

## Supplemental Online Content

Rahman A, Ray M, Madewell ZJ, et al; Child Health and Mortality Prevention Surveillance (CHAMPS) Network. Adherence to perinatal asphyxia or sepsis management guidelines in low- and middle-income countries. *JAMA Netw Open*. 2025;8(5):e2510790. doi:10.1001/jamanetworkopen.2025.10790

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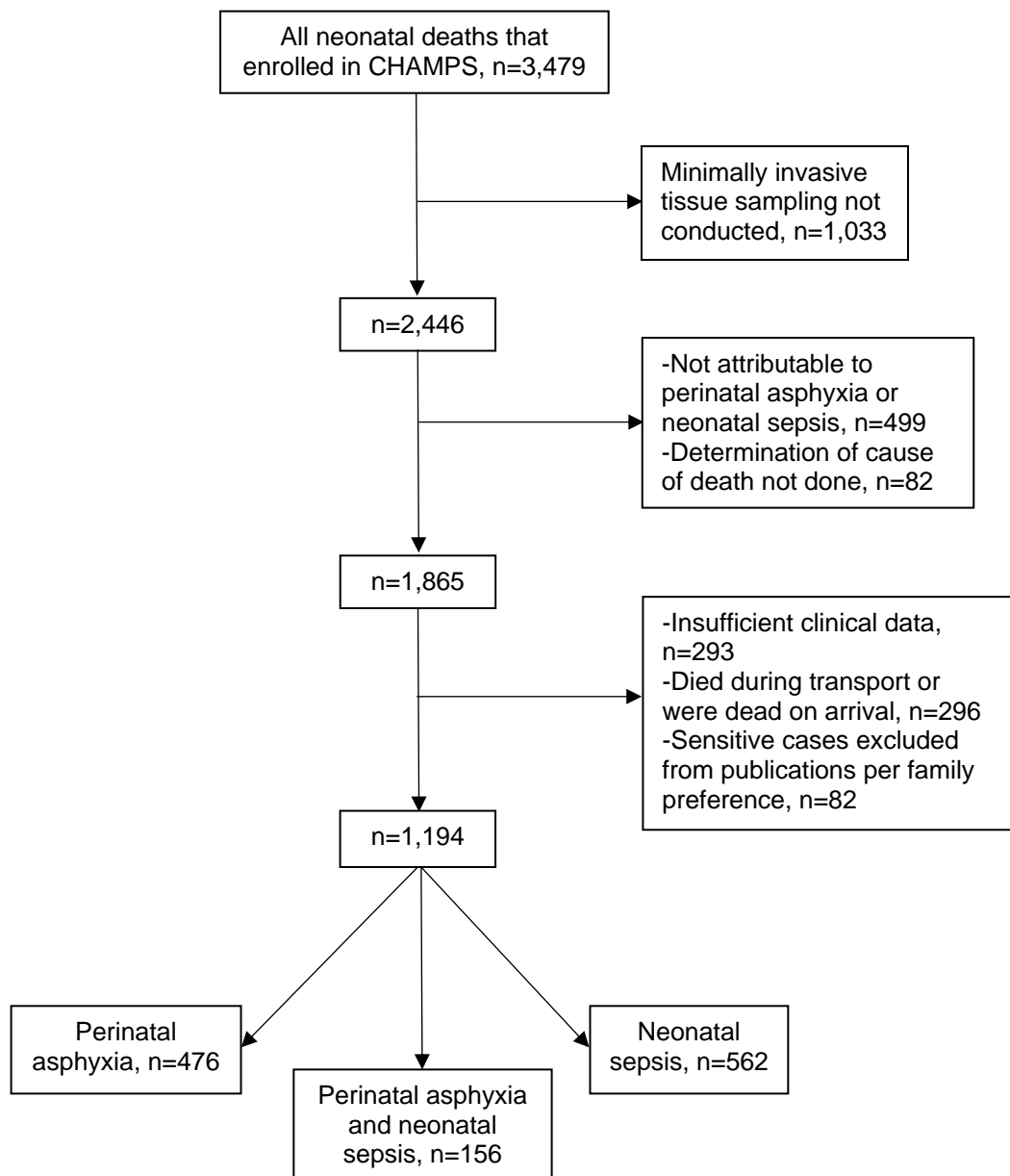
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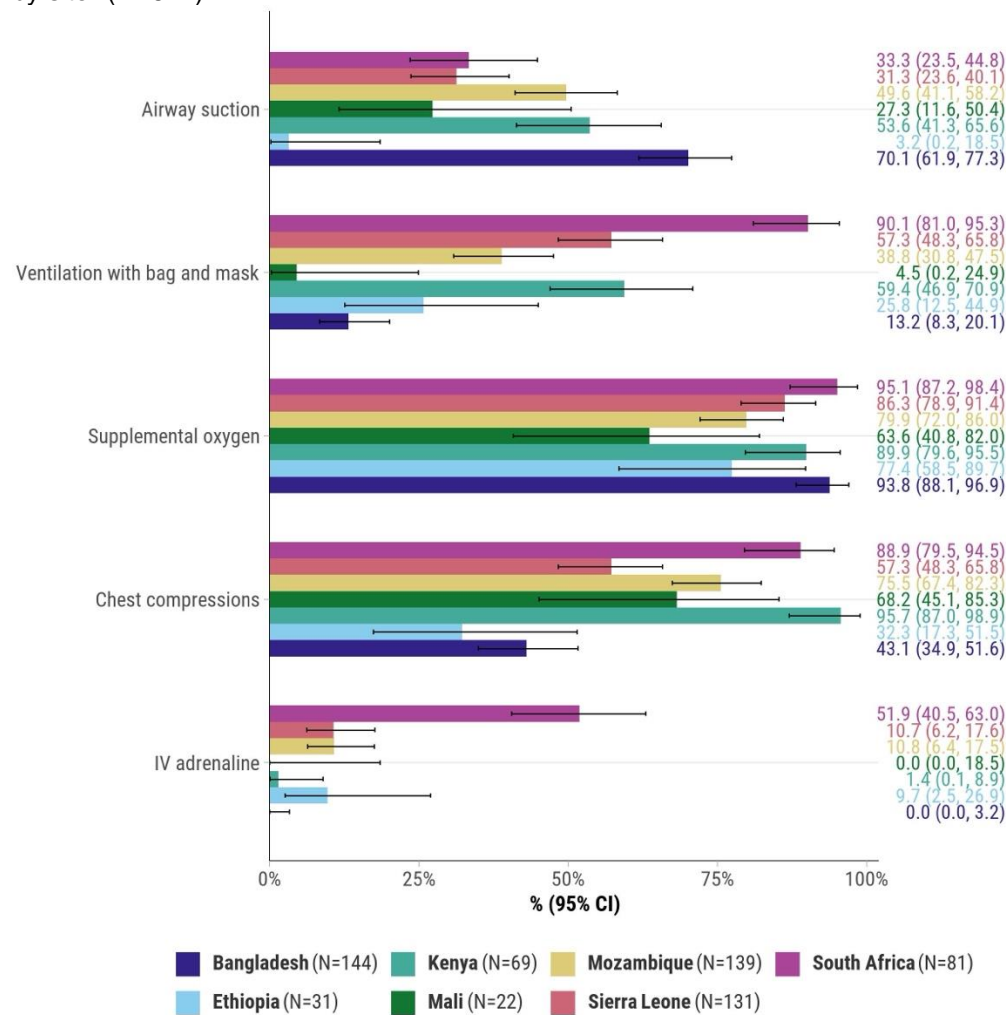
**eTable 6.** Adherence to WHO Pocket Book of Hospital Care for Children Recommendations for Neonatal Sepsis Determined by Postmortem Diagnosis (N=718)

