Neonatal nurses' as advocates for antimicrobial stewardship in the multidisciplinary NeoAMS team

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BACKGROUND - THE IMPORTANCE OF ANTIMICROBIAL STEWARDSHIP

Overuse and Misuse of antibiotics

- Drive antimicrobial resistance (AMR)
- AMR leading cause of neonatal death in Africa
- Few effective antibiotics to treat AMR infections
- Alters the gut microbiome of the neonate

Prescription Errors

- Most commonly prescribed drugs in neonates
- Highest number of prescription errors

Hangtime

- Time between antimicrobial prescription and administration
- Ideal <60min = “Golden hour”
- Improves sepsis outcomes

Who is responsible for AMS?

MEDICAL

- Neonatologist
- Paediatricians
- Microbiologist
- Infectious disease (ID) specialist
- Infection prevention & control (IPC) specialists

NURSING

- **Ward and NICU professional nurses**
- Infection prevention & control (IPC) sisters

PHARMACY

- Ward/clinical pharmacist
- Pharmacy management

Prospective antimicrobial stewardship interventions by multidisciplinary teams to reduce neonatal antibiotic use in South Africa: the Neonatal Antimicrobial Stewardship (NeoAMS) study

Methods

Phase 1

1. **89 AMS Team Members**
   Neonatologist (28), Pharmacist (27)
   Microbiologist (16), Nurse (18)

2. **14 hospitals**
   private and public

3. **7 learning & feedback sessions**

4. **20-week AMS intervention**

Results

- 565 neonates enrolled
- 700 infection episodes
- 437 pharmacist interventions

Acceptance Rate → **77%**

Interventions

Stop antibiotics	Drug monitoring	Change dose
42%	17%	15%

Days of antibiotic Therapy	Days of antibiotics for culture-negative sepsis
9.1d	8.2d
24% decrease	28% decrease
6.9d	5.9d
p<0.001	p<0.03

Conclusion: A multidisciplinary team including non-specialized pharmacists, significantly reduced neonatal antibiotic days of therapy. Skills beyond infectious diseases were crucial in implementing AMS.

Ref: Dramowski A, et al. for the NeoAMS study team 2024 IJID

NeoAMS: Mowbray Maternity and Tygerberg Hospitals

AMR Industry Alliance Awards the 2023 AMR Stewardship Prize to South Africa's NeoAMS Program

Phase 2

Tygerberg Hospital
132 neonatal beds

Mowbray Maternity Hospital
73 neonatal beds

NeoAMS Quality Improvement intervention Phase 2

Aim: To expand and sustain the multidisciplinary team (MDT)-led NeoAMS QI programme

Main objective: To compare change in AMS referrals, AMS and IPC interventions and antimicrobial hangtime over two time periods (**May-Aug 2024** versus **Sept-Dec 2024**)

Methods:

- NeoAMS members identified and referred neonates for AMS & IPC
- NeoAMS Teams met Weekly-Monthly to discuss & review AMS/IPC
- RedCAP data collection (demographic and AMS/ IPC interventions)

Ethics: Stellenbosch University HREC approval (N21/10/110)

Neonatal demographics (n = 288)

Median gestational age and birth weight

32 weeks
1870g

Male predominance

54%

Location

Neonatal ward - 60%

Neonatal ICU/HC - 40%

Day of infection onset (mean)

10 days of life

Died during antibiotic therapy

9 neonates (3%)

Final infection category

Early onset sepsis	20%
Healthcare-associated infection	28%
Infection ruled out	52%

Results: NeoAMS and IPC interventions

Referrals to the NeoAMS programme doubled between time periods

88 referrals in Period 1
to
200 in Period 2

Who referred to NeoAMS?

