

Targeted neonatal echocardiography in Switzerland: update May 2017

Nicole Sekarski, Cecile Tissot, Vincent Muehlethaler, Romaine Arlettaz for the working group TNE Switzerland (Ch. Balmer, P. Kuen, M. Berger, E. Valsangiacomo, M Gittermann, S. Schulzke, M. Roth-Kleiner, C. Mann)

Introduction

Targeted neonatal echocardiography (TNE) is defined as the longitudinal evaluation by echocardiography of the hemodynamic state of the neonate in the neonatal intensive care unit. It allows the assessment of myocardial function, intra and extracardial shunts, systemic and pulmonary blood flow (table 1). It also helps to evaluate response to treatment in a given patient over time. After core level training the neonatologist should be able to complete a full echocardiogram and can differentiate a normal from an abnormal ultrasound.

Training guidelines

There are 2 levels of training in TNE: the basic or core level and the advanced level. The core level training will be accomplished under the supervision of a paediatric cardiologist and a TNE advanced level neonatologist.

Training for core level TNE:

- 1. Theoretical course:** the candidate will participate in a 2 days' minimum theoretical course certified by the TNE steering committee. This course should contain the bases of echocardiography, ultrasound equipment and standard echocardiographic views and measurements. (the list of up-to-date courses can be found on the SSN and SSPC websites).
- 2. Training in a paediatric cardiology unit:**
A minimum of 2 months will be spent training in a paediatric cardiology unit of a level 3 perinatal centre under the responsibility of a paediatric cardiologist. During this phase the neonatologist will concentrate on acquiring the ability to perform a normal systematic echocardiogram (table 2) and the recognition of a structurally abnormal heart. At least half of the required echocardiograms (see point 4) should be performed in the paediatric cardiology unit.
- 3. Training in the neonatal unit:**
The remainder of the training can be done on patients from the own neonatal unit under the supervision of an advanced TNE neonatologist or a paediatric cardiologist. This phase of the training will be focussed on neonatal aspects (table 1).
- 4. Echocardiographic requirements:**
The neonatologist must have performed a certain number of echocardiograms himself as well as reviewed echocardiograms done by other paediatric cardiologists or advanced TNE neonatologist. These echocardiograms will be obtained from digital paediatric cardiology databases and will be reviewed with a paediatric cardiologist or an advanced TNE neonatologist.

Number of echocardiograms having be done by end of training: 150 of which at least 75 newborns and a minimum of 50 abnormal scans.

Number of reviewed echocardiograms: 150 of which at least 75 are abnormal

5. Logbook

The candidate fills out a logbook containing anonymised data (age of patient, echocardiography date, diagnosis) of all patients in which he has performed the echocardiogram himself as well as the reviewed echocardiograms. The logbook with the summary of the number of echocardiograms and the duration of training will be signed by the candidate and the training paediatric cardiologist. It will be sent to the TNE steering committee prior to registration for the certifying exam.

6. Duration of training:

The core level training should be accomplished in 12 months but can be extended to 24 months' maximum.

A paediatric cardiologist responsible for the training will be attributed to each candidate (mentor). The mentor can delegate part of the training to other paediatric cardiologists but he has the responsibility to sign the logbook.

7. Certifying exam

At the end of the training the candidate must pass a certifying oral/ practical examination. He announces himself to the TNE steering committee at the latest 3 months prior to accomplishing his training. Together with the candidate(s), the steering committee will decide about the date and the place of the exam, and this information will be announced in the homepage of the Swiss Society of Neonatology and of the Swiss Society of Pediatric Cardiology. The examination fee is 300 SFr which cover the examiner and administrative fees. The money will be put on the SSPC account with a special mention TNE. The exam includes the performance of a standard neonatal echocardiogram per recommendations of table 1 and 3-5 cases to be reviewed by the candidate (see appendage). The total duration of the exam is 90 minutes. The exam is conducted by a paediatric cardiologist from another centre than the training centre and a second examiner (advanced TNE neonatologist or 2nd paediatric cardiologist). The candidate having passed the exam will receive a certificate from the TNE steering committee. The exam can be repeated twice In case of failure.

8. Maintenance of certification

In order to maintain certification the neonatologist has to perform at least 50 echocardiograms / year for the first 3 years, to be recorded in the logbook which will be signed at the end of the 3 years by the training paediatric cardiologist and submitted to the steering committee. If the requirements are not met the TNE steering committee will revoke the TNE certification.