This supplemental material has been provided by the authors to give readers additional information about their work.

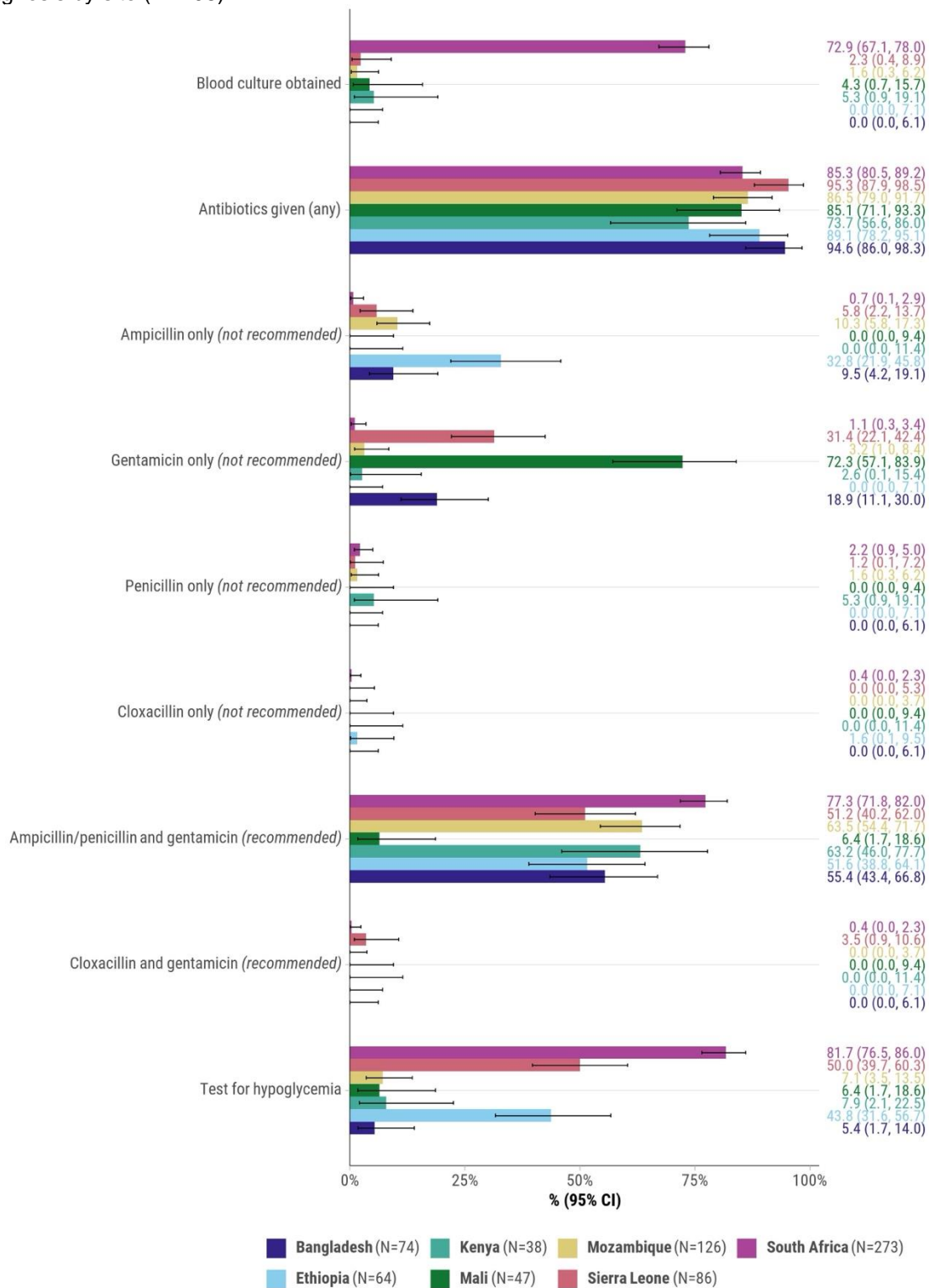
**eFigure 1.** Included cases of perinatal asphyxia or neonatal sepsis deaths, 2015-2023



**eFigure 2.** Adherence to WHO recommendations for birth asphyxia determined by postmortem diagnosis by site\* (N=617)



**eFigure 3.** Adherence to WHO recommendations for neonatal sepsis determined by postmortem diagnosis by site (N=708)



\*Error bars represent 95% confidence intervals.

**eTable 1.** Healthcare facilities at each CHAMPS site

<b>CHAMPS Site</b>	<b>Hospital(s)</b>	<b>Type of Hospital</b>
Bangladesh	-Baliakandi Upazila Health Complex -Faridpur Medical College Hospital -Zahid Memorial Children Hospital	-Urban referral hospital -Urban referral hospital -Peri-urban hospital
Ethiopia	Hiwot Fana Comprehensive Specialized Hospital	Urban referral hospital
Kenya	-Jaramogi Oginga Odinga Teaching & Referral Hospital (Kisumu) -Siaya County Referral Hospital (Siaya)	-Urban referral hospital -Rural referral hospital
Mali	Hôpital Gabriel Touré	Urban referral hospital
Mozambique	-Manhiça District Hospital -Central Hospital of Quelimane	-Urban district hospital -Rural regional hospital
Sierra Leone	Makeni Regional Hospital	Rural regional hospital
South Africa	Chris Hani Baragwanath Hospital	Urban referral hospital

