



NeoIPC

Protecting our tiniest patients: Strategies for managing NICU outbreaks

CPN Outbreak panel discussion

Moderators: Julia Bielicki, Tuuli Metsvaht

Presentation: Angela Dramowski

Panellists:

Brar Piening – IPC Physician perspective

Christof Dame – Neonatologist perspective

Marta Castro – Neonatal specialist nurse perspective

Marina Aucamp – IPC specialist nurse perspective

Surbhi Malhotra – Microbiologist perspective

Sven Schulzke – Hospital leadership perspective

Aline Wolfensberger – IPC/Implementation Science perspective

Outline of slide set

- Background courtesy of Angela Dramowski
- Summary of a real-life outbreak
- Summary of expert panel discussion
- Top tips from each panelist



Neonatal outbreaks: definitions and detection

Hospitalized neonates are particularly vulnerable to infection

Pathogen exposures may occur in utero, intrapartum, and postnatally

Outbreaks: more cases in a time / place / population than expected

Two or more epidemiologically-linked cases

Modes of transmission



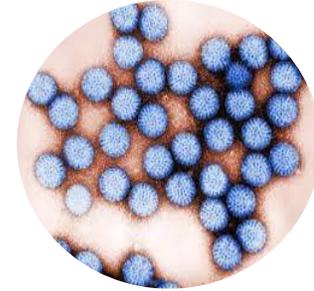
Infection types: bloodstream infections (BSI), urinary, respiratory infections

Detection: routine IPC surveillance, reports from alert clinicians and laboratory

Which organisms cause outbreaks in neonatal units?

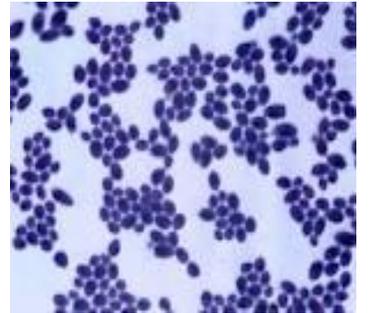
- Bacteria

- *Klebsiella pneumoniae*, *E coli* (ESBL)
- *Acinetobacter baumannii*, *Pseudomonas aeruginosa*
- *Staphylococcus aureus* incl. MRSA
- Emerging pathogens: *Serratia marcescens*



