

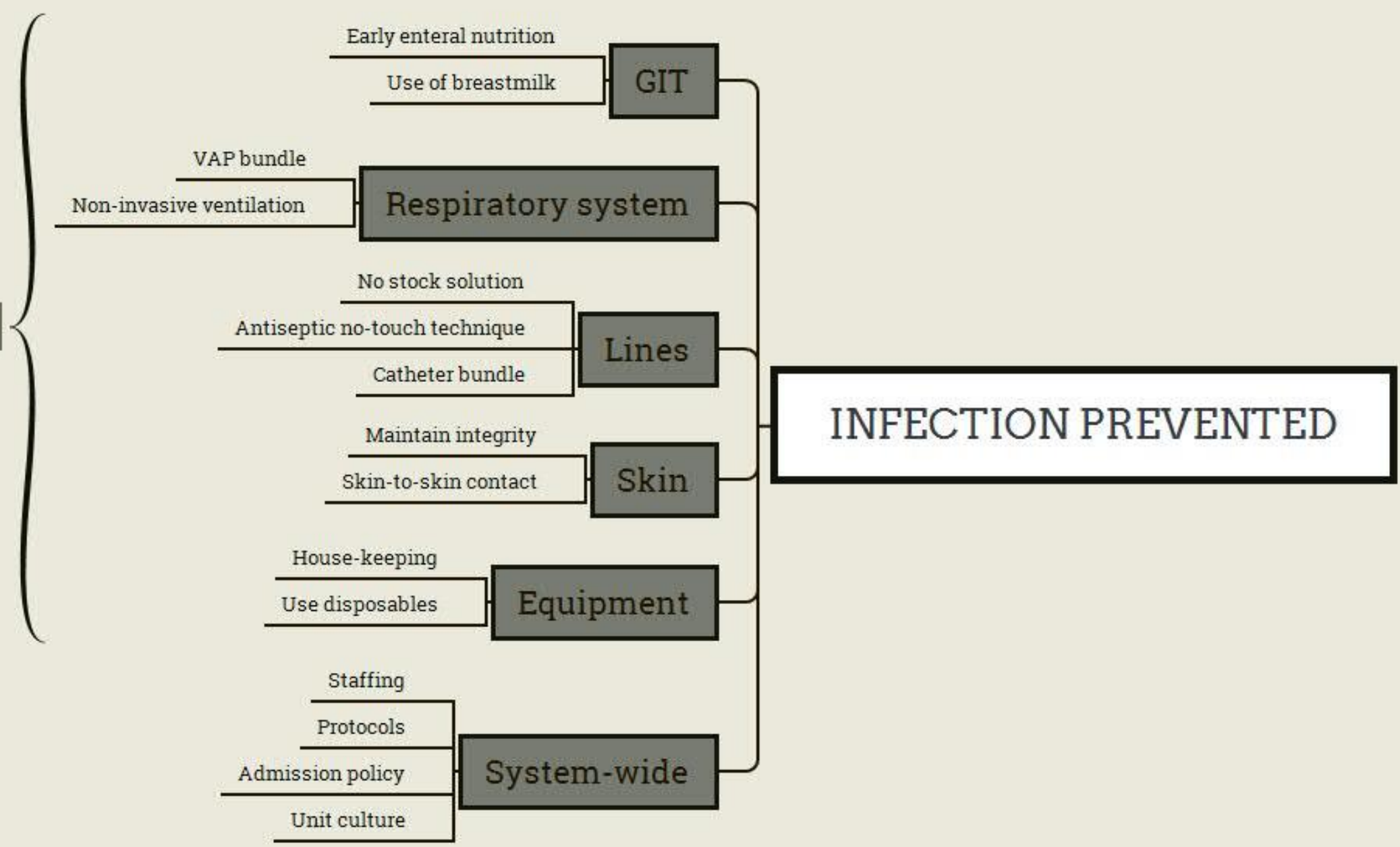


Strategies to prevent bacterial and fungal infections in NICU



Dr Deepak Chawla

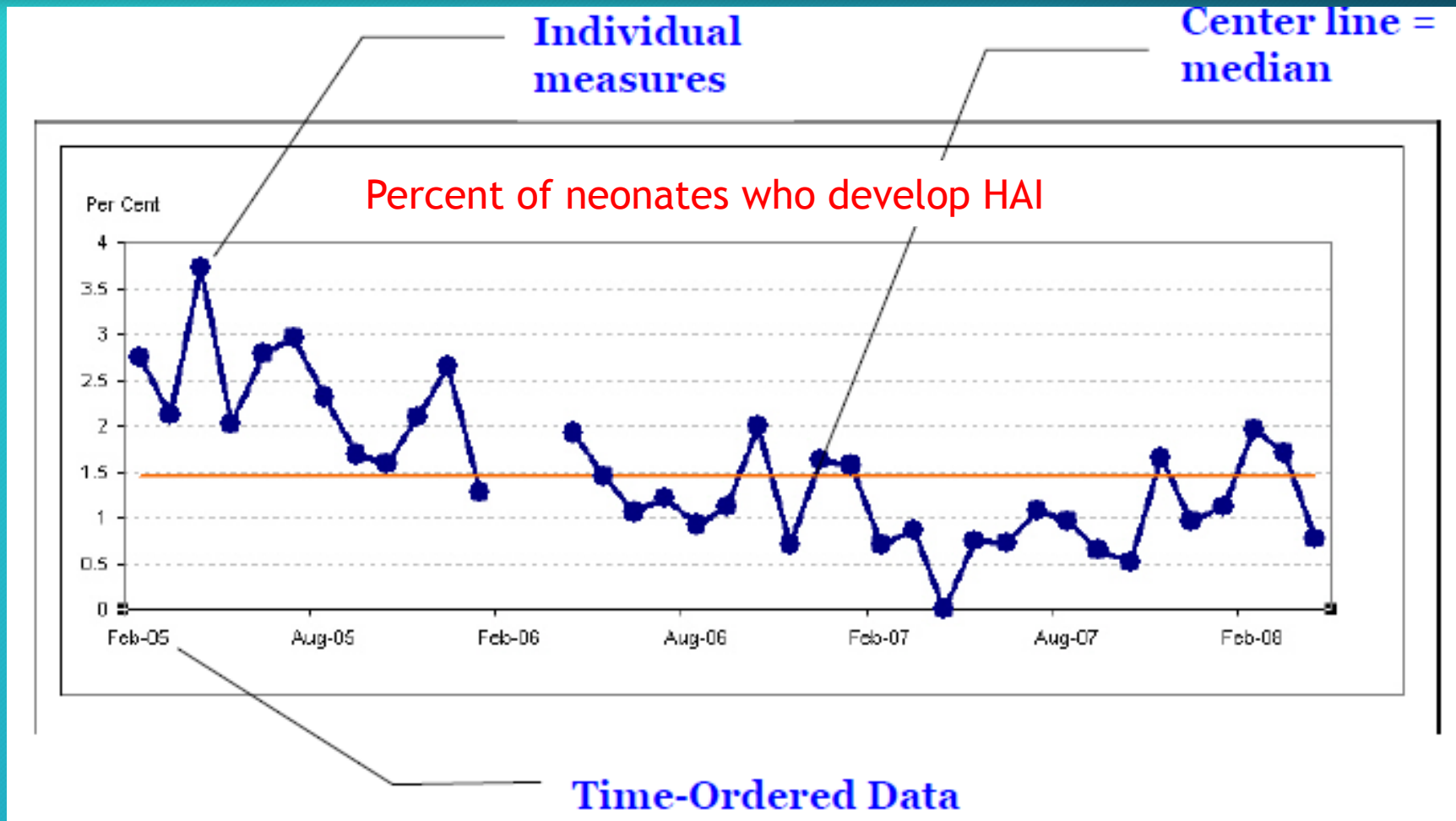
Hand hygiene



Surveillance

- You can not prevent what you have not measured
- Follow standard definition of HAI: CDC or NEO-KISS
 - Culture-positive sepsis
 - Probable sepsis
 - Ventilator-associated pneumonia
 - NEC
- Any sepsis with onset after 24 h is potentially HAI

How to monitor?



Clean delivery and resuscitation

Original Article

A survey of infection control practices in the delivery room and nursery to investigate and control the high rate of neonatal sepsis: An experience at a secondary care hospital

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Delivery room

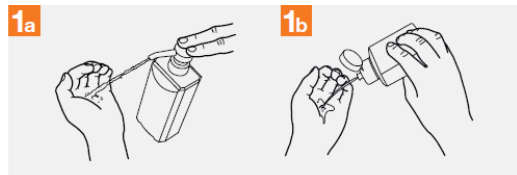
1. General cleanliness of the delivery room was satisfactory.
2. Baby towels and blankets appeared dirty and were not regularly sterilized/washed and properly stored.
3. Sterile gloves were not being used while handling the neonates.
4. No hand rub was available.
5. Masks were not being used.
6. Only three delivery sets were available and these were only being treated with hot water.
7. Treatment of umbilical stump was not being done regularly after cutting.
8. Proximal sucker tube was being changed only once in months.
9. Terminal sucker catheter was not even being changed for each newborn.