**eTable 2.** WHO Pocket Book of Hospital Care for Children perinatal asphyxia and neonatal sepsis guidelines\*

<b>Birth Asphyxia</b>
<ul style="list-style-type: none"> <li>• Assess breathing and check heart rate with a stethoscope</li> <li>• Airway suction if infant had meconium-stained liquor or the mouth or nose is full of secretions</li> <li>• Positive pressure ventilation with mask and self-inflating bag if infant is not breathing or gasping</li> <li>• Provide high concentration oxygen if heart rate is &lt;60/min or between 60 – 100/min</li> <li>• Provide chest compressions if heart rate is &lt;60/min</li> <li>• Provide other ventilatory support if heart rate is &lt;60/min</li> <li>• Provide IV adrenaline if heart rate is &lt;60/min</li> </ul>
<b>Neonatal Sepsis</b>
<ul style="list-style-type: none"> <li>• Empirical antibiotics should be given to children with suspected neonatal sepsis</li> <li>• When possible, perform a lumbar puncture and obtain blood cultures before starting antibiotics</li> <li>• For newborns with any signs of serious bacterial infection or sepsis, give ampicillin (or penicillin) and gentamicin as a first-line antibiotic treatment</li> <li>• If at greater risk of staphylococcus infection (extensive skin pustules, abscess or omphalitis in addition to signs of sepsis), give IV cloxacillin and gentamicin</li> <li>• If the infant is drowsy or unconscious, ensure that hypoglycemia is not present; if it is, give 2 ml/kg 10% glucose IV</li> <li>• Treat convulsions with phenobarbital</li> <li>• If the child is from a malarious area and has fever, take a blood film to check for malaria. If confirmed, treat with artesunate or quinine.</li> </ul>

\*World Health Organization. *Pocket book of hospital care for children: guidelines for the management of common childhood illnesses*. World Health Organization; 2013.

**eTable 3.** Comparison of deceased neonates with MITS and DeCoDe in the CHAMPS network included and excluded in the analysis of clinical care recommendation adherence

	Included in Analyses (N=1,194), n (%)	Excluded from Analyses (N=947), n (%)	P value*
<b>Patient Age, days (median, [IQR])</b>	2 [1, 6]	1 [0, 3]	<0.001
<24 hours	391 (32.7)	440 (46.5)	
1 – 6 days	556 (46.6)	383 (40.4)	
7 – 28 days	247 (20.7)	124 (13.1)	
<b>Sex</b>			0.123
Male	692 (58.0)	544 (57.4)	
Female	501 (42.0)	401 (42.3)	
Indeterminate	1 (0.1)	2 (0.3)	
<b>Causes of Death</b>			
Neonatal preterm birth complications	409 (34.1)	516 (54.4)	<0.001
Other neonatal disorders	134 (9.8)	65 (6.9)	0.282
Congenital birth defects	79 (6.2)	102 (10.8)	<0.001
Neonatal aspiration syndromes	44 (4.3)	71 (7.5)	0.001
Neonatal encephalopathy	71 (5.0)	31 (3.3)	0.608

\*calculated by Chi-square test

**eTable 4.** Adherence to WHO Pocket Book of Hospital Care for Children recommendations for perinatal asphyxia determined by postmortem diagnosis (N=632)

<b>Recommendation</b>	<b>n (%)</b>
Airway Suction	284 (44.9)
IV Hydration	426 (67.4)
<b>Resuscitation</b>	
Ventilation with bag-valve-mask	273 (43.2)
Chest compressions	412 (65.2)
Adrenaline	77 (12.2)
<b>Supplemental Oxygen*</b>	
Any supplemental oxygen	540 (85.4)
Blow-by-air	44 (7.0)
Nasal cannula	311 (49.2)
Continuous Positive Air Pressure (CPAP)	156 (24.7)
Bilevel Positive Air Pressure (BiPAP)	1 (0.2)
<b>All Recommended Treatments</b> (airway suction, ventilation with bag-valve mask, chest compressions, adrenaline)	28 (4.4)
<b>No Recommended Treatments</b>	51 (8.1)

\*WHO guidelines state "Positive pressure ventilation should be initiated with air for infants with gestation > 32 weeks. For very preterm infants, it is preferable to start with 30% oxygen if possible."