- Viruses

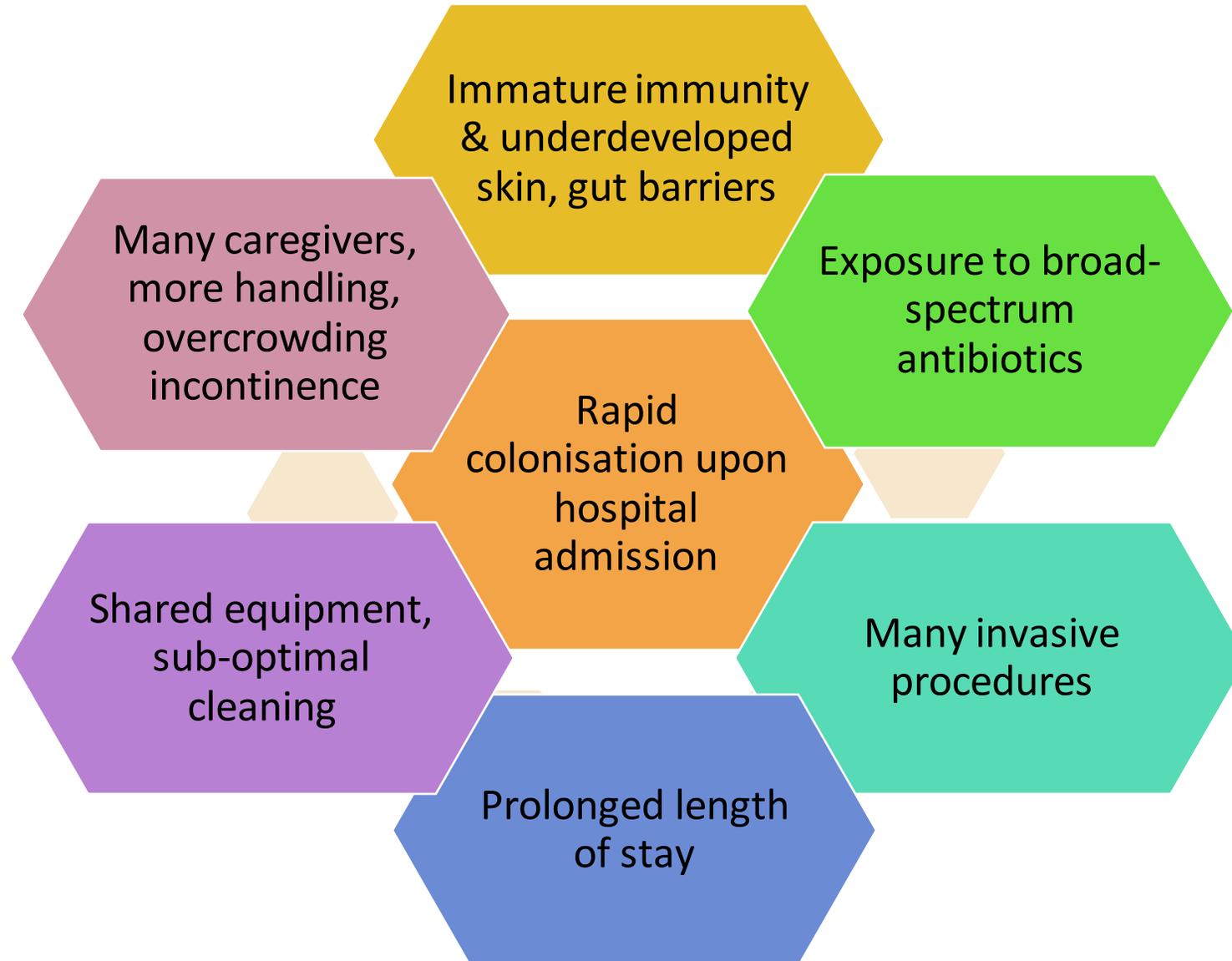
- Rotavirus, Norovirus
- Respiratory syncytial virus, influenza, COVID-19



- Fungi - mostly *Candida* species

Occasionally: Tuberculosis, HIV, Hepatitis B, *Pneumocystis jirovecii*, *Bordetella pertussis*

Why are hospitalized neonates vulnerable to infection?



Neonatal unit outbreak epidemiology

- Neonates are a high-risk population for infections and outbreaks
- NeoKISS: EU neonatal units experience 10 outbreaks/year
- Unknown burden of neonatal unit outbreaks in Africa, likely substantially higher



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Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid



- Tygerberg: 13 outbreaks affecting 148 babies (7% mortality)

- Africa: 20 outbreaks affecting 524 babies (34% mortality)

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

- 50% of neonatal unit outbreaks caused by *Klebsiella pneumoniae*

A. Dramowski^{a,*}, M. Aucamp^b, A. Bekker^a, S. Mehtar^b

Outbreak scenario

- Outbreak occurring in a >130-bedded NICU in an upper middle-income country (South Africa)
- Three infants diagnosed with multidrug resistant *Klebsiella* spp within one week
- Upon assessing a further two colonized infants identified and outbreak declared

Initial containment measures

- Assemble outbreak team
- Close affected cubicles and ensure terminal cleaning
- Cohort isolation of infected and colonized infants
- Intensify hand hygiene + routine cleaning + institute universal contact precautions
- Staff education on transmission/prevention
- Investigate epidemiology of identified pathogen to date

Expert panel

Brar Piening – IPC Physician perspective

Christof Dame – Neonatologist perspective

Marta Castro – Neonatal specialist nurse perspective

Marina Aucamp – IPC specialist nurse perspective

Surbhi Malhotra – Microbiologist perspective

Sven Schulzke – Hospital leadership perspective

Aline Wolfensberger – IPC & Implementation Science perspective



Key points during expert panel discussion

- Collect ALL data/information from as early on as possible
- Good communication is key!
- Define roles and responsibilities and interact frequently
- Be mindful that outbreak management results in a lot of additional work for unit staff, but also to the microbiology laboratory and others
- Therefore, make resources available to the affected NICU to aid outbreak containment
- Focus on interventions that are feasible in the context of the outbreak and are sustainable, e.g. placement of additional ABHR dispensers



Q: When should one sample the environment? Which types of samples to collect?

