

Mortality Review: Infant Death

Note: This case is part of the regular mortality reviews that Nyaya Health conducts. The rationale behind these reviews is that death is the ultimate arbiter of epidemiological truth and that every death in the catchment area, even if apparently not related to care provided at the clinic, should be reviewed by the staff team. The reports of death will be compiled by staff members and by CHWs. Deaths are analyzed by their proximate causes, as well as their biological, structural, and societal precursors.

Brief Assessment

A baby girl infant previous product of a 38 week gestation at 36 hours of life was brought to the hospital by his mother after she noted him to be not passing urine and breathing rapidly. He had been discharged from the Bayalpata hospital the previous day. The child had been delivered at Bayalpata after prolonged delivery complicated by obstruction requiring three attempts at vacuum extraction. The time between rupture of membranes and delivery was seven hours. There was meconium aspiration.

Oropharyngeal/nasopharyngeal suction had been performed and high flow oxygen was given. Positive pressure ventilation with ambu bag was done for thirty minutes. There was delay in both oxygen delivery and ventilation since equipment was not readily available in the delivery room. APGAR scores were 2/10 at one minute and 6/10 after 10 minutes. Intravenous access was attempted twice without success. Baby was improved at the end of resuscitation. Improved tone and color, minimal cry, spontaneous breathing, and minimal movements. The baby was maintained on high-flow oxygen. Mother was taught breast feeding. Mother was not producing breast milk. She was counseled for home remedies such as lactogen milk. At discharge 16 hours after birth, baby was stable, able to drink mother`s milk and pass urine. Vital signs at discharge were not recorded but were noted to be normal. According to mother, she couldn't produce breast milk at home. Baby was fed buffalo milk mixed with water. Baby was brought to the hospital when she didn`t pass urine and found difficulty breathing.

On repeat presentation, the baby was lethargic, no sucking reflex, grunting. Respiratory rate was 77 breaths per minute and heart rate was 157 beats minute. Temperature was noted to be normal but not recorded. On examination, indrawing chest and crackles on auscultation. IV access was obtained. The baby was treated with intravenous Leclyte P infusion and Ceftriaxone 75mg/kg. She baby subsequently died shortly upon presentation to the hospital.

Likely causes of death

1. Neonatal sepsis
2. Pneumonia
3. Meconium aspiration syndrome
4. Respiratory Distress Syndrome/Surfactant Deficiency
5. Patent ductus arteriosus-dependent congenital cardiac anomaly

Modifiable risk factors:

1. Adequate number of antenatal visit
2. Emergency cesarean section
3. Ready to use equipments (suction machine, vacuum, oxygen delivery machine, ambu bag)

Systems-Level Analysis

The primary concern of this review is the management of the infant at resuscitation and during her initial hospitalization, since that is likely where the causal pathway leading to her death started and since she was very nearly already dead by the time of her second presentation to Bayalpata Hospital. Below, we assess the root causes of mortality within the following levels of analysis.

Hospital operations

We lack formal guidelines in neonatal care, and our staff has received very little training in the care of sick newborn infants. This led to several delays and errors in appropriate treatment.

The infant received oxygen only after one minute of life despite being blue and listless and should have received treatment immediately.

Intravenous access was attempted unsuccessfully, which would have been important for fluid resuscitation. Staff do not feel adequately trained in obtaining intravenous access for infants.

Given the presentation of 1) very sick infant with low APGAR scores requiring extensive resuscitation and 2) delayed rupture of membranes without the provision of intrapartum penicillin, the infant should have received treatment with ampicillin and gentamicin for presumed neonatal sepsis.

The infant should have then received at least 48 hours of observation in the hospital given how critically ill the patient had been.

Supply chain

Neonatal size oxygen mask was not available.

X-Ray was not available, and in any case no staff are trained in the interpretation of neonatal X-Rays.

Blood culture facilities would assist in understanding the epidemiology of neonatal sepsis and in determining the ultimate disposition of infants initially treated with antibiotics.

Equipment/machinery

There was delay in both getting oxygen and positive pressure ventilation initiated during the resuscitation. There was only ambu bag in other room and searching for mask, generator had to be turned on because electricity went off during delivery process. Training and supplies both could be improved. The oxygen delivery machine and suction machine were shared for general emergency care and obstetric care. Ambu bag was in another room.

Personnel

One midwife, a doctor trained in general medicine, an advanced medical student, and a health assistant were present at the resuscitation. This is adequate personnel to lead a neonatal resuscitation, although as above the staff is not currently appropriately trained in neonatal resuscitation. Additionally, there was no designated roles or protocol for quickly running the resuscitation (e.g., who gains intravenous access, who manages the airway, who administers medications and fluids). There was some delay in calling the on-call clinicians during the care of this infant. The current process by which the night watchman runs to the staff quarters presents a clear barrier to timely evaluation of sick patients.

Outreach

No community health worker is currently working in the patient's village development committee. The mother did not have a documented tetanus vaccine or tests for syphilis and HIV. These are all interventions that could have prevented neonatal syphilis, HSV, tetanus (doubtful any of these are the ultimate etiology in this case, but still worth reflecting upon)

On subsequent discharge from the hospital, extremely sick infants such as this should receive follow-up visits from a community health worker to ensure 1) that they are feeding well; 2) that they are stooling and urinating appropriately; 3) that they are breathing comfortably. Our outreach system is still in its infancy, and it is frustrating that we did not have the capacity to follow-up this infant who only lived a half-hour from the hospital.

Societal/Structural

The woman was of Kshetryia caste which is higher within the caste system. She lived in extreme poverty. Her husband suffered from alcoholism. The mother lived half an hour from Bayalpata Hospital; in this case, transportation was not a primary issue. There was a lack of health awareness of the mother, which prevented her to seek antenatal care, lack of resources (money, husband's support) to go to nearest referral center, and lack of obstetrical surgical care in Achham.

Final Evaluation and Response

This tragic death reveals several weaknesses in our current capacity to care for the sick newborn infant. The devastating aspect of this case is that we currently do not have the technology and human resources to improve neonatal care. Rather, we need solid protocols and trainings. Mechanical ventilation and other more high-tech aspects of neonatology are really not what's needed to save the vast majority of these infants such as this. The primary needs we will pursue as a result of this case:

1. We should develop formal guidelines for neonatal resuscitation.
2. We do not have a clear protocol on neonatal sepsis that we follow.
3. Prior to discharge from the hospital, all infants should have a thorough physical exam including evaluation of feeding and documentation of passage of stool and urine. Strict discharge criteria should be made, and the period of observation should be liberalized.
4. All deliveries should have oxygen with ambu bag-mask and suction available, and these should be tested by the individual leading the postnatal care of the infant.
5. We will continue to work to identify how outreach workers can ensure follow-up of sick infants, perhaps through a roaming community health worker for those patients in whom a local CHW is not available.
6. We will investigate whether the new cellular CDMA signal can be utilized for on-call staff, or whether walkie-talkies should be purchased.