

Neonatal Transport Program Overview

Mohamed Shawky Elfarargy^{1,2}, Thamer Alshami Alruwaili¹, Dalia Hamdy Elbadry³, Ahmad Roshdy Ahmad^{1,4}

¹Department of Pediatrics, College of Medicine, Jouf University, Sakakah, Saudia Arabia, ²Department of Pediatrics, Faculty of Medicine, Tanta University, ³Department of Pediatrics, El Menshawey General Hospital, Tanta, ⁴Department of Pediatrics, College of Medicine, Assiut University, Assiut, Egypt

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DEFINITION

Neonatal transport program (NTP) is a specialized service for neonatal transport for those who require transfer between hospitals for intensive care. All hospitals should have agreements with higher neonatal care centers for consultations and neonatal transfer.^[1,2] It was first founded in the USA, but it differs slightly according to local medical units.^[3,4]

INDICATION AND CONTRAINDICATION

NTP is indicated in any transportation of neonate from place to place, but it is specially indicated in unstable or high-risk neonates like transportation of very-low-birth-weight neonates who weigh below 1.5 kg and extremely low-birth-weight neonates who weigh below 1 kg, neonatal respiratory problems requiring respiratory support, severe hyperbilirubinemia, hypoxic-ischemic encephalopathy, liver problems, renal problems, heart problems, surgical problems, blood diseases, especially bleeding disorders, electrolyte disturbance, and congenital anomalies compatible with life.^[5-9] NTP is contraindicated in congenital anomalies incompatible with life, immature neonates who are not viable in conditions when their weights are below 400 g or below 23 weeks gestational age, neonates who

ABSTRACT

Neonatal transport program (NTP) is a specialized service for neonatal transport for those who require transfer between hospitals for intensive care. NTP is indicated in any transportation of neonates from place to place, but it is specially indicated in unstable or high-risk neonates. The aim of this review is to discuss the importance of NTP, indication, and contraindication of NTP. In addition, we demonstrate the items of the transport system, methods for the preparation for transportation, as well as all the items of the transportation pathway. We also discuss the predeparture checklist, in addition to the illustration of the NTP telephone referral template. This review will demonstrate the predeparture checklist. Our main goal is to show the importance of NTP in providing the best place for the treatment of needed neonates with safe and adequate scientific transportation from the referring hospital to the receiving hospital.

KEYWORDS: Ambulance, hospital, neonate, program, referral, telemedicine, transport

cannot be stabilized or not responding to resuscitation and predicted to arrest during transport, and improper transport circumstances either in qualified personnel or required devices and materials.^[10-14]

ITEMS OF TRANSPORT SYSTEM

First, personnel include the transport team, which consists of skilled personnel in the care of the high-risk neonate. The team includes a neonatal physician, neonatal transport nurse, and staff from the Egyptian Ambulance Organization under the leadership of a neonatal consultant.^[15-17] Second, the records which include records of each transport should include referral forms which include all the neonate's data and clinical conditions. Finally, all the required equipment which are present in the prepared special ambulances, which include a transport incubator, monitors for all vital signs, O₂ delivery system, intravenous (IV) infusion equipment, medications for resuscitation and assisted ventilation equipment.^[18-20]

Address for correspondence: Dr. Mohamed Shawky Elfarargy, Department of Paediatrics, College of Medicine, Jouf University, Sakaka, Kingdom of Saudia Arabia, Department of Paediatrics, Faculty of Medicine, Tanta University, Tanta, Egypt. E-mail: farargy2009@hotmail.com, mselfarargy@ju.edu.sa

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PREPARATION FOR TRANSPORTATION

Before transport, the NTP team should contact the receiving hospital to ensure the availability of beds and services, and assess the neonate's condition to ensure safe transport during transport; there should be regular checking and documentation of the neonate's status and contact the hospital if any problem occurred, and finally, after transport, there should be supply of the receiving hospital with the referral form and what had happened before and during the transfer.^[21-27]

TRANSPORTATION PATHWAY

Referring hospital calls, emergency medical services (EMS) arrange an ambulance and divert the call for the NTP team, all calls are recorded for verification purposes, and the call handlers answer and record the data which include the referring hospital name, referrer name and title, referrer contact number, patient name, and patient date of birth.^[28-32] Call handlers inquire if the bed acceptance for admission is already confirmed or not; if confirmed, the call handlers connect the referring hospital with the on-call NTP team, and if not confirmed, the NTP team tries to facilitate the sourcing of neonatal intensive care unit (NICU) bed to the referring hospital.^[33-35] The NTP team (who is available, 24 h/day, 7 days/week) target mobilization time is 40 min from the hospital base, and the NTP ambulance should move to the relevant hospital as soon as the transport is accepted. When air transport is indicated, the call handler will link with EMS to arrange for that at the earliest time.^[36-38]

PREDEPARTURE CHECKLIST

The predeparture checklist includes the airway, breathing, and circulation which involve checking the patency of the airways and measuring respiratory rate and blood pressure; it also includes the required resuscitation drugs and fluids as well as the site and the number of vascular accesses.^[39-41] The predeparture checklist also includes the available O₂, air, power supply, and required equipment, and it also includes the history, clinical, medical, investigation and treatment records, as well as transport forms and consent.^[42-44]

INFANT REFERRAL HISTORY

It should be done by the referring main hospital. It includes infant details (name and address), referral items (cause of referral, referring main hospital, referring neonatal consultant, receiving tertiary hospital, receiving neonatal consultant, and exact time of referral), maternal items (her name, age, contact telephone, consanguinity, and smoking), past medical history, family history, pregnancy and delivery history, neonatal condition

at birth, the neonatal current problem at the time of referral, neonatal general and systematic examination at the time of referral, neonatal Investigations, current medications and fluids, NTP doctor signature, NTP nurse signature, referring doctor signature, and referring nurse signature.^[45-50]