10. MRSA carrier testing/eradication of the nursing staff were not being done.

No.	Place of specimen	Result of culture
1.	Delivery bed No 1	Bacillus sp, Staphylococcus aureus, Streptococcus sp
2.	Delivery bed No 2	Bacillus sp
3.	Delivery set instruments x 3	Bacillus sp
4.	Baby towel x 2	Staphylococcus aureus (MRSA), Aspergillus sp
5.	Baby blanket x 2	Bacillus sp, Staphylococcus aureus
6.	Oxygen tube x 1	Staphylococcus aureus
7.	Proximal sucker tube x 1	Klebsiella pneumoniae, Bacillus sp
8.	Terminal sucker catheter x 1	Klebsiella pneumoniae, Proteus mirabilis
9.	Hand washing tap x 1	Bacillus sp
10.	Nasal swabs of nursing staff x 3	Staphylococcus aureus (MRSA), Streptococcus sp

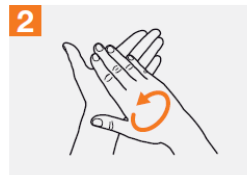
Hand hygiene

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

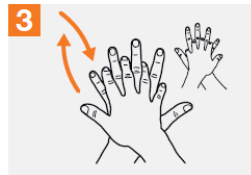
 Duration of the entire procedure: 20-30 seconds



Apply a palmful of the product in a cupped hand, covering all surfaces;



Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;



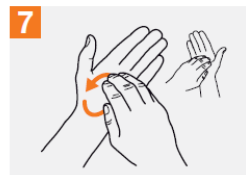
Palm to palm with fingers interlaced;



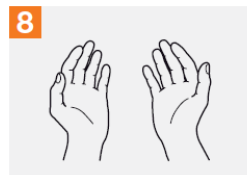
Backs of fingers to opposing palms with fingers interlocked;



Rotational rubbing of left thumb clasped in right palm and vice versa;




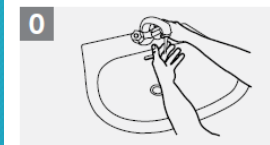
Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Once dry, your hands are safe.