Nurses	32%
Doctors	13%
Pharmacists	55%

Nurses made 12% of all AMS recommendations

86% acceptance rate

AMS recommendations made by nurses

- Stop antibiotics
- Perform monitoring (TDM)
- Reduce hangtime
- Add time of prescribing

Antibiotic hangtime < 60 minutes

Hangtime unchanged (73%)
Improved prescription chart completion rates (87%)

IPC interventions

- Start precautions (40%)
- Isolate patient (20%)
- Remove device (10%)
- Repeat cultures (5%)
- Consult micro/ID (5%)
- Other (20%)

Role of Neonatal Nurses in AMS

*Proper Antibiotic storage

*Educating others

*Hang times < 1 hour

ADVOCATING

*IPC
*New sepsis symptoms & signs
*CRP results
*Stopping antibiotics

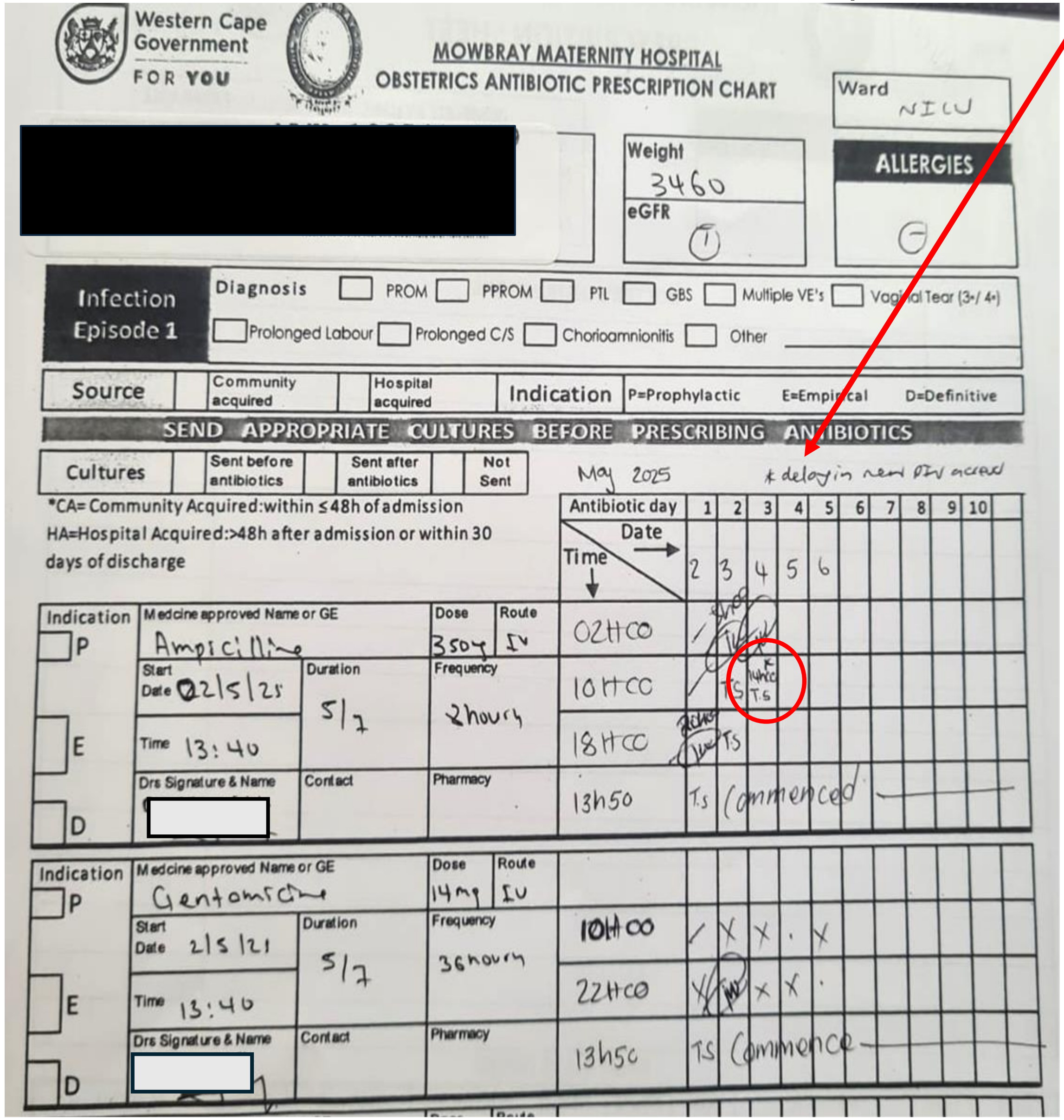
*Validity
*Legality
*5 "R's"

