

NEWBORN INTENSIVE CARE UNIT – Dr. Stephen Swanson

1. Introduction:

Preterm birth complications are the leading cause of death among children less than 5 years of age, according to the World Health Organization (WHO). The Newborn Intensive Care Unit (NICU) at ALMC is dedicated to providing care for critically ill premature and term babies. Free and subsidized care is provided to babies in the NICU.

The NICU at ALMC provides a full range of advanced newborn support, including overhead warmers, temperature-regulated, humidified incubators, phototherapy lights and fiber optic blankets (“Biliblankets”) for treating neonatal jaundice, respiratory support (continuous positive airway pressure and oxygen blenders), pulmonary surfactant, cardiorespiratory monitors, umbilical venous catheters, advances in nutrition support, and a wide array of neonatal medications available.



Hospitalization in the NICU includes:

1. Admission and exam by a pediatric registrar physician, a nurse, and consultant specialist.
2. Around the clock monitoring by NICU staff who are present 24 hours a day.
3. Laboratory, imaging, and technological support, including point of care laboratory testing.
4. Each mother is provided with a bed in the hospital for round the clock availability.

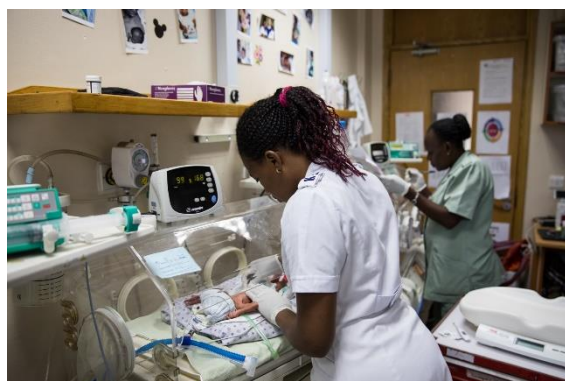
At present, the ALMC NICU provides the highest level of care available for critically-ill babies in Tanzania and is among the most advanced NICUs in all of East Africa.

2. Highlights:

2017 saw a record number of admissions and neonatal discharges from the Neonatal Intensive Care Unit (NICU), with ongoing advances in newborn respiratory care, acquisition of new medications, protocols and improved nursing care.

1. 251 admissions to the NICU in 2017, a 20% increase compared to 2016.
 2. Increasing survival rates among all NICU admissions (90.4%) and among all premature babies (87%).
 3. Improving survival rates in extremely small babies, including babies born with very low birth weights (VLBW; <1,500 grams or 3 pounds – 4 ounces) and extremely low birth weights (ELBW; < 1,000 grams or 2 pounds – 3 ounces).
 4. Increasing use of pulmonary surfactant for severe respiratory distress syndrome in extremely premature newborns. We are the only hospital in Tanzania that is providing this life-saving pulmonary medication to our sick babies, irrespective of family's ability to pay.
 5. Our smallest survivor ever, baby Gracious, weighing only 670 grams (1 pound – 7 ounces) on arrival. This beautiful little girl was born 14 weeks premature, and along with her twin brother (birth weight 860 grams, 2 pounds – 6 ounces) was discharged home after 2 months in the NICU. Both are doing extremely well!
 6. Increasing numbers of discharged babies attending our follow-up NICU clinic, with most premature babies demonstrating continued excellent weight gain and age-appropriate neurodevelopmental milestones on follow-up examinations.
 7. Publication of "***Principles of Neonatal Care, Muhimbili National Hospital***, 1st edition". Muhimbili National Hospital in Dar es Salaam is Tanzania's national referral hospital. Our NICU team extensively contributed to the writing of this manual, and the NICU's guidelines were extensively incorporated into this manual. "Principles of Neonatal Care" will be distributed electronically to hospitals and physicians across Tanzania to guide neonatal care.
 8. Greater media awareness of the unique accomplishments and level of care provided at ALMC's NICU: see NICU videos online at www.vimeo.com/drswanson and <https://www.facebook.com/savingbabieslives/>
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During the year 2017, 251 babies were admitted to the NICU (Table 1), representing a 20% increase in overall admissions compared to year 2016. Year 2017 represented the highest number of NICU admissions on record. In 2017 we also achieved our lowest mortality rate (9.6%) ever—this is a 45% reduction in NICU deaths compared to 2016 (17.7%). Stated differently, 90.4% of all critically-ill newborns admitted to our NICU survived in 2017. It is a remarkable accomplishment to have a 90% survival rate among all NICU admissions, considering the large numbers of critically ill babies that arrive from outside the hospital in poor condition, and those babies that are born extremely premature or with severe congenital and surgical conditions.



Among the 251 neonatal admissions, 84 (33%) were preterm babies and 167 (67%) were full term babies. Admissions to the NICU included newborns with conditions such as prematurity, perinatal/birth asphyxia, neonatal seizures, respiratory distress, meconium aspiration syndrome, neonatal sepsis, jaundice, and requiring care following surgery for congenital conditions.