**eTable 5.** Factors associated with any supplemental oxygen for birth asphyxia among neonates who had birth asphyxia in the causal chain of mortality (N=579)<sup>a</sup>

	Any supplemental oxygen N=501, n (%)	No supplemental oxygen N=78 n (%)	Odds Ratio (95% CI)	P value	Adjusted Odds <sup>b</sup> Ratio (95% CI)	P value
<b>Time from admission to death</b>				0.009		0.19
Died in a facility <24 hours	249 (49.7)	51 (65.4)	<i>Referent</i>		<i>Referent</i>	
Died in a facility ≥24 hours	252 (50.3)	27 (34.6)	1.91 (1.17, 3.18)		1.64 (0.77, 3.49)	
<b>Patient Age, days</b>				0.03		0.34
<24 hours	248 (49.5)	49 (62.8)	<i>Referent</i>		<i>Referent</i>	
1-6 days	226 (45.1)	28 (35.9)	1.59 (0.98, 2.65)		1.07 (0.51, 2.28)	
7-28 days	27 (5.4)	1 (1.3)	5.33 (1.10, 96.27)		4.89 (0.58, 41.19)	
<b>Sex</b>				0.15		0.16
Female	213 (42.5)	40 (51.3)	0.70 (0.43, 1.13)		0.70 (0.43, 1.15)	
Male	288 (57.5)	38 (48.7)	<i>Referent</i>		<i>Referent</i>	
<b>Congenital anomalies</b>				0.16		0.27
Yes	34 (6.8)	9 (11.5)	<i>Referent</i>		<i>Referent</i>	
No	467 (93.2)	69 (88.5)	1.79 (0.78, 3.75)		1.62 (0.69, 3.81)	
<b>Concordant antemortem and postmortem diagnoses</b>				0.01		0.001
Yes	231 (46.1)	24 (30.8)	1.92 (1.17, 3.26)		2.62 (1.46, 4.70)	
No	270 (53.9)	54 (69.2)	<i>Referent</i>		<i>Referent</i>	
<b>Birthweight</b>				0.42		0.77
<1,000 grams	32 (6.4)	2 (2.6)	2.67 (0.77, 16.78)		1.86 (0.40, 8.65)	
≥1,000 to <1,500 grams	40 (8.0)	8 (10.3)	0.83 (0.39, 2.01)		0.77 (0.32, 1.85)	
≥1500 grams to <2,500 grams	129 (25.7)	18 (23.1)	1.19 (0.68, 2.18)		1.04 (0.56, 1.93)	
≥2,500 grams	300 (59.9)	50 (64.1)	<i>Referent</i>		<i>Referent</i>	

<sup>a</sup> Complete case analysis excludes deaths missing birthweight (N=38), deaths that occurred in the community or were missing duration of hospitalization (n=14), and with indeterminate sex (n=1).

<sup>b</sup> All values are in mixed effects model controlled for fixed effects for variables in column and random effect for site.

**eTable 6.** Adherence to WHO Pocket Book of Hospital Care for Children recommendations for neonatal sepsis determined by postmortem diagnosis (N=718)

<b>Recommendation</b>	<b>n (%)</b>
<b>Blood Culture</b>	207 (28.8)
<b>Antibiotics</b>	
Any antibiotic	623 (86.8)
Ampicillin only ( <i>not recommended</i> )	48 (6.7)
Gentamicin only ( <i>not recommended</i> )	84 (11.7)
Cloxacillin only ( <i>not recommended</i> )	2 (0.3)
Ampicillin/penicillin AND gentamicin ( <i>recommended</i> )	438 (61.0)
Cloxacillin AND gentamicin ( <i>recommended</i> )	4 (0.6)
<b>Seizures</b>	
Seizures	193 (26.9)
Anticonvulsant ( <i>if neonate had seizures</i> )	165 (85.5)
<b>Blood Culture and Recommended Antibiotics</b> (ampicillin/penicillin and gentamicin OR cloxacillin and gentamicin)	173 (24.1)
<b>No Recommended Treatments</b>	212 (29.5)