Challenges of AMS

- **Lack of AMS awareness**
- **Lack of experienced PN's**
- **Lack of trained IPC Reps**
- **Policies & Protocols**
  - Limited visibility
  - Download App guide @ own cost
  - Locum/ new Dr's and nursing staff
- **Delays**
  - Lack of communication between Doctors and Nurses
  - Awaiting Consultant sign off-restricted Antibiotics
  - Receiving prescription chart & antibiotics from pharmacy
  - After hour collection of antibiotics from EC
  - Awaiting new peripheral intravenous access

Prescription chart examples

Reason for delayed administration indicated by *



Western Cape Government
FOR YOU

MOWBRAY MATERNITY HOSPITAL
OBSTETRICS ANTIBIOTIC PRESCRIPTION CHART

Ward: NICU

[redacted]

Weight: 3460
eGFR: ⓣ
ALLERGIES: ⊖

Infection Episode 1 — Diagnosis: PROM, PPROM, PTL, GBS, Multiple VE's, Vaginal Tear (3+/4+), Prolonged Labour, Prolonged C/S, Chorioamnionitis, Other

Source: Community acquired, Hospital acquired — Indication: P=Prophylactic, E=Empirical, D=Definitive

SEND APPROPRIATE CULTURES BEFORE PRESCRIBING ANTIBIOTICS

Cultures: Sent before antibiotics, Sent after antibiotics, Not Sent

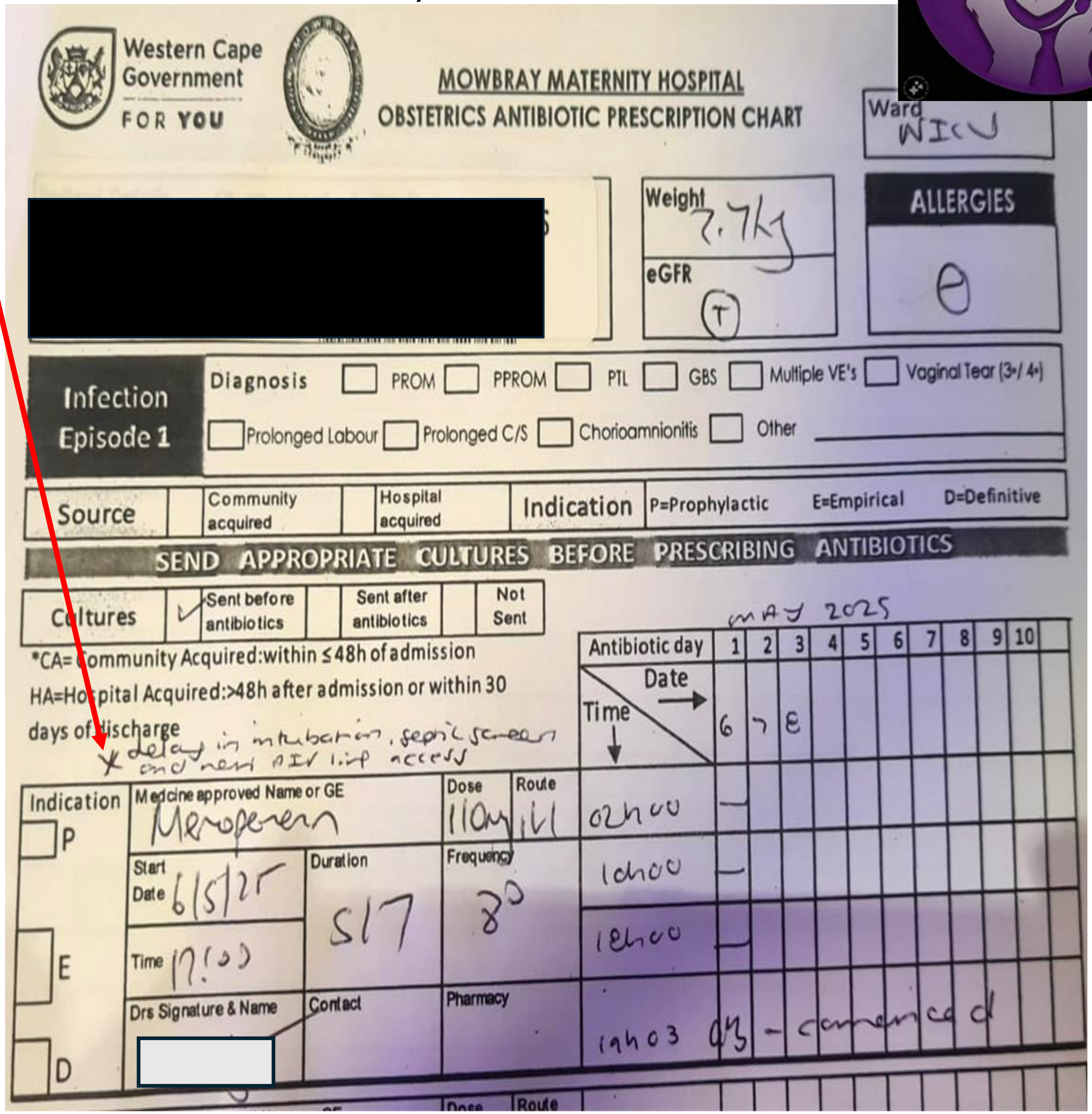
*CA= Community Acquired: within ≤48h of admission
HA=Hospital Acquired: >48h after admission or within 30 days of discharge