- A single environmental point source is generally rarely identifiable in NICU resistant bacterial outbreaks
- A database that gives pointers towards "typical" niches for specific pathogens of interest can be used to gauge whether environmental sampling is likely helpful (see top tips from C. Dame).
- A potential source for sampling is also sometimes identified based on careful assessment of shared risk factors
- While sampling may be of limited value, reinforced environmental cleaning (incl. disinfection) is often critical to terminate an outbreak



Q: What is the role of PPE in dealing with resistant bacterial outbreaks in NICU (spec. shoe covers)?

- PPE typically plays a minor role in responding to resistant bacterial outbreaks in NICU, although measures such as wearing of aprons are often implemented
- PPE should be worn in all situations in which contact with bodily fluids may occur as a means of safeguarding contact precautions
- Wearing of gloves is controversial, since this may result in a false sense of security among staff and paradoxically lead to greater contamination of the environment/cot/incubator
- Shoe covers and hairnets are unlikely to be helpful in the context of resistant bacterial outbreaks in NICU



Q: Is periodical information about the colonization status and the antimicrobial susceptibility of invasive isolates useful in managing outbreaks?

- Such information, if available through on-going surveillance for example, is invaluable in identifying the likely start of an outbreak
- Furthermore, monitoring once all measures to address the outbreak have been put in place is facilitated by on-going surveillance
- Occasionally, surveillance data will provide the first evidence for an outbreak that would not have been otherwise identified
- From an NICU perspective, it is helpful to investigate the epidemiology of the pathogen considered to be causing the outbreak at the level of the whole hospital (e.g. asking the question about maternity units, prenatal units, other paediatric units with shared staff etc)



Q: How important is it to individualise equipment in an outbreak situation?

- A lot of equipment in NICUs cannot be used for just one infant, e.g. ultrasound machines but also incubators
- Disinfectant cleaning should be maximised for all such equipment, with cleaning always taking place before equipment is used to manage a specific infant
- If possible, all materials that are available/affordable as single use pieces should be procured as such; this minimizes transmissions/transfers between infants



Q: How do you implement water-free care?

- Contaminated hospital water supplies has been associated with higher rates of bacterial gram-negative colonization and infection – especially in high-risk settings e.g. ICU. The article below describes how this can be implemented in adult ICUs:
 - Hopman, J., Tostmann, A., Wertheim, H. et al. Antimicrob Resist Infect Control 6, 59 (2017). <https://doi.org/10.1186/s13756-017-0213-0>
- In neonatal settings, water-free care may involve exclusive use of sterile water for:
 - cleaning the perineum after nappy changes
 - oral suctioning and oral care
 - dissolving / reconstituting oral medications
 - feed preparation
 - preferred use of alcohol hand rub by staff and families



Q: When would one consider an outbreak resolved? Once resolved, do you continue to use the IPC measures implemented to address it?

Core question: **Has the problem that induced outbreak management been resolved?**

Depending on the case definition and observations during the outbreak, resolution can be triggered by different observations, e. g.:

- Problematic pathogen eliminated from the population
- Suspected transmissions disproved
- Incidence back to baseline level
- Point source eliminated

In our scenario I'd typically go with “problematic pathogen eliminated from the population” and consider the outbreak as resolved after the last case has been discharged.

Every outbreak management should be concluded in an interdisciplinary and interprofessional “lessons learnt” meeting and a document summarizing the outbreak. There you should decide on the measures to withdraw and the measures to keep.





