

# Smart Use of Smartphone in Neonatology

ANKIT SONI, SANDEEP KADAM, SANJAY PATOLE, ANAND PANDIT

## ABSTRACT

Physicians are increasingly using smartphone to support education and clinical practice, and improve procedural skills through various 'applications' on the device. Prompt detection and management of the underlying condition/s and preventing further deterioration is important in the management of critically ill neonates. Smartphones can facilitate neonatal emergency management and stabilization, especially in resource limited settings where access to expert advice is often difficult/not available. Smartphones are effective in coordination

and ongoing communication during transport, with potential to improve neonatal outcomes. We present our experience with a series of critically ill neonates where the use of smartphone resulted in significant benefits such as avoidance of an intercostal drain, prompt diagnosis and treatment of cardiac arrhythmia avoiding transfer and safe transport, and prompt patient management on arrival at the referral centre. The need for prospectively evaluating the benefits of smartphones in neonatal intensive care is emphasized.

**Keywords:** Emergency, Telecommunication, Transport

## INTRODUCTION

Smartphones offer advanced computing ability and connectivity than the old generation mobile phones. Physicians from the 'mobile' era are increasingly using smartphones to support education and clinical practice, improve procedural skills through applications such as NeoTube for training in neonatal intubation [1,2]. Prompt detection and management of underlying conditions is lifesaving and helps in preventing further deterioration of critically ill neonates. Smartphones can be used to facilitate neonatal emergency management, stabilization, especially in resource limited settings where access to expert advice may not be available. Importantly smartphones are effective in coordination and ongoing communication during transport, with potential to improve outcomes. Considering the limited data on applications and benefits of smartphone in neonatology, we wish to share our experience for diagnosis and management of critically ill neonates in a resource poor set up.

## CASE REPORTS

**Case 1:** Term male neonate admitted in a district hospital on day 2 of life, for respiratory distress. Clinical examination revealed significant tachycardia requiring an ECG. The attending doctor immediately sent the ECG image on smartphone to the consultant neonatologist, who diagnosed a supra-ventricular tachycardia (SVT) and advised intravenous adenosine. The SVT responded

to two doses of adenosine. This baby was discharged home on day 5. Cardiology follow-up done later was normal.

**Case 2:** Preterm neonate, 35 weeks was admitted to a level II nursery with severe respiratory distress (congenital pneumonia) and was ventilated. An Intercostal drain (ICD) was inserted for left Pneumothorax. The neonate had sudden desaturation on day 4, needing an emergency X-ray. The attending doctor was unsure about the diagnosis and immediately sent the X-ray on the smartphone, which showed pneumatocele. Second ICD was avoided. The neonate was stabilized and discharged home on day 12.

**Case 3:** Term neonate was admitted to a level II nursery for severe respiratory distress (meconium aspiration syndrome). Baby was managed with oxygen. Chest X-ray showed air-leak. The attending doctor was unsure about ICD. The X-ray image was sent on a smartphone to the neonatologist who diagnosed bilateral Pneumomediastinum. An ICD was avoided. The follow-up X-ray after 24 hours of Oxygen therapy showed resolution of the air-leak. The neonate was discharged home on day 7.

**Case 4:** Term male neonate with respiratory distress and shock required urgent transfer to a Level III nursery. The senior registrar on retrieval noted baby to be in severe shock and acidosis. The neonate was stabilized and a short video was sent to the neonatologist on call. The

video helped the receiving team in anticipating all needs (e.g. Inotrope, umbilical catheters, ventilation), and be well prepared. Stabilization of the neonate took only 15 minutes after arrival at the unit.

## DISCUSSION

Our experience indicates the potential benefits of smartphones in neonatal intensive care (NIC), especially in resource poor set-ups, where immediate access to a specialist may not be available. Avoidance of ICD with potential for serious complications in inexperienced hands, prompt diagnosis and successful treatment of SVT avoiding transfer, safe transport, and prompt management by the well informed (smartphone) team at the referral centre are the significant benefits we observed. Considering everyone these days has smartphone, we believe such benefits are potentially available for everyone involved in NIC irrespective of the setups where they work.

Use of smartphones is on the rise in medical fields [1], as these devices offer opportunity for improving interpersonal interactions with videos, real-time support, improving the quality of care and linkage with specialized centers. The importance of smartphones in NIC cannot be over emphasized considering need for timely expert help/advice in neonatal emergencies and the fact that they are marginally low-cost, easily accessible and user-friendly tools for communication and sharing important data in real time.

The image-quality of smartphone was satisfactory in our experience. The X-rays and ECG were easy to interpret, and no diagnostic errors were made. It is important to note that transportation of a sick neonate, under ideal conditions, is not without risks. These risks are real and significant in resource limited set-ups where there are few good facilities for neonatal transport. Consent and protecting confidentiality are also important issues but probably not a major barrier against using smartphones, at least in emergency situations. Advances in technology

are expected to optimize quality, safe transfer, storage and retrieval of smartphone images.

Smartphones have been used for cardiopulmonary resuscitation training and teaching students [3]. The benefits of these devices for offsite supervised training in various aspects of primary/advanced NIC needs to be assessed.

## LIMITATION

Misdiagnosis is a risk when relying only on smartphone. Thorough discussion on patient's history, presentation and current condition will reduce the probability of serious errors. Reducing this probability to zero is not possible and one will have to balance the risks versus potential benefits of smartphone in the best interest of the patient.

## CONCLUSION

We wish to emphasize that smartphones should not replace or substitute physician judgment, which is the cornerstone of medicine. They will however be useful as a supplementary tool in patient care when expert advice/help is not available. In summary, our experience indicates that prospective assessment of the potential of Smartphones in improving patient care and processes related outcomes in NIC is essential.

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### AUTHOR(S):

1. Dr. Ankit Soni
2. Dr. Sandeep Kadam
3. Dr. Sanjay Patole
4. Dr. Anand Pandit

Women, University of Western Australia, Perth, Western Australia.

4. Director and HOD, Department of Pediatrics, KEM Hospital, Pune, Maharashtra, India.

### PARTICULARS OF CONTRIBUTORS:

1. DNB Neonatology trainee, Department of Pediatrics, KEM Hospital, Pune, Maharashtra, India.
2. Senior Consultant, Department of Pediatrics, KEM Hospital, Pune, Maharashtra, India
3. Senior Consultant, Department of Neonatal Pediatrics, Centre for Neonatal Research and Education, King Edward Memorial Hospital for

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Ankit Soni,  
NICU, Department of Pediatrics, KEM Hospital,  
Pune-411011, Maharashtra, India.  
E-mail: drankit.pediatrician@gmail.com

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