May 2025 * delay in new PIV access

Antibiotic day	1	2	3	4	5	6	7	8	9	10
Date / Time	2	3	4	5	6					

Indication	Medicine approved Name or GE	Dose	Route	Time	
P / E / D	Ampicillin	350mg	IV	02H00	
	Start Date 2/5/25; Time 13:40; Duration 5/7; Frequency 12hourly			10H00	TS
	Drs Signature & Name; Contact; Pharmacy			18H00	TS
				13h50	TS Commenced

Indication	Medicine approved Name or GE	Dose	Route	Time	
P / E / D	Gentamicin	14mg	IV	10H00	
	Start Date 2/5/21; Time 13:40; Duration 5/7; Frequency 36hourly			22H00	
	Drs Signature & Name; Contact; Pharmacy			13h50	TS Commence



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MOWBRAY MATERNITY HOSPITAL
OBSTETRICS ANTIBIOTIC PRESCRIPTION CHART

Ward: NICU

[redacted]

Weight: 2.7kg
eGFR: ⓣ
ALLERGIES: ⊖

Infection Episode 1 — Diagnosis: PROM, PPROM, PTL, GBS, Multiple VE's, Vaginal Tear (3+/4+), Prolonged Labour, Prolonged C/S, Chorioamnionitis, Other

Source: Community acquired, Hospital acquired — Indication: P=Prophylactic, E=Empirical, D=Definitive

SEND APPROPRIATE CULTURES BEFORE PRESCRIBING ANTIBIOTICS

Cultures: ✓ Sent before antibiotics, Sent after antibiotics, Not Sent

*CA= Community Acquired: within ≤48h of admission
HA=Hospital Acquired: >48h after admission or within 30 days of discharge