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

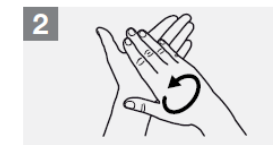
 Duration of the entire procedure: 40-60 seconds



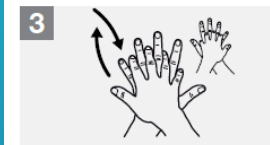
Wet hands with water;



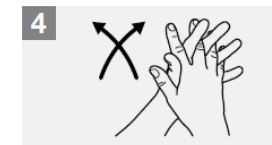
Apply enough soap to cover all hand surfaces;



Rub hands palm to palm;



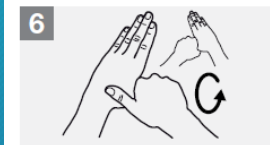
Right palm over left dorsum with interlaced fingers and vice versa;



Palm to palm with fingers interlaced;



Backs of fingers to opposing palms with fingers interlocked;



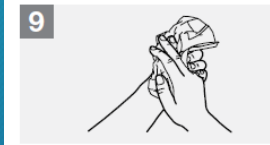
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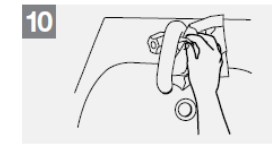
Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



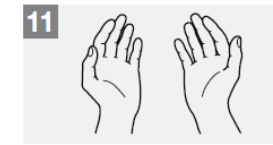
Rinse hands with water;



Dry hands thoroughly with a single use towel;



Use towel to turn off faucet;



Your hands are now safe.

1a. System change -

Alcohol-based hand-rub at point-of-care

- At each bed and/or in pocket of staff

1b. System change - access to safe, continuous water supply, soap and single-use towels

- One sink/10 beds; soap and disposable towels at every sink

2. Training and education

- Hand hygiene education program and regular updates for all staff

3. Evaluation and feedback

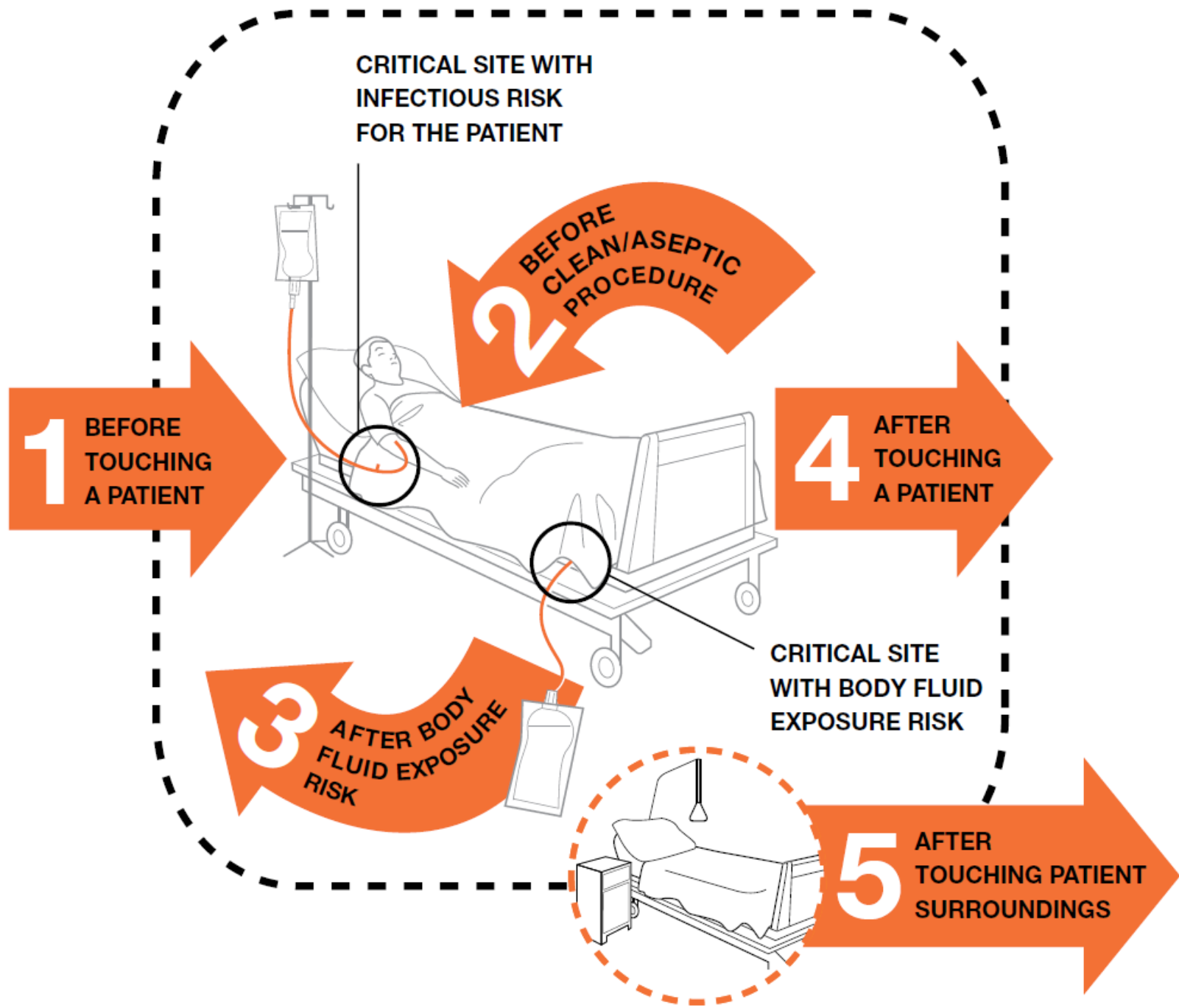
- Infrastructure survey, hand hygiene observations, soap and hand rub consumption monitoring