Thirty-five percent of all NICU admissions were from outside births (“transfers into ALMC). Fewer transfers arrived into our NICU compared to previous years, due to declining deliveries at Selian Lutheran Hospital and an expanding obstetric service at ALMC. Among the 87 neonates referred in to the NICU, 59 babies arrived from Selian Lutheran Hospital in Ngaramtoni. All hospital expenses for these 59 critically-ill neonates were fully paid for by the NICU fund (Table 2).

As our NICU survival rate has steadily increased through advances in nursing skills, improved clinician education, new protocols and better medications, we often experience our NICU being at full capacity. Extremely premature or small babies, especially those with birth weights under 1,500 grams (3 pounds – 4 ounces), require lengthier hospitalizations. Our NICU is sometimes at full capacity and unable to accept new admissions from outside hospitals. There remains a strong need for additional NICU beds and trained personnel in Arusha. Future admission growth in the face of improving survival rates remains dependent on training and retaining additional qualified nurses and physicians, and increased levels of outside funding to support higher levels of neonatal care.

Year 2017 represented many new accomplishments. We had our highest survival rate ever for premature babies. We had 9 extremely low birth weight (ELBW) newborns survive and “graduate” from our NICU, with an average birth weight of 840 grams (1 pound- 14 ounces).

Our smallest survivor ever left our NICU after nearly 2 months of hospitalization, having been born 14 weeks premature with a birth weights of 670 grams. Another baby was born at 25-weeks' gestation (15 weeks early) survived, and after 70+ days in our NICU is now a thriving infant at home. In 2017, we administered 22 doses of pulmonary surfactant to severely preterm babies who might otherwise have died from respiratory distress syndrome due to pulmonary immaturity. Our increasing capacity to care for early preterm neonates has meant that more NICU beds are being occupied by premature babies. This has also resulted in many mothers, who having lost multiple prior pregnancies due to preterm labor, now being able to gratefully bring a baby home that otherwise would not have survived.

Despite the NICU's many successes in 2017, 24 of 251 (9.6%) admitted babies did not survive. The most common causes of neonatal death in the NICU were extreme prematurity, severe birth asphyxia/hypoxic ischemic encephalopathy, sepsis (infection), and severe birth anomalies or congenital heart disease. Among the 24 neonates who did not survive in 2017, 45% (11/24) had a birth weight of less than 1500 grams. Critically-ill neonates who were transferred from external hospitals to our NICU experienced substantially higher mortality rates (14.9% mortality rate) when compared to neonates admitted directly to our NICU from ALMC's obstetric service (6.7% mortality rate). This fact is not surprising, as every minute counts for a critically ill or premature baby following birth. Newborns whose admission was delayed by being born at home or at outside hospitals had substantially poorer outcomes (2x higher mortality rates), due to delays in appropriate care and timely transfer to our NICU.

3. Challenges:

The NICU at ALMC faces many challenges in the coming year. Globally, prematurity is now the leading cause of death among children under age 5. The prematurity rate in northern Tanzania is unknown, but likely to be >10%. Most prematurity deaths (>75%) are preventable with basics of resuscitation, thermoregulation, respiratory support and appropriate feedings. The ALMC NICU continues to face the challenge of greater and greater numbers of babies needing this higher level of newborn care in Tanzania. While the true costs of neonatal care continue to rise, actual reimbursement rates for NICU hospitalization through government insurance rarely reimburses actual expenses. Not surprisingly, rising numbers of newborns require this level of NICU care, with fewer financial resources to deliver it.



In 2017, the ALMC NICU provided \$61,645 in unreimbursed direct patient care and \$9,000 in maternal care (free board and meals for all mothers of NICU babies). In addition, over \$35,000 in NICU operational costs was provided at no cost for newborn medications, staff training, new equipment and infrastructure improvements. In total, \$107,645 in subsidized or free care was provided to the 251 NICU patients in 2017. This amount (\$107,645) was provided entirely through individual donors and churches. Without these charitable donations, our NICU would cease to deliver its current level of care. We remain the only NICU in Tanzania that employs routine use of intravenous (IV) pumps, continuous respiratory monitoring, advances in neonatal respiratory support, thermoregulation, medication, and adequate nurse staffing *to every newborn who might need it*.

4. Plans for 2018:

Future growth in our NICU depends on continued donations to support the costs of caring for these critically-ill neonates. It is worth noting that our *annual* NICU budget (caring for 250+ hospitalized neonates) remains less than the cost of a *single* newborn being hospitalized in a NICU in the United States for 2 weeks!

In 2018, we look forward to continuing to provide the most advanced newborn care in northern Tanzania. We hope to recruit overseas NICU nurse educators to join us in efforts to improve our care of neonates. We anticipate the further hiring and training of NICU nurses and doctors. We will be producing additional videos to raise awareness of the needs of newborns and the role of a NICU in Tanzania (viewable at: www.vimeo.com/drswanson). We hope to complete an updated manual of NICU care for our new doctors, to provide greater neonatology guidance and updated protocols to medical trainees. 2018 looks to be another productive year in a busy neonatal intensive care unit, caring for the smallest of all possible patients.