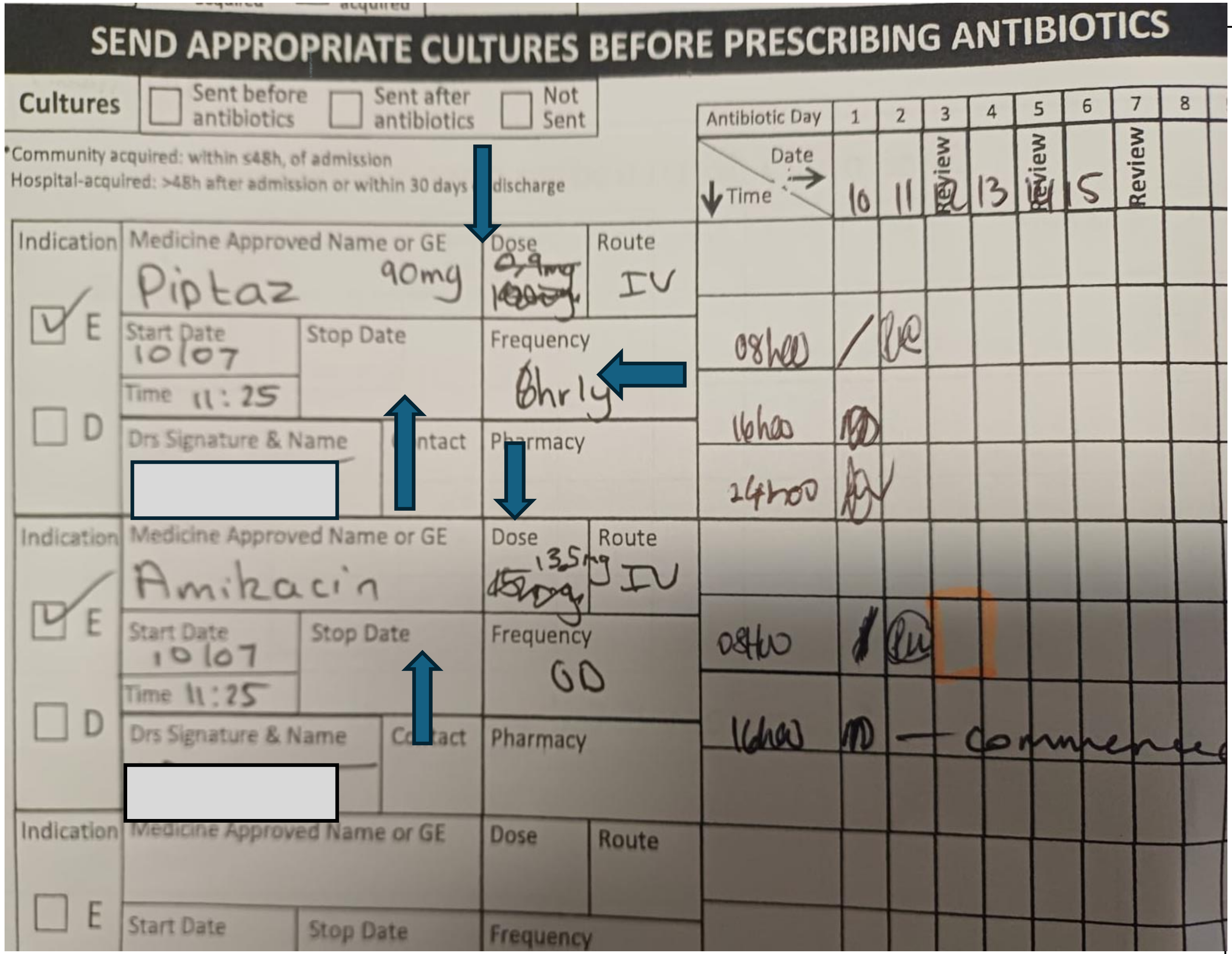
* delay in intubation, septic screen and new PIV line access