Training in advanced TNE

Core level TNE neonatologists can achieve advanced TNE level if they meet the following requirements:

1. Regular TNE training in a perinatal centre level 3 during a minimum of 5 years with at least 100 documented echocardiograms/ year.
2. Regular participation in interdisciplinary discussions with paediatric cardiologists (case presentations with echocardiograms, discussions on findings)
3. Participation as a trainer in formal theoretical training course.

If the above-mentioned conditions are met the supervising paediatric cardiologist or the advanced TNE neonatologist sign the logbook which will be transmitted to the TNE steering committee who will grant advanced TNE certification.

To be noted: The function and position of an advanced TNE neonatologist can only exist in a team of a level 3 perinatal centre.

Organisation / surveillance

Training, examinations and accreditation of TNE is supervised by a steering committee composed of 2 FMH paediatric cardiologists and neonatologists, delegated/ elected by their professional societies. They are elected for 4 years with possibility to be re-elected 1 time.

Each TNE training centre has the responsibility to acquire a digital platform to store, visualise and analyse echocardiograms performed by paediatric cardiologists and neonatologists.

Each TNE training centre should put in place a reviewing process of echocardiograms done by neonatologists.

A core level neonatologist can authorize a neonatology fellow to perform an echocardiogram if he is supervised. The core level or advanced level TNE neonatologist has the responsibility over each echocardiogram performed by a neonatologist.

It is recommended that every new-born needing an echocardiogram should have at least 1 complete echocardiogram reviewed within 24 hours by a paediatric cardiologist. This initial echocardiogram can be performed by a paediatric cardiologist or by a TNE accredited neonatologist.

All new-borns with suspicion of congenital heart disease or arrhythmias should be immediately signalled to the paediatric cardiologist.

Candidates with TNE training abroad

Each candidate having performed TNE training abroad must be able to attest the same number of echocardiograms demanded for Swiss candidates. He needs to take and pass the Swiss certification exam to be accredited by the steering committee.

Table 1: Indications for TNE

Suspicion of PDA in premature baby 24 – 72h of life
Evaluation of a perinatal asphyxia
Abnormal cardiovascular adaptation in the first 24 h
Suspicion of persistent pulmonary hypertension
Congenital diaphragmatic hernia

Table 2: Standard echocardiogram required for TNE core level certification

1. Anatomy :
 - a. Cardiac anatomy including :
 - i. inflow
 - ii. outflow
 - iii. cardiac valves
 - iv. cardiac chambers
 - b. Skills :
 - i. 2D images of the neonatal heart in long axis, short axis, high parasternal, PDA and aortic arch view, apical and subcostal
 - ii. Mode M to measure LA/ Ao ratio
 - iii. Pulsed and color doppler to demonstrate normal blood flow across valves and outflow tracts
 - iv. Continuous doppler to measure TR
2. Systolic LV Function
 - a. End diastolic and end systolic dimension of the LV (2D or M Mode)
 - b. End diastolic and end systolic thickness of the posterior LV wall (2D, M Mode)
 - c. End diastolic and end systolic thickness of the interventricular septum (2D, Mode M)
 - d. Shortening fraction (M Mode)
 - e. Ejection fraction (M Mode or 2D Simpson)
3. Diastolic LV function
 - a. VM max velocity of E wave (PW Doppler)
 - b. VM max velocity of A wave (PW Doppler)
4. Evaluation of pulmonary hypertension
 - a. Max velocity of TR (CW doppler)
 - b. Enddiastolic velocity of PR (PW/ CW doppler)
5. Evaluation of PDA
 - a. Minimal dimension of the PDA (2D)
 - b. Shunt direction (Color, PW, CW)
 - c. max and mean gradient of ductal flow (CW, PW)
6. Evaluation of an inter atrial shunt:
 - a. Direction of shunt (color doppler)
7. Evaluation of pericardial effusion
 - a. Measure of the effusion in diastole (2D)

References

1. Mertens et al. Targeted neonatal echocardiography in the intensive care unit: practice guidelines and recommendations for training. Eur J Echocardiography 2011;12: 715-736.
2. de Boode WP et al. Recommendations for neonatologist performed echocardiography in Europe: Consensus Statement endorsed by European Society for Paediatric Research (ESPR) and European Society for Neonatology (ESN). Pediatr Res. 2016 Oct;80(4):465-71.