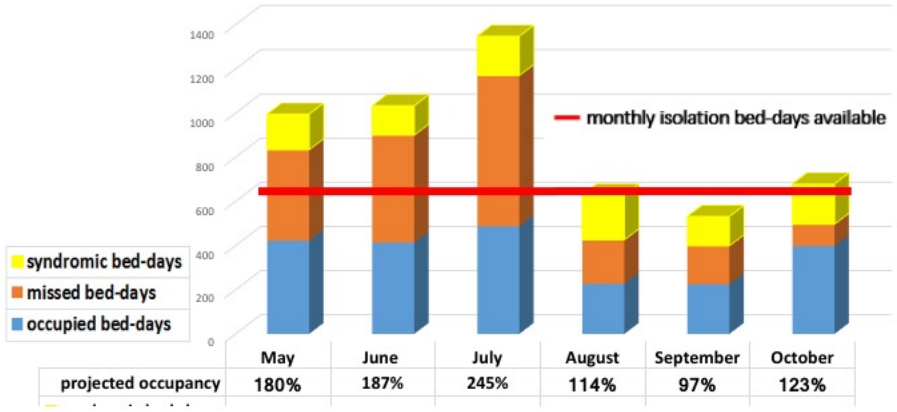
Projected bed demand exceeds availability

Projected occupancy if syndromic isolation were implemented



	May	June	July	August	September	October
projected occupancy	180%	187%	245%	114%	97%	123%

*syndromic isolation = empiric use of patient isolation based on symptoms & signs, prior to laboratory confirmation

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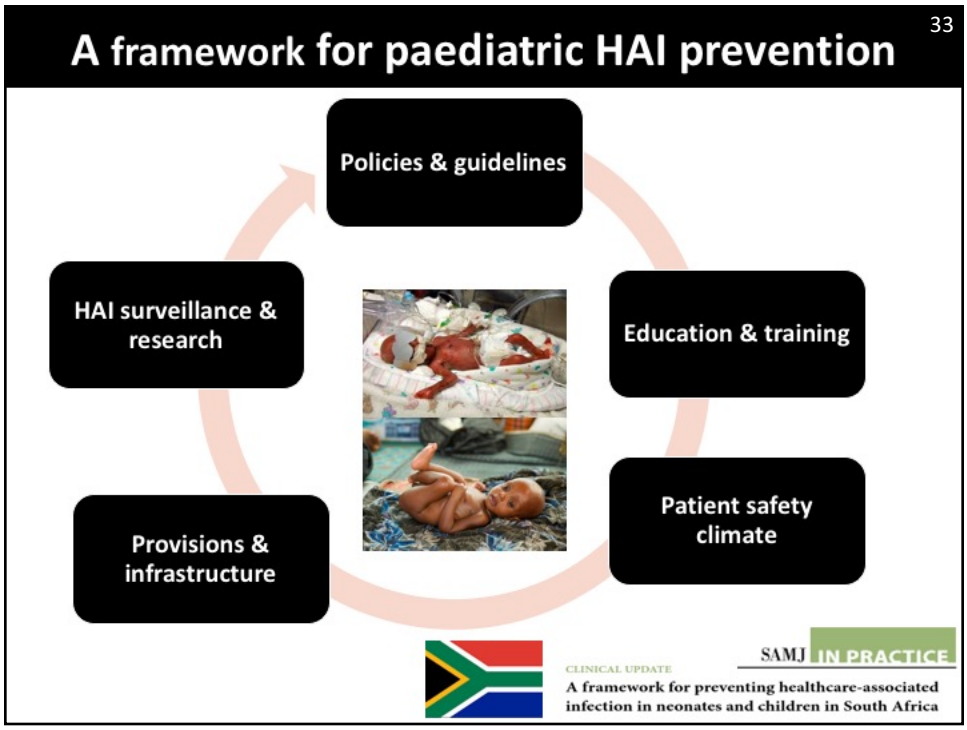
Challenges to HAI prevention in children and neonates

National healthcare factors	The healthcare environment	Patient factors
Competing health priorities	Overcrowding	Malnutrition
High burden of community-acquired infections	High patient to staff ratios	HIV-exposure and-infection
Few resources for IPC implementation	Lack of IPC provisions	Prematurity
Lack of HAI surveillance	Lack of isolation facilities	Chronic diseases
Lack of IPC policies	Ageing infrastructure	High rates of device utilisation
Lack of HCW IPC training	Poor environmental cleaning	High rates of antimicrobial usage
Lack of HAI research	Re-use and sharing of devices and equipment	
	Lack of a culture of patient safety	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A framework for paediatric HAI prevention
Policies & guidelines
Education & training
Patient safety climate
Provisions & infrastructure
HAI surveillance & research
SAMJ IN PRACTICE
CLINICAL UPDATE
A framework for preventing healthcare-associated infection in neonates and children in South Africa


What is known about paediatric and neonatal HAI in Africa
HAI
What is yet to be researched!
YOU CANNOT MANAGE WHAT YOU CANNOT MEASURE.

Infection Prevention For Hospitalized Children and Neonates in Africa
Dr. Angela Dramowski, Stellenbosch University, Cape Town, South Africa
A Webber Training Teleclass

www.webbertraining.com/schedulep1.php

November 9, 2017	CLEANING THE GREY ZONES OF HOSPITALS: LESSONS FROM A COMMUNITY-BASED TEACHING HOSPITAL Speaker: **Prof. Makeda Semret**, McGill University, Montreal
November 13, 2017	*(FREE ... WHO Teleclass)* FACING THE THREAT OF CARBAPENEM-RESISTANT ORGANISM SPREAD: THE NEW WHO INFECTION PREVENTION AND CONTROL GUIDELINES Speaker: **Professor Lindsay Grayson**, University of Melbourne, Australia *Sponsored by the World Health Organization Infection Control Global Unit (www.who.int/infection-prevention/en)*
November 20, 2017	*(FREE South Pacific Teleclass - Broadcast live from the 2017 ACIPC conference)* EVIDENCE CHALLENGES IN INFECTION PREVENTION AND CONTROL Speaker: **Prof. Frank Bowden**, **Dr. Chong Ong**, **Emily Larsen**, and **Prof. Allen Cheng** Broadcast live from the 2017 conference of the Australasian College of Infection Prevention and Control
November 21, 2017	*(European Teleclass)* THE ROLE OF RAPID DIAGNOSTICS IN PREVENTING HEALTHCARE INFECTION

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