4. Reminders in the workplace

- “How to” and “Your 5 moments of hand hygiene”

5. Institutional safety climate

- Commitment of leaders



Central line bundle

- Insertion bundle
- Maintenance bundle
- Hub care bundle

Central line bundle: Insertion

- Central line kit or cart **Use checklist for each insertion** necessary
- Prefer upper limb vein

- Perform hand hygiene before insertion
- Adhere to aseptic technique
- Use maximal sterile barrier precautions (i.e., mask, cap, gown, sterile gloves, and sterile full-body drape)
- Perform skin antisepsis with >0.5% chlorhexidine with alcohol
- Choose the best site to minimize infections and mechanical complications
 - Avoid femoral site in adult patients
- Cover the site with sterile gauze or sterile, transparent, semipermeable dressings

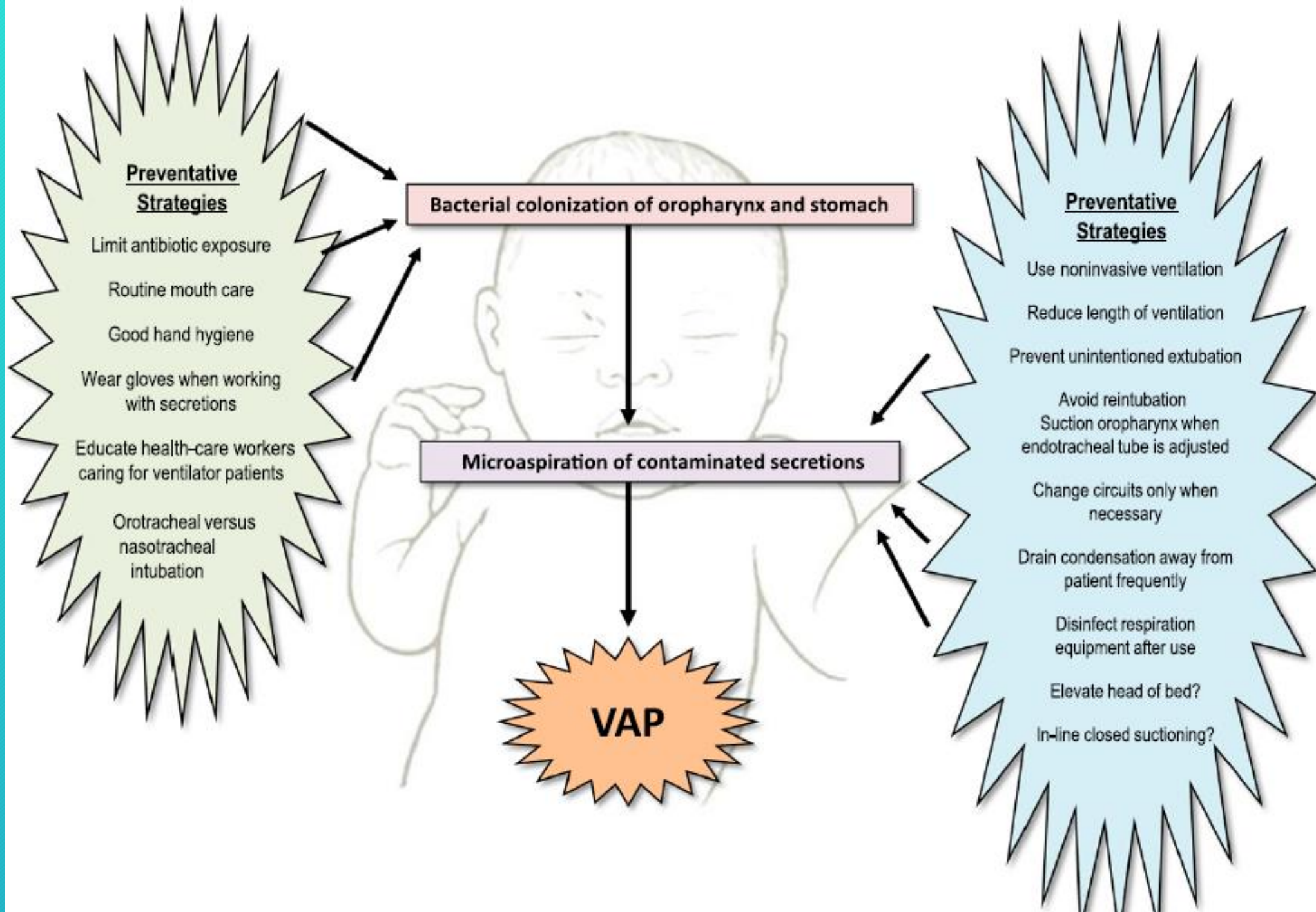
- Keep connecting ports away from diaper area