MAY 2025

Antibiotic day	1	2	3	4	5	6	7	8	9	10
Date / Time	6	7	8							

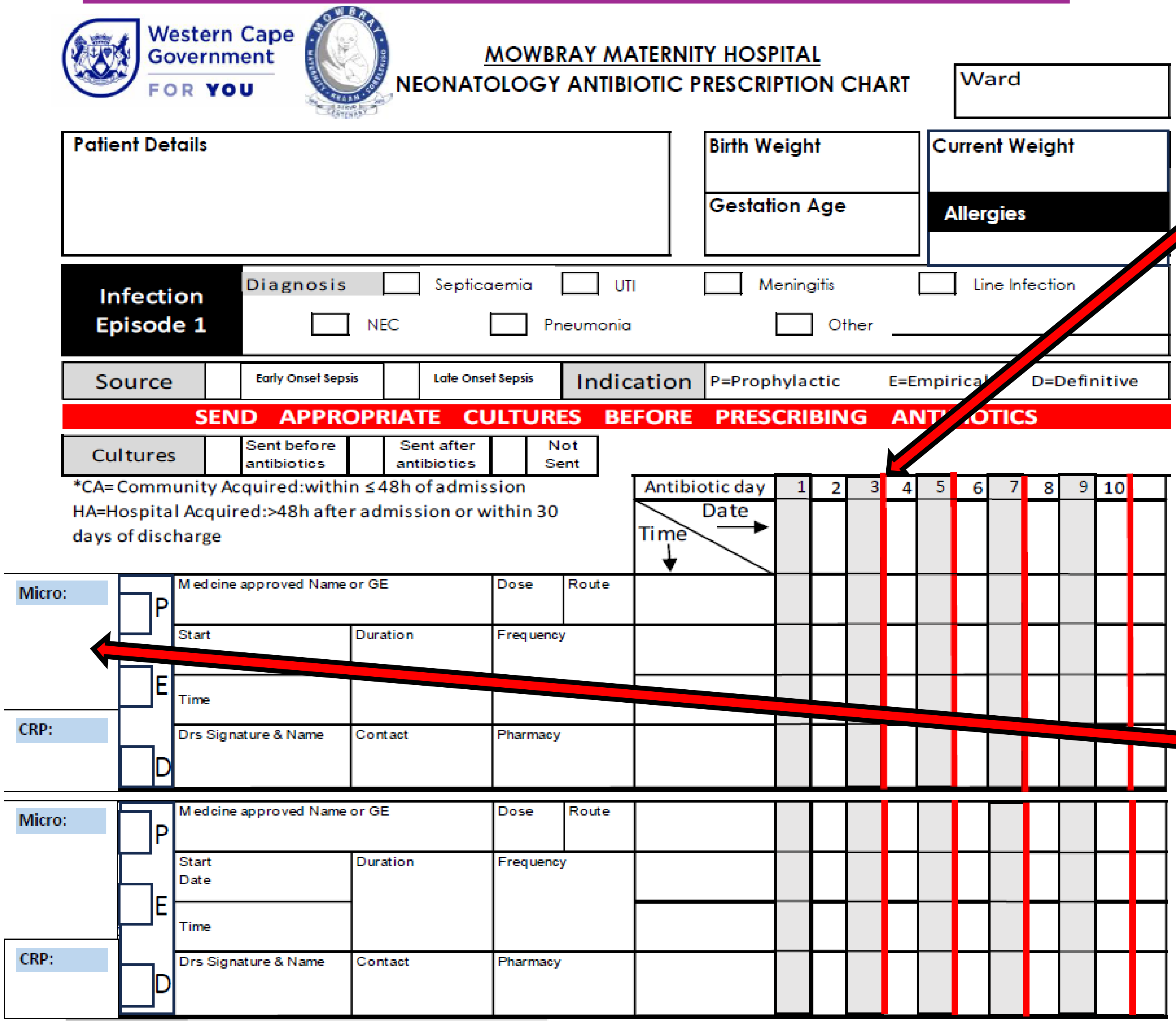
Indication	Medicine approved Name or GE	Dose	Route	Time	
P / E / D	Meropenem	110mg	IV	02h00	—
	Start Date 6/5/25; Time 17:00; Duration 5/7; Frequency 8°			10h00	—
	Drs Signature & Name; Contact; Pharmacy			18h00	—
				19h03	— commenced

Antimicrobial prescription charts problems



- Change in dose should be signed
- No stop date
- Long hangtime
- Highlighted block reminds staff to take amikacin level before 3rd dose

Prescription chart improvements



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MOWBRAY MATERNITY HOSPITAL

NEONATOLOGY ANTIBIOTIC PRESCRIPTION CHART

Ward

Patient Details

Birth Weight

Current Weight

Gestation Age

Allergies

Infection Episode 1

Diagnosis: Septicaemia, UTI, Meningitis, Line Infection, NEC, Pneumonia, Other

Source: Early Onset Sepsis, Late Onset Sepsis

Indication: P=Prophylactic, E=Empirical, D=Definitive

SEND APPROPRIATE CULTURES BEFORE PRESCRIBING ANTIBIOTICS

Cultures: Sent before antibiotics, Sent after antibiotics, Not Sent

*CA= Community Acquired:within ≤48h of admission
HA=Hospital Acquired:>48h after admission or within 30 days of discharge

Antibiotic day: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Date →
Time ↓

Micro:	P	Medcine approved Name or GE	Dose	Route
		Start	Duration	Frequency
	E	Time		
CRP:	D	Drs Signature & Name	Contact	Pharmacy
Micro:	P	Medcine approved Name or GE	Dose	Route
		Start Date	Duration	Frequency
	E	Time		
CRP:	D	Drs Signature & Name	Contact	Pharmacy

Red lines on day 3, 5, 7 & 10 to prompt the question:
Can we stop antibiotics?

