The majority of newborn infants successfully make the transition from foetal to neonatal life without any help (1). However, an estimated 10% of newborns need help to establish effective ventilation, which remains the most critical step of neonatal resuscitation. Fortunately, the need for chest compression (CC) or medications in the delivery room (DR) is rare. Approximately 0.8% term neonates and up to 10% of preterm neonates require CC at birth (1,2). In term infants, these interventions result in approximately 1 million newborn deaths annually worldwide (3). The current resuscitation techniques, which are revised by the International Liaison Committee On Resuscitation (ILCOR) every 5 years, are based on current understanding and latest evidence (4). If a newborn infant needs chest compression, ILCOR recommends to deliver a CC to ventilation (C:V) ratio of 3 CC and 1 ventilation (3:1 C:V ratio) (4). The recommendation of a ratio of 3:1 C:V is based on expert opinion and consensus rather than strong scientific evidence. Rationales for using a 3:1 C:V ratio include the higher physiological heart rate of 120–160/min and breathing rates of 40–60/min in newborns compared with adults. Furthermore, profound bradycardia or cardiac arrest in newborns is usually caused by hypoxia rather than primary cardiac compromise; therefore, providing ventilation is more likely to be beneficial in neonatal CPR compared with adult CPR (1). Successful resuscitation requires the delivery of high-quality CC, encompassing several factors including (A) optimal C:V ratio, (B) adequate rate, (C) depth of CC and (D) full recoil between compressions (3). Although there is an agreement that these factors are all important for a successful resuscitation, neither has been extensively studied to optimise coronary and cerebral perfusion while providing adequate ventilation of an asphyxiated newborn.

In this issue of Acta paediatrica, Boldingh et al. (5) examined two of these important factors (factors A and C) in a manikin model. Factor A: Current neonatal resuscitation guidelines recommend 3:1 C:V ratio; however, the most effective C:V ratio in newborns remains controversial. Unfortunately, during clinical observation not even experienced rescitators do always comply with the current algorithm of neonatal CPR (6). These observations are further supported by manikin studies that participants did not manage to deliver the intended number of ventilations during CPR at the 3:1 C:V ratio (7). In particular, compliance with the current algorithm is poor in simulated neonatal CPR with providers, irrespective of experience, performing CC at a significantly higher rate than the recommended 90 CC per minute (8). In the current study, Boldingh et al. reported similar observations, although the CC and ventilation were within the target range and CC rate and number of CC/min were below the target (5). These deviations from the current suggested 3:1 C:V ratio might be attributed to increased stress level during these situations and that this deviation from the guidelines is not exceptional.

Current neonatal resuscitation guidelines recommend an external CC depth of ~33% of the anterior–posterior (AP) chest diameter (4). In addition, there is a positive correlation between receiving adequate CC and improved outcomes (e.g. to achieve adequate cardiac output) (9). In contrary, over-compressing of the chest will result in inadequate residual chest depth during CPR and could lead to rib fractures, cardiac contusion and other thoracic injuries. Despite the importance of delivering appropriate CC, adequate CC AP depth has not been rigorously evaluated in neonates. Further, CC depth should be tailored to produce a palpable pulse and sufficient diastolic blood pressure during CPR. A recent computer tomography study reported the AP diameter to be 90 mm in newborn infants (10). This would suggest that CC depth should be ~30 mm. Boldingh et al. reported a similar depth in their current study. Participants had higher and more consistent CC depth during 3:1 C:V CPR, and the depth decay during CC was significantly higher during continuous CC with asynchronous ventilation (5). Similar results have been reported form several other manikin studies (11,12). Overall using a 3:1 C:V ratio compared with continuous CC with asynchronous ventilation seems to allow some fatigue recovery. However, the current study by Boldingh et al. in addition to the already published studies strongly suggests that during neonatal resuscitation, operators should change every 2–3 minutes to avoid fatigue, which could lead to a lower AP diameter during CC. This potentially could cause increased mortality.

Overall, the study by Boldingh et al. supports the currently recommended 3:1 C:V ratio. However, more studies are needed to investigate different chest compression ratios to optimise neonatal resuscitation.
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References