Clinical question.
In term neonates with a heart rate <60 and no other signs of life (P) does ceasing resuscitation after 15 minutes or longer of effective resuscitation in the delivery room (I) as opposed to 10 minutes (C) result in better outcomes (lower incidence of abnormal neurological examination and/or death) (O)

Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention/therapy

State if this is a proposed new topic or revision of existing worksheet: New

Conflict of interest specific to this question
Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? NO

Search strategy (including electronic databases searched).
1. MEDLINE; "heart rate less than 60",ti,ab; 19 results.
2. MEDLINE; bradycardia,ti,ab; 13651 results.
3. MEDLINE; exp BRADYCARDIA/; 8095 results.
4. MEDLINE; 1 OR 2 OR 3; 18094 results.
5. MEDLINE; resuscitation,ti,ab; 27620 results.
6. MEDLINE; exp RESUSCITATION/; 57553 results.
7. MEDLINE; 5 OR 6; 68928 results.
8. MEDLINE; 4 AND 7; 555 results.
9. MEDLINE; 8 [Limit to: Publication Year 1986-2006 and Humans and (Age Groups Newborn Infant birth to 1 month)]; 95 results.
10. MEDLINE; death,ti,ab; 315945 results.
11. MEDLINE; exp DEATH/; 93691 results.
12. MEDLINE; "mental retardation",ti,ab; 18735 results.
13. MEDLINE; exp MENTAL RETARDATION/; 68917 results.
14. MEDLINE; "physical disability",ti,ab; 1843 results.
15. MEDLINE; exp DISABLED PERSONS/; 35676 results.
16. MEDLINE; handicap,ti,ab; 6078 results.
17. MEDLINE; 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16; 490003 results.
18. MEDLINE; 9 AND 17 [Limit to: Publication Year 1986-2006 and Humans and (Age Groups Newborn Infant birth to 1 month)]; 23 results.

Also:
Medline, Embase and CINAHL for the following words:
Withhold* resuscit* and Apgar score
Withhold* resuscit* limited by human and age group newborn infant
Resuscitat* and bradycardia limited by human and age group newborn infant
Low Apgar score at 10 minutes limited by human and age group newborn infant
CPR or cardiopulmonary resuscitat* limited by human and age group newborn infant

Hand search of Pediatrics and Archives of Disease in Childhood back to 2005 and eligible references from any of the reference lists.

State inclusion and exclusion criteria
Excluded were abstract only studies, those not peer reviewed and animal studies.
As data were hard to find, some has been included from articles that did not directly address this or a related question.

Number of articles/sources meeting criteria for further review: Only 6 articles had some report of outcome after bradycardia at 10 minutes of age, all at LOE 5
## Summary of evidence

### Evidence Supporting Clinical Question

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<tr>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Chamnanvanakij and Perlman 2000 BCD</th>
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**Level of evidence**

A = Return of spontaneous circulation  
B = Survival of event  
C = Survival to hospital discharge  
D = Intact neurological survival  
E = Other endpoint  
*Italics = Animal studies*
# Evidence Neutral to Clinical question

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<td>Thornberg et al 1995 BCD</td>
<td>Nelson and Ellenberg 1981 BCD</td>
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# Evidence Opposing Clinical Question

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<td>Patel and Beeby 2004 BCD</td>
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<td>Casalaz et al 1998 BCD</td>
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- **A** = Return of spontaneous circulation
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Italics = Animal studies
**REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:**

This was a very difficult question to collect evidence for. It was only possible to find evidence for a small number of patients from a variety of studies, none designed to answer this question directly. Most data came from a study of babies on NICU, who may not be representative of babies in the DR (Chamnanvanakij, 2000, 173). Other data which was not specific to bradycardia, but was related to babies with low Apgar scores at 10 minutes (van de Riet, 1999, 1024) showed survival of 28% without severe disability (a further 28% had either normal development or minor disability).

Unlike the data for asystole at 10 minutes there is insufficient data to make any recommendation about whether continuing resuscitation when there is a bradycardia is associated with acceptable outcomes. Further, there is no data about whether outcome in such babies could be improved by the use of therapeutic hypothermia.

Prospective data are required to answer this question and babies need to be followed up for several years with good ascertainment of neurological and developmental outcome in the survivors.

Acknowledgements:

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**Citation List**


LOE 5 Neutral  (Retrospective cohort)

Comment: Again this study was not designed to look at persisting bradycardia. There is 1 identifiable infant with an Apgar score of 1 at 10 minutes (but there is no data as to the HR) who died. No conclusion can be reached from this study

Chamnanvanakij S, Perlman JM Outcome following cardiopulmonary resuscitation in the neonate requiring ventilatory assistance.  Resuscitation, 2000, 45(3), 173-180

LOE 5 Supportive Retrospective cohort

Comment: This study was designed to look at the outcome for babies with persisting bradycardia of ≥9 minutes on an NICU and therefore is not necessarily representative of what happens at birth. In this series all of these 5 babies died. There was a mixture of term and preterm babies.


LOE 5 Neutral (Retrospective cohort)

Comment: A cohort looking at those with an Apgar of 0 at 1 and 5 minutes. It is not possible to tease out from the data those babies who may have had persistent bradycardia (or Apgar of 1) at 10 minutes. The study, of course, did not aim to look at this.
LOE 5 Neutral Retrospective cohort  
Comment: A very large cohort (but with now quite old data) but once again it is very difficult to extract data usable to answer this question. There are 122 babies >2500g with Apgars of 0-3 after 10 minutes, from which there were 34.4% deaths and 16.7 having cerebral palsy.  
It is not possible to draw meaningful conclusions from these data.

LOE 5 Neutral (Retrospective cohort, insufficient data)  
Comment: Although in this series it is possible to identify 14 babies with an audible HR at 10-15 minutes (having had an Apgar score of 0 at 1 and 5 minutes) it is not possible to determine the outcome of these babies from the data presented. The study was not designed to look at persisting bradycardia. Babies may have been excluded as they improved or died at their base hospital and we do not know how HR was determined.

LOE 5 Neutral Retrospective cohort  
Comment: A study designed to look at neurological outcome following “birth asphyxia” (Apgar score <7 at 5 minutes). It is not possible to tease out any data about babies at 10 mintes (Apgar score or HR) and therefore it is impossible to come to any conclusions from these data.

Supplementary article  
Comment: A good systematic review of a related question. However, of 368 patients with Apgar of 0-3 at 10 minutes, 68% died and 12% of survivors had cerebral palsy. It was not possible to extract any data about heart rate from this paper, so no conclusions could be made towards this question.