Central line: Maintenance bundle

- Comply with hand hygiene requirements
- Scrub the access port or hub immediately prior to each use with an appropriate antiseptic (e.g., chlorhexidine, povidone iodine, an iodophor, or 70% alcohol)
- Access catheters only with sterile devices
- Replace dressings that are wet, soiled, or dislodged
- Perform dressing changes under aseptic technique using clean or sterile gloves

Peripheral cannula insertion Antiseptic non-touch technique (ANTT)

1. Two Persons Doing The Procedure
2. Hand Hygiene Before The Procedure
3. Hand hygiene for the assistant -hand wash/hand gel
4. Cleaning the trolley/Surface where equipment kept
5. Assistant opening the equipment appropriately
6. Appropriate glove use for the person during the procedure
7. Sterile field for the procedure
8. Cleaning of the site of procedure (Alcohol-Betadine-Alcohol, 30 s)
9. Protection of the key parts all the time
10. Hand Hygiene after the procedure

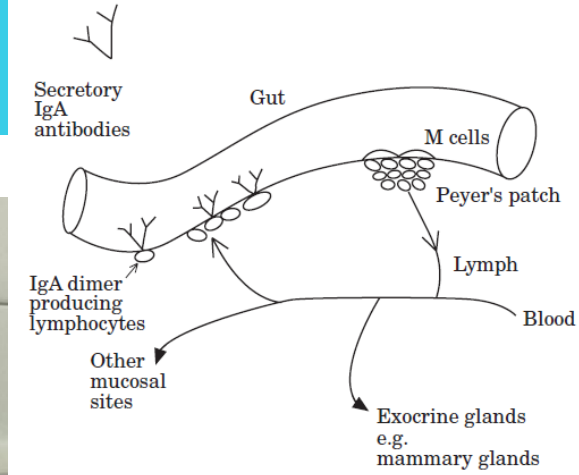


VAP bundle

1. Hand hygiene
2. Endotracheal tube care
3. Humidification
4. Respiratory equipment care
5. Baby position
6. No stress ulcer prophylaxis
7. Enteral feeds
8. Post-extubation support