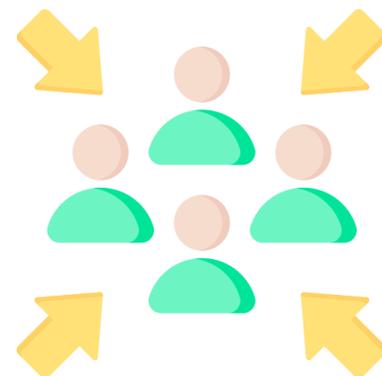
Top tips from our outbreak panel

Top tips from the IPC Physician perspective (Brar Piening)

Good communication and quick access to resources are key – **plan ahead of time**

- Define roles and responsibilities (e.g., IPC link doctor[s], IPC link nurse[s])
- Establish communication channels (e.g., mobile phone numbers, video conference system)
- Establish access to resources you may need (e.g., staff, isolation rooms, diagnostics, genotyping)
- Define trigger events and escalation steps and ensure accurate early communication

Make IPC a routine part of daily life in the NICU! You cannot practice your actual outbreak scenario, but you can practice basic IPC measures and communication and establish mutual trust.



Top tips from the IPC nurse practitioner's perspective (Marina Aucamp)

WRITE DOWN THE DETAILS!

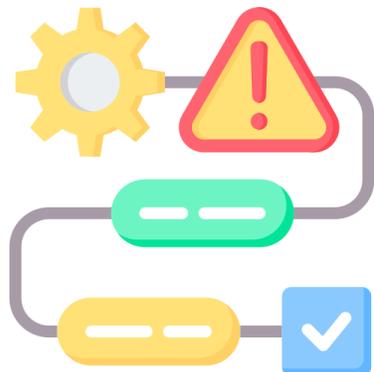
- As soon as you see a cluster and suspect an outbreak, start writing down the details of each case and actions taken
- The details become very valuable to analyze and manage the outbreak
- Add a clear timeline to the events, findings, actions, and outcomes
- The details you need will vary according to the nature of the outbreak



Top tips from the neonatologist's perspective (Christof Dame)

If there is crisis, manage crisis!

- Perform strict cohort and barrier nursing
- Avoid overcrowding and understaffing, stop admissions and transfer patients
- Increase the number of nurses and physicians in the ward, or split the team
- Use only single unit packages and cohort-assigned equipment
- Search common sources of the outbreak, identify risks (areas)
- Search for specific interventions -> <https://www.outbreak-database.com>
- Establish early an outbreak team (incl. hospital director, obstetrics etc.)
- Write (daily) protocols (incl. patients numbers, new findings, tasks etc.)
- Prepare and control internal and external communication



Top tips from the neonatal specialist nurse perspective (Marta Castro)

Protected IPC Nursing Time

Dedicated allocated time to IPC activities

Essential to ensure that all nurses have the capacity to fully implement the defined IPC plan

- Improve Nurse/patient ratio if necessary
- Integrate IPC recommendations in each shift handover as top priority
- Recognize the role of **families** and integrate their education in the nurses' priorities
- Include **ALL Nurses** in knowledge refreshment sessions (formal and informal) to ensure all and each one recognizes their part in fighting the common outbreak "war"

**Priorities
clearly
defined!!!**



- Choose and support champions
(natural leader/person of recognized authority
by the peers) for better engagement

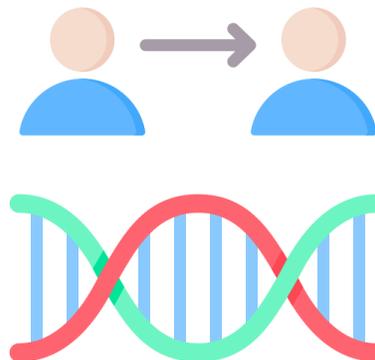
Engagement

(Re) Education!