NEONATAL TRANSPORT PROGRAM TELEPHONE REFERRAL TEMPLATE

All information should be available when telephoning the NTP team, including the date of transport request, time of transport request, time of referring hospital decided to transfer infant, referring hospital, referring hospital contact, referring neonatal consultant, receiving main hospital, receiving hospital contact, receiving consultant, and reason for transport.^[36,51-54] It should also include the infant's name, date of birth, age, sex, gestational age, birth weight, present weight, APGAR score, current problem, and diagnosis. Finally, it should include neonatal airway condition, either intubated or not, respiratory rate, ventilated or not, mode of ventilation, HR, capillary refill time, BP, current treatment and fluids, temperature, consent, and NTP doctor signature.^[55-60]

TRANSPORT FLOW SHEET

It includes transport type, the time of referring hospital decided to transfer the neonate, the time of referring hospital called the EMS, the time of EMS called the NTP team, the time of NTP team departed the base unit, the time of NTP team arrived at the referring hospital, the time of NTP team departed the referring hospital, the time of NTP team arrived the receiving hospital, the time of NTP team returned to the base unit, receiving hospital, receiving hospital contact number, receiving consultant, the reason for transport, either the transport accepted or not, mode of transport either ground ambulance or air ambulance, NTP doctor signature, and NTP nurse signature.^[61-69]

CONSENT FOR TRANSPORT AND TREATMENT BY NEONATAL TRANSPORT PROGRAM

It includes the name of the patient, date of birth, hospital address, referring hospital, referring doctor, receiving hospital, and receiving doctor.^[70-72] The risks of transportation include but are not limited to the risks of emergency transportation: failure of medical equipment, transport incubator or ambulance malfunction, traffic hazards, and adverse weather conditions as well as the risks associated with all medical transport: possible worsening of the patient condition or interruption of the medical treatment during transportation.^[73-75] The parents

of the neonates made authorization of transportation of their neonates to the receiving hospital for treatment by writing a documented paper clarifying that they understand the risks associated with transportation and accept the transportation of my infant and authorize transportation of their neonates by NTP team by ground and/or air ambulance as well as that they authorize NTP team doctors and nurses to continue treatment of their neonates and give them any medication or perform any procedure which is necessary for their neonate condition according to NTP team opinion.^[76-79]

RISKS DURING NEONATAL TRANSPORT AND METHODS OF THEIR PREVENTION

The risks during neonatal transport include hypothermia (body temperature below 36°C) which is prevented by ensuring that the transport incubator has appropriate temperature and humidity with the application of a cap, especially in preterm neonates.^[80-82] The risks also include hypoglycemia (blood glucose level <40–50 mg/dl) which is prevented by IV glucose infusion. Hypotension (systemic blood pressure <2 SD) is another risk that may occur during neonatal transport and prevented by the administration of adequate fluid treatment as well as inotropic drugs.^[2,83-85] Hypoxia or hyperoxia may also occur during neonatal transport, and these risks could be prevented by maintaining the SpO₂ levels of the transported neonates between 90% and 94%, and this is monitored with the pulse oximeter.^[86,87]

TELEMEDICINE IN NEONATAL TRANSPORT PROGRAM

The effective high-resolution camera worked successfully to evaluate the neonates who are liable to be transferred between primary or secondary neonatal care units to tertiary neonatal care units and allow free, safe, and easy communication between medical staff in the receiving hospitals and the referring hospitals, which allow effective, easy, and accurate consultation that depend on direct visualization of the transferred neonate.^[88-91] Telemedicine allows accurate, effective, and easy video and audio communication between well-experienced neonatal consultants in tertiary neonatal units in the receiving hospitals and the neonatal team in the referring hospitals. Telemedicine has many advantages, which include that it improves the quality of neonatal transport through effective and valuable communication between the highly skilled neonatal team in the receiving hospital and the neonatal team in the referring hospital with the implementation of skilled maneuvers in the process of neonatal transportation, which allow effective, safe, and easy neonatal transportation without

complications.^[92-94] Telemedicine gives immediate and effective solving of any problems that may occur during neonatal transportation, which allows safe neonatal transportation between the transferring and receiving hospitals. Telemedicine implements the correct clinical decision-making in different clinical situations depending on direct visualization of the transferred neonates.^[95,96]

CONCLUSION

NTP is an important service for neonatal transport between hospitals for intensive care. NTP is indicated in unstable or high-risk neonates who will benefit from highly skilled personnel and highly qualified intensive care in the receiving hospital. The process of transportation should be safe and scheduled to allow effective transport for the benefit of the transferred neonates. The program of transportation should be done by skilled personnel with good communication of the EMS with the referring and receiving hospitals. All the equipment should be ready and prepared for any emergency requirement for the transferred neonates. The NTP allows safe, smooth transport of high-risk neonates and avoids all the risks and complications that may occur during transport. NTP causes a decrease in morbidity and mortality, which may occur during neonatal transport. Telemedicine allows adequate visualization of the transferred neonate allowing follow-up and solving any problems that may occur during transport by a highly skilled neonatal team. We recommend that NTP should be implemented in all the transported neonates between primary or secondary neonatal care units and tertiary NICUs with strict follow-up for the proper implementation of the program for the benefit of the transported neonates.

Author contributions

ME collected the scientific data and references and did the scientific writing. DE, AR and TA did the scientific revision of the content.

Ethical approval

This is a review article with no research protocol to be approved by the Ethics Committee.

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Conflicts of interest

There are no conflicts of interest.

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