KMC: Protection against infection

- Start early
- Start within NICU



5 studies in Cochrane review: 46-78% reduction in nosocomial sepsis

Breast milk feeding

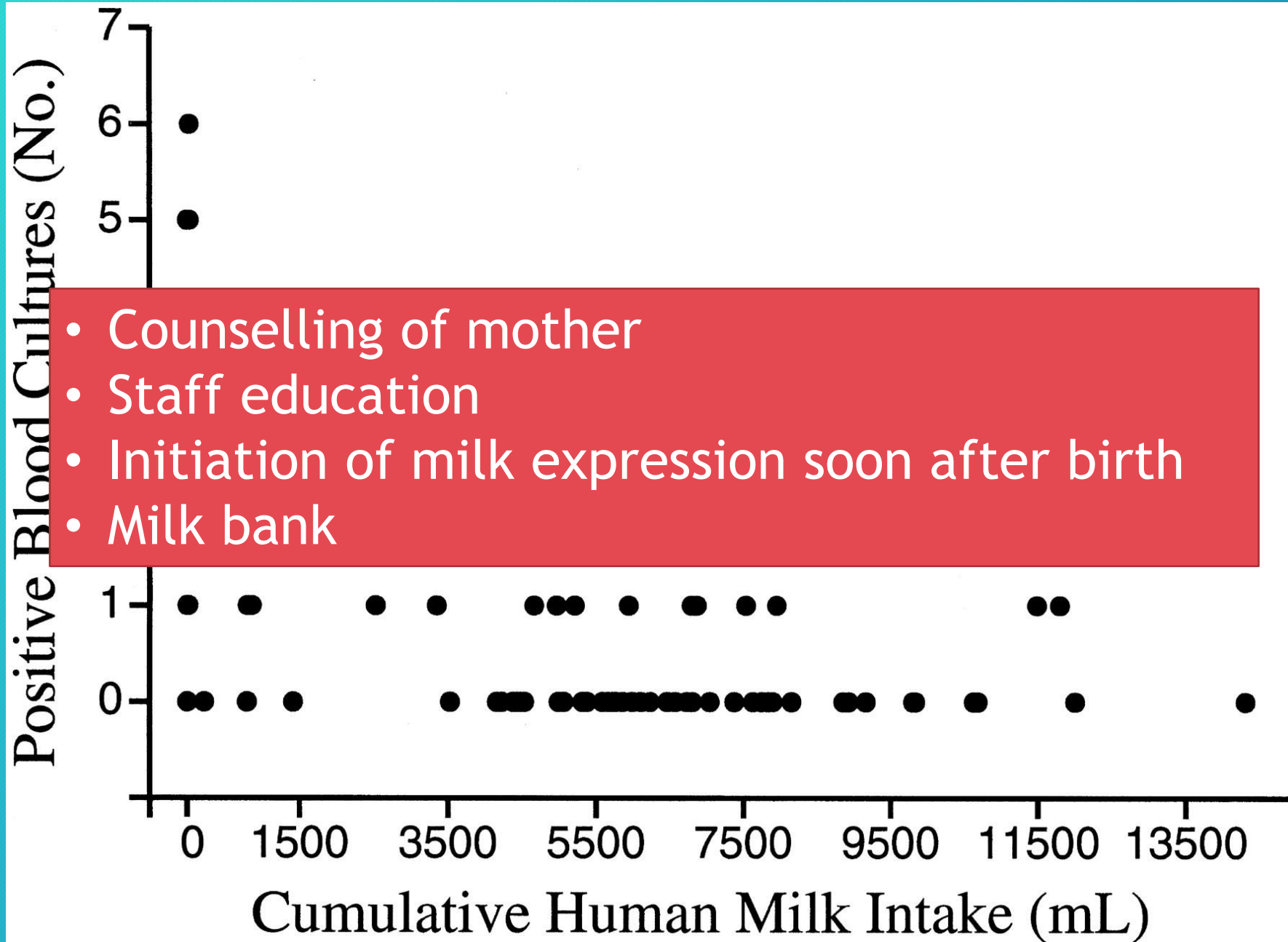
1. Mother infected



2. WBC in mother's body make antibodies to protect mother

4. Antibody to mother's infection secreted in milk to protect baby

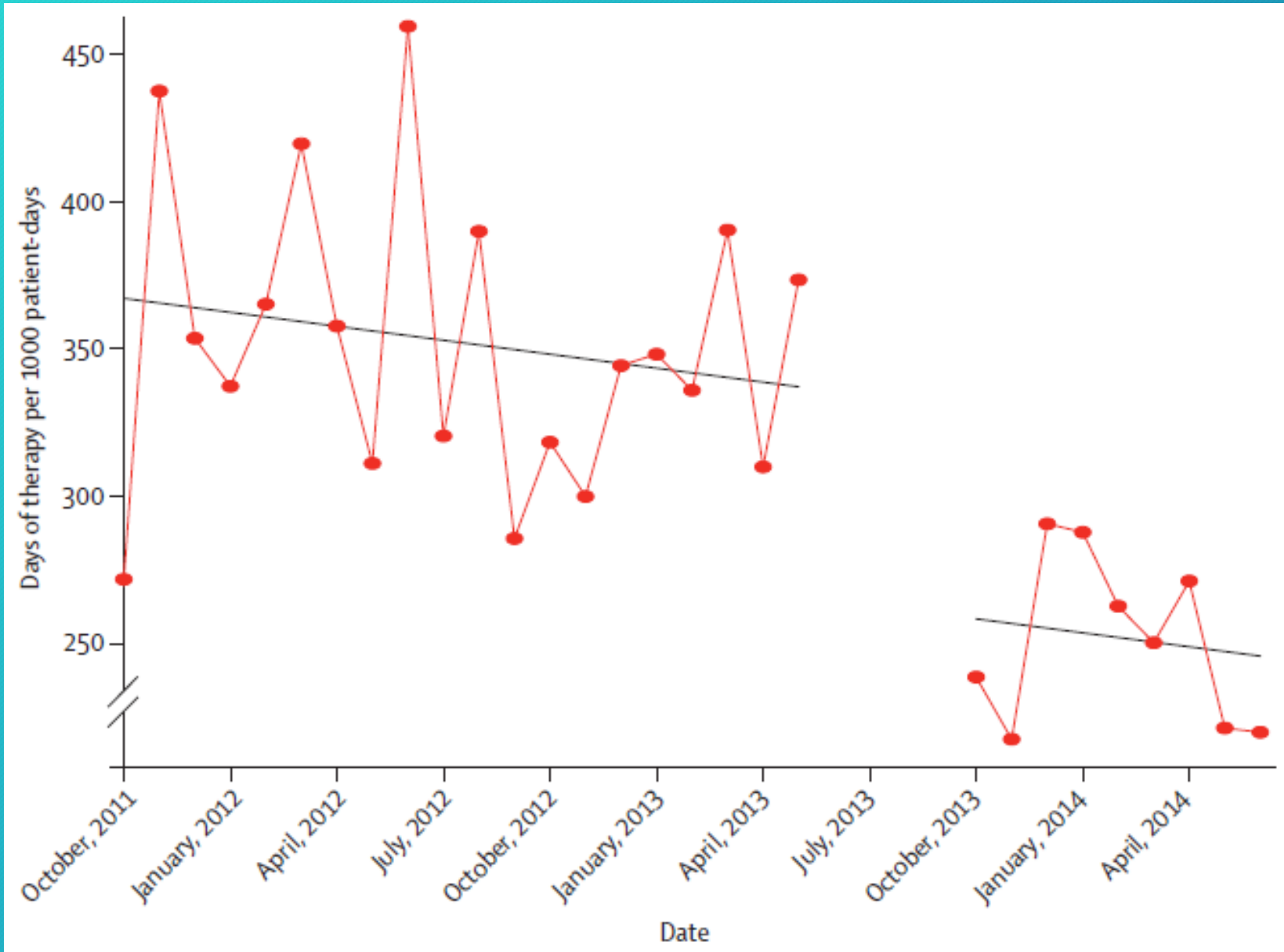
3. Some WBCs go to breast and make antibodies there













- Counselling of mother
- Staff education
- Initiation of milk expression soon after birth
- Milk bank

Antibiotic stewardship program

- To optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms and the emergence of resistance
- Components
 - Prospective audit and feedback
 - Formulary restriction and need of pre-authorization
 - Written antibiotic policy/guidelines
 - Right agent, dose, route, duration
 - Antibiotic ordering forms



