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The Nigerian LNG respiratory support substation and its politeheartCPAP machine in the neonatal centre of Aminu Kano Teaching Hospital, Kano: nurses' perspective

Abstract

Respiratory distress (RD) in the neonate can be difficult to manage, especially in LMICs, where knowledge gap and lack of efficient equipment make this even worse for the nurse. At Aminu Kano Teaching Hospital (AKTH) Kano, Nigeria, RD has been the nurses' nightmare which has been recently minimized by a novel idea of a 'Respiratory Support Substation' at the special care baby unit of the hospital. The installed politeheart CPAP machine is efficient, easy to operate, algorithm-driven, and has yielded a 100% success rate within the first eight weeks of usage at AKTH Kano.

The substation and the accompanying equipment can easily be adaptable elsewhere, especially where a high incidence rate of RD exists.

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Introduction

Neonatal respiratory distress syndrome (RDS) is one of the nursing nightmarish conditions that leads to nursing fatigue in the Nigerian practice as in other LMICs.[1] The lack of efficient and easy-to-use models of bubble continuous positive airway pressure (bCPAP) machine in most centres in Nigeria, including in our experience, makes it difficult to effectively nurse the huge numbers of RDS patients in our care. It has hence become a source of practice frustration for which help has long been hoped and desired.

The Nigeria Liquefied Natural Gas (NLNG) Limited recently donated and installed a neonatal intensive care unit (NICU) 'substation' for neonatal respiratory support at Aminu Kano Teaching Hospital, Kano (Figure 1). The installed devices included two units of the Politeheart bubble CPAP (politeheartCPAP) machine.[2] The project, which was led by the NLNG Ambassador—Hippolite Amadi of Imperial College London, culminated in theoretical and practical training that was attended by most of the nurses at the AKTH special care baby unit (SCBU). This was beautifully anchored by the NLNG Ambassador, with the doctors, nurses, and engineers of AKTH who work in SCBU participating.

Figure 1 AKTH, Kano respiratory support substation.

As nurses, the continuous monitoring of the patients on admission is our duty. Hence, it is often easy for us to identify and compare peculiar reactions from patients under diverse kinds of life-support. The coauthors of this report are self-aggregated small team of nurses within the wider nursing family of the SCBU, with self-motivated interest of carefully following the operational rules of the new substation's devices to form independent opinion.

The aim of this brief report is to present -our nursing perspective of the NLNG NICU substation at AKTH Kano, reflecting on the specific few patients we teamed up to nurse and comparing the final outcomes with others in similar critical conditions within the same period.

Methods

Careful attention was paid to details on the operation and nursing care with the politeheartCPAP system during the theoretical training sessions. The nursing staff, AMI, of our team led the cohorts of the hands-on trainees by practically manipulating one of the devices as the NLNG Ambassador demonstrated with the second device.

The subsequent nursing and monitoring of the index patient following training was carefully continued by our team. The neonate's nasal cannula and prongs were assembled and applied to every new patient as taught by the Ambassador. The end delivery limb of the ventilatory tubing was connected to the cannula and machine was started with physiological target settings of the appropriate respiratory gas temperature for maintaining stable physiological temperature of the lungs. Oxygen flowrate and air flowrate were set based on the peculiar situation of each neonate.

Oxygen saturation was continuously monitored via the inbuilt pulseoximeter as this guided the readjustments of the fraction of inspired oxygen (FiO_2). Of each of the three neonates that have received care through our team in the substation, the nasal prongs were inserted to the baby's nostrils and were secured after a 'kidney dish' test as learnt, and subsequently monitored continuously to

avoid 'neonatal suffocation' through nasal prong blockage often orchestrated by wrong cannula latching or knotting. We used the politeheartCPAP machine to aid the babies, supporting and teaching them to breathe using the provided algorithm until they were able to carry on breathing on their own.

Other patients with similar circumstances during the same period were managed based on our previously existing devices and care methods by the teams and shifts of other members of the SCBU nursing staff without the control of our team members.

Results and discussion

A total of seven very low birthweight neonates in very similar critical conditions during eight weeks following the commissioning of the NLNG substation can be identified. Of these seven patients, three of them were nursed by our team in the substation as we carefully coordinated our duty shifts to cover the nursing care. The index neonate who was placed on politeheartCPAP machine was successfully weaned off with no difficulties by the fifth day of treatment. The baby did not stay too long on the machine before weaning-off unlike the other CPAP machines we have previously used in the unit irrespective of this patient's initial setback before being sub-admitted to the substation. The lack of an adequate number of trained nursing staff in our small team led to some weeks of idleness when no patients were sub-admitted to the substation by us. However, activities gradually returned, and for our team, the substation has successfully weaned off all three neonates we sub-admitted and have been managed. However, all the four other neonates managed with our existing alternative applications were lost.

The initial case: The initial case involved an extremely low birthweight 26-week gestation female neonate who was already placed on another kind of oxygen support with progressive deterioration. The decision was made to transfer the patient to politeheartCPAP as the substation's index-patient on 23/9/24 at 4:10 pm. The neonate arrived at the NLNG substation at oxygen saturation (SpO_2) of 52%. Therefore, the politeheartCPAP's oxygen flowrate for the neonate was set at 4 LPM and airflow rate of 2 LPM. This yielded a FiO_2 of 63.2%, with its positive end expiratory pressure (PEEP) set at 5 cm H_2O. The baby passed the first 'round of oxygen saturation' at 4:55 pm with SpO_2 of 98%. Hence, oxygen was reduced by 0.5 LPM. Oxygen flowrate was reduced by 0.5 LPM after each FiO_2-sturation round (marathon) till baby was on 0 oxygen flowrate on 24/7/24, but still on atmospheric air of which was increased to 4.5 LPM yielding FiO_2 of 20.5%, and SpO_2 of 97% was re-attained in quick time. The nasal prongs were placed on top of the baby's lip to train neonate for independent uptake of the flowing gas on her own, and this was later placed on top of her nose bridge after neonate super saturated again at SpO_2 of 97%. The PoliteheartCPAP machine was switched off on 28/9/2024 but its pulse oximeter was still left 'on' for continuous monitoring and observations of the patient. The baby was finally discharged after five days of continuous monitoring (off CPAP) with an independent SpO_2 of 98%.

Conclusion

Our short-term nursing experience with this substation initiative seems to suggest that our long-awaited game-changer for improved neonatal survival is finally here with us. The added advantage of politeheartCPAP machine is that it can be used easily at peripheral centres without the need for expensive consumables and many babies can be extubated successfully.

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Conflicts of interest

The authors declare that they have no conflict of interest.

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