Top tips from the microbiologist's perspective (Surbhi Malhotra)

- HAI prevention in the NICU is a unique challenge as invasive infection expected to be more frequent than in other patient groups
- Sources of outbreaks difficult to track but stored samples/strains are very valuable for a retrospective investigation and to plan future interventions
- Common sources are infected patients, colonized parents and personnel but also surface microbes!
- Important role of routine cleaning in managing the NICU microbial ecosystem
- Whole genome sequencing important for establishing cluster (un)relatedness, phylogenetic linkages, and identification of possible transmission pathways



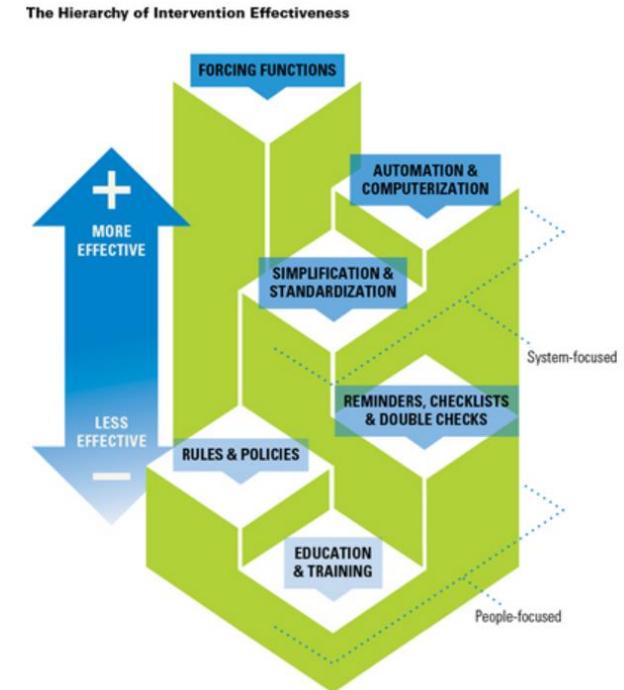
Top tips from the hospital leadership's perspective (Sven Schulzke)

- Be prepared to allocate the required resources
 - Ensure sufficient staffing; Invest in screening, testing, and genotyping
- Communicate calmly and constructively with all involved parties
 - Make sure all staff and parents are aware of the situation and the plans how to resolve it;
 - Inform local collaborators about the situation;
 - Be sure to funnel external communication towards the public through dedicated communications team. Written statements are less likely to be misinterpreted compared to verbal interviews.
- If you renovate or rebuild your unit, learn from past outbreaks to optimize layout of your new NICU in order to reduce likelihood of future outbreaks



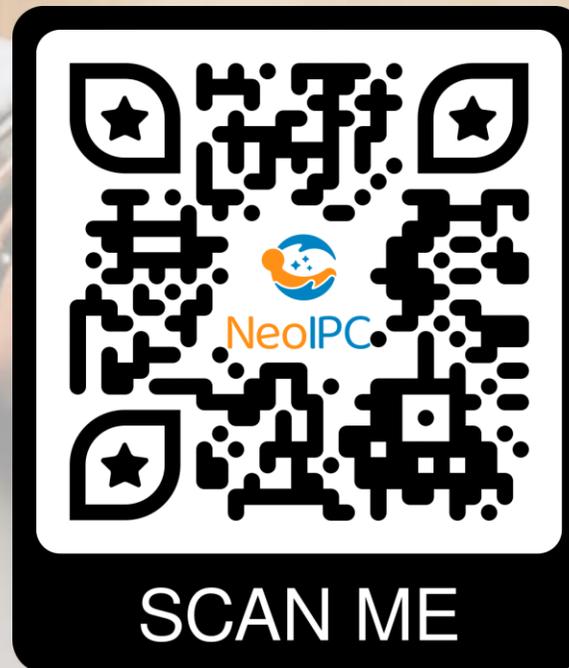
Top tips from the implementation scientist's perspective (Aline Wolfensberger)

- Work with frontline staff to identify IPC-gaps and barriers for adherence early – do observations and talk to stakeholders
- After the outbreak might be before the outbreak: Use the time to more thoroughly identify barriers for IPC adherence
- We don't know what we don't know: consider using models/frameworks (e.g. COM-B, by Michie et al.) as guidance to explore all potential barriers
- Address barriers! Education might not always be the best choice, consider also other (more sustainable) implementation strategies (Caffazzo et al., Hierarchy of intervention effectiveness)



We value your feedback!

Please take 2-5 minutes to complete the survey.



Thank you for your input!





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Thank you for joining!



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