Antibiotic prescription form

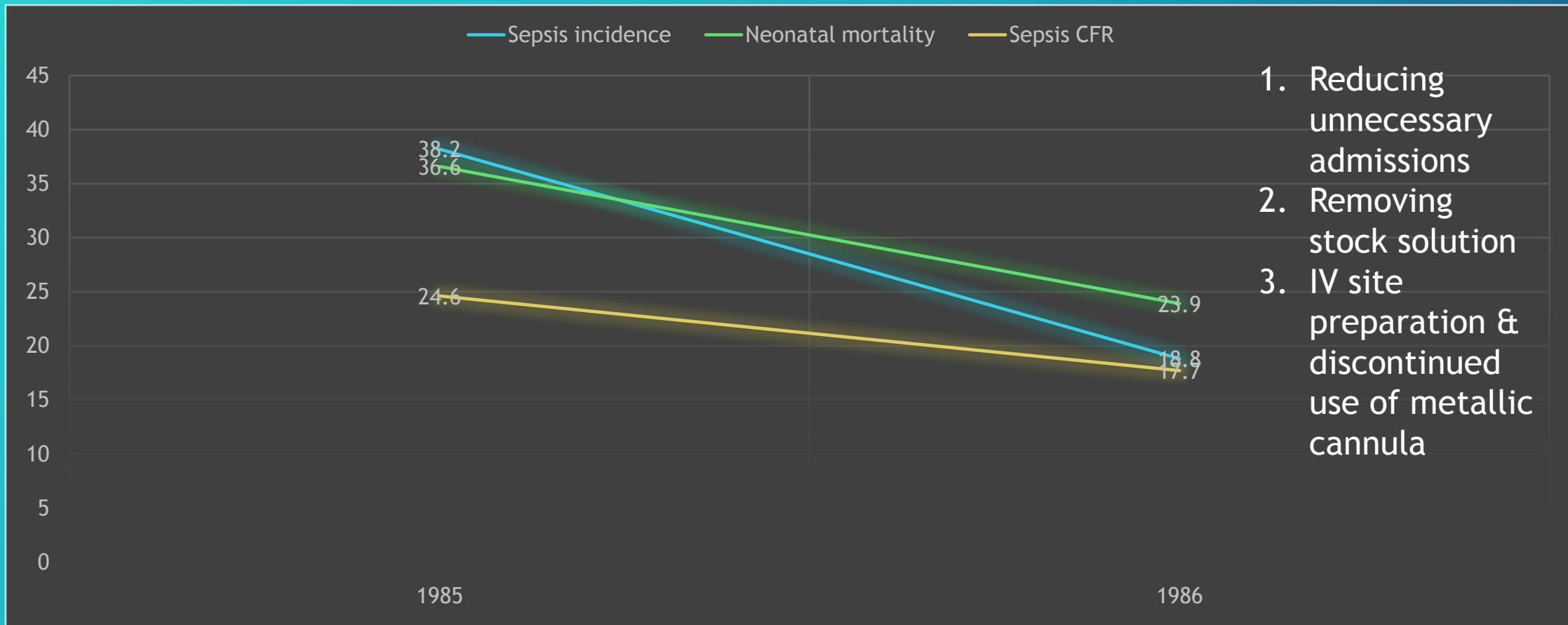
Name of mother				CR number				GA		BW			
Indication of starting				Perinatal risk factors				Clinical sepsis		Lab evidence			
Age at starting antibiotics				<24 h		24-72 h		>72 h					
Blood culture sent at the time of initiation				Yes		No							
Blood culture report		48 h		Sterile		Growth of							
Blood culture report		Final		Sterile		Growth of							
CSF		Not done		Normal		Meningitis by							
Antibiotic 				Antibiotic 									
Dose 				Dose 									
Diluent				Diluent									
Date started 				Date started 									
Date stopped 				Date stopped 									
Admin time 				Admin time 									
Date	Initial	D		Date	Initial	D							
		1				1							
		2				2							
		3				3							
Check culture b4 continuing				Check culture b4 continuing									
		4				4							
		5				5							

S No	Name	Postnatal age	Dose	GA	Dose	Rate
1.	Ampicillin + Sulbactam	≤34 w		>34 w		Over 30 minutes -1 hr
		≤7 d	50 mg/kg x 12 hrly	0-28 d	50 mg/kg x 8 hrly	
		8-28 d	75 mg/kg x 12 hrly			
Dose of Ampi+sulbactam is 2-3 times higher in meningitis						
2.	Meropenem	<32 w		≥ 32 w		Over 2-3 hrs
		≤ 14 d	20 mg/kg x 12 hrly	≤ 14 d	20 mg/kg x 8 hrly	
		>14 d	20 mg/kg x 8 hrly	>14 d	30 mg/kg x 8 hrly	
For meningitis or partial sensitivity meropenem dose is doubled						
3.	Pipra+tazobactam			< 30 w	100 mg/kg x8 hrly	Over 30min-1 hrs
				30-35 w	80 mg/kg x 6 hrly	
				36-49 w	80 mg/kg x 4 hrly	
4.	Gentamycin/tobramycin			<28 w	4-5 mg/kg x 48 hrly	Don't give simultaneously with Cephalosporins
				28-30 w	5 mg/kg x 36 hrly	
				>=31 w	5 mg/kg x 24 hrly	
5.	Amikacin			<28 w	15 mg/kg X 36 hrly	
				≥ 28 w	15 mg/kg x 24 hrly	
6.	Vancomycin	<1500 g		>1500 g		Infuse over 1-2 hours
		≤ 7 d	20 mg/kg/d X 24 hrly	≤ 7 d	30 mg/kg/d x 12 hrly	
		>7 d	30 mg/kg/d x 8 hrly	>7 d	45 mg/kg/d 8 hrly	
7.	Kloxacillin	0-28 d	25-30 mg/kg/dose x6 hrly			Give diluted over 30-60 min
In deep seated infections: eg OM/meningitis dose is 200- 300 mg/kg/day						
8.	Imepenem	0-28 d	50 mg/kg/d x 12 hrly			
9.	Fluconazole	≤ 29 w		30-36 wks		Loading dose of 12 mg/kg
		≤ 14 d	6 mg/kg/dose X 72 hrly	≤ 14 d	6 mg/kg/dose X 48 hrly	
		>14 d	6 mg/kg/dose X 48 hrly	>14 d	6 mg/kg/dose X 24 hrly	
10.	Ampho B	0-28 d	D1 0.5mg/kg/dose D 2 + 1 mg/kg/dose x 24 hrly	Don't give TPN and Ampho B in same line		Over 4 hours Dilute in 5% D only
11.	Colistin	0-28 d	20-25,000 IU/Kg/dose X 8 hourly			Over 1 hour