Microbiology and CRP results can be added

Antibiotic administration and dosing improvements

Administration of combination antibiotics

Amoxicillin / Clavulanic acid	Trimethoprim / Sulfamethoxazole
Dose per kg: based on ***Amoxicillin*** component • S suspension: 125mg/31.25mg • SF Suspension: 250mg/62.5mg • BD suspension: 400mg/57mg • ES suspension: 600mg/42.9mg • Vial: 500mg/100mg	Dose per kg: based on ***Trimethoprim*** component • Suspension: 40mg/200mg • Vial: 80mg/400mg

Piperacillin / Tazobactim	Ceftazidime / Avibactam
Dose per kg: based on ***Piperacillin*** component • Vial: 4000mg/500mg	Dose per kg: based on ***Ceftazidime*** component • Vial: 2000mg/500mg

Compiled by Hanneke Botha (B.Pharm, M.Pharm)
November 2024

ACYCLOVIR

* ANTIVIRAL *

TRADE NAME: Accord Acyclovir

STRENGTH
- 250 mg
- 500 mg

SOLVENT (10 ml) FOR RECONSTITUTION
- 1st option: WFI
- Other: NS, D5W

FURTHER DILUTION
Dose must be further diluted with minimum 20 ml [< 5 mg/ml]:
- NS
- D5W or D10W

NEONATAL DOSE

20mg/kg/dose IVI	8 hourly
<34 weeks or renal/hepatic failure	12 hourly

INFUSION TIME
60 minutes

STORAGE & STABILITY OF RECON VIAL
Room temp: < 25 °C
24 hours
Fridge: 2 - 8 °C
Not stable

AMIKACIN

* ANTIBIOTIC *

STRENGTH
- 100 mg
- 250 mg
- 500 mg
- 1000 mg

SOLVENT FOR RECONSTITUTION
Already prepared

FURTHER DILUTION
Dilute dose with 2 - 10 ml required for IV infusion:
- NS
- D5W or D10W

NEONATAL DOSE
15 mg/kg/dose IV 24 hourly

INFUSION TIME
60 minutes

EXTRA
Amikacin drug level (TDM) before every 3rd dose

STORAGE & STABILITY
Room temp: < 25 °C
24 hours
Fridge: 2 - 8 °C
Not stable

AMPHOTERICIN B

* ANTIFUNGAL *

TRADE NAME: Fungizone

STRENGTH
- 50 mg

SOLVENT (10 ml) FOR RECONSTITUTION
- 1st option: WFI
- Other: D5W

FURTHER DILUTION
Dose must be further diluted with minimum 10 ml [< 0.1 mg/ml]:
- D5W only

NEONATAL DOSE
1 mg/kg/dose IVI 24 hourly

INFUSION TIME
Over 4 hours

EXTRA
Protect vial, IV bag and lines against light

STORAGE & STABILITY OF RECON VIAL
Room temp: < 25 °C
24 hours
Fridge: 2 - 8 °C
24 hours

Improvements and benefits of nurses in NeoAMS

Better ward management of antimicrobials

Increased AMS awareness

ADVOCATING

Bedside IPC

Prompt response to sepsis signs and symptoms

To chase CRP & Blood culture results and STOP antibiotics timeously

Achieving hangtimes < 1hr

Better completion of prescription charts

Empowerment, being part of a MDT to improve AMS and IPC

Conclusions

Neonatal nurses play a crucial role in AMS

The NeoAMS QI programme at 2 large neonatal units achieved:

- ✓ Increased overall referrals for AMS/IPC
- ✓ More nurse-led AMS recommendations, with high acceptance rates
- ✓ Other QI innovations (improved antibiotic administration, prescription chart completion)

Future programme focus areas should target:

- Interventions to reduce antibiotic hangtime
- Expansion in nurse-led IPC interventions.

<u>NeoAMS should become part of basic neonatal care!</u>

~ a NeoAMS culture