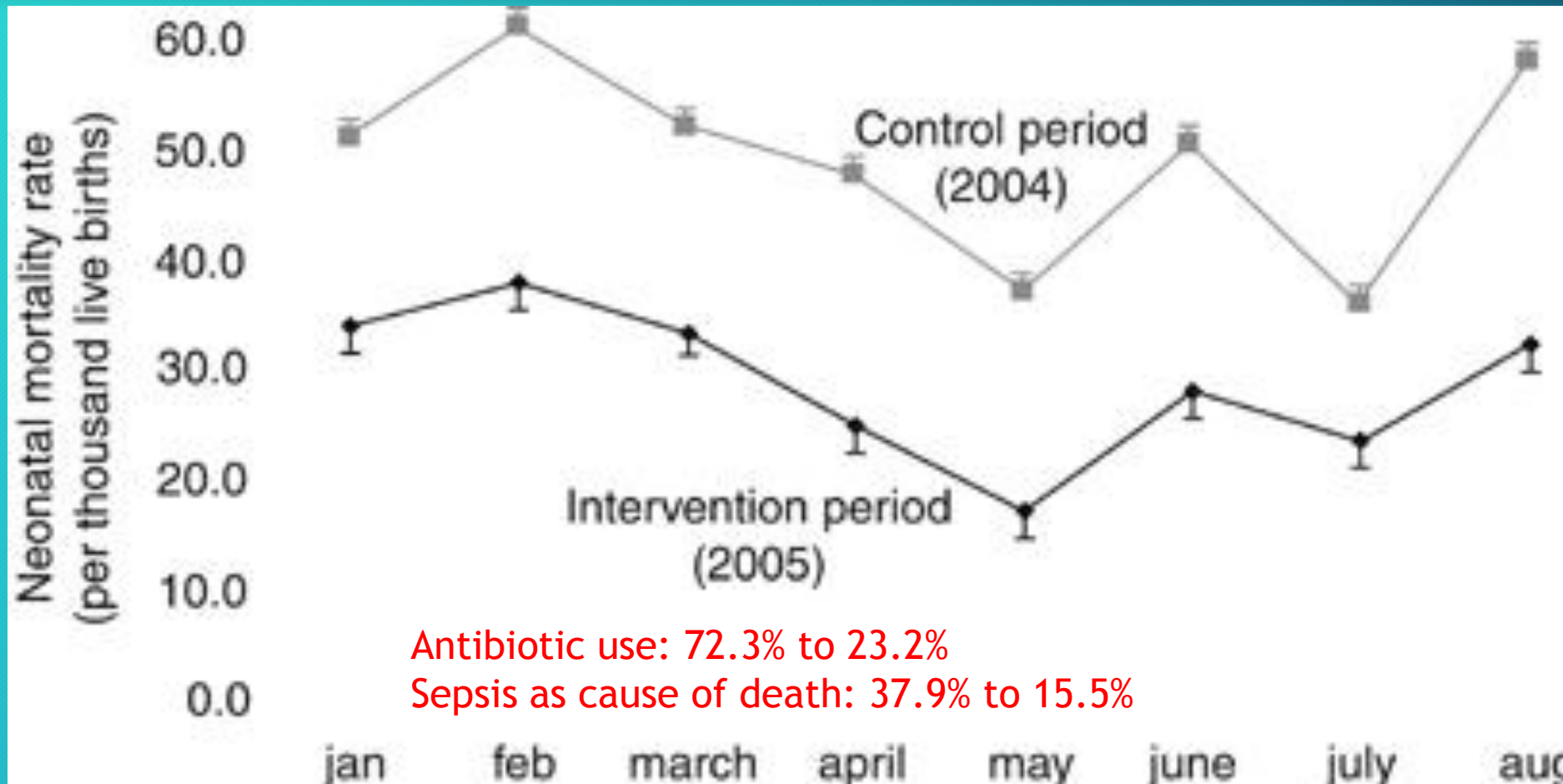
Fluconazole prophylaxis

- Impairs adherence of *Candida* to endothelial and epithelial surfaces, decreases biofilm formation, and enhances the killing of *Candida* species
- 9/10 RCTs: Significant reduction (41-69%) in invasive candidiasis
- Concern about development of resistance to fluconazole
- Candidates
 - Which babes: ELBW
 - Which units: Baseline incidence of fungal infection: 5-10%

System changes



System changes



1. Rational admission policy & shortened nursery stay
2. Asepsis routines
3. Aggressive enteral nutrition
4. Rational antibiotic therapy
5. Training of nurses
6. Protocol based management

Take Home Messages

- Surveillance and auditing key to prevention
- Promote culture of asepsis
 - Hand hygiene
 - House keeping
 - Bundle approach
- Implement antibiotic stewardship program