Clinical question.

In infants and children with unstable ventricular tachycardia (pre-hospital and in-hospital) (P), does the use of any drug, combination of drugs, or intervention (I) compared with not using drugs (C) improve outcome (eg, termination of rhythm, survival) (O)?

Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention
State if this is a proposed new topic or revision of existing worksheet: Revision

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).

Pub Med: Tachycardia > mesh wide complex mesh children (<18 years) and treatment mesh Pre hospital "Tachycardia/drug therapy"[MAJR] "wide complex" Limits: Humans, All Child: 0-18 years "Tachycardia/drug therapy"[Mesh] Limits: Humans, All Child: 0-18 years in hospital Text words: Malignant wide complex tachycardia; children <18; drug therapy in wide complex tachycardia in children <18
AHA End note Master Library; Cochrane data base for systemic reviews; Central Register of Controlled Trials EMBASE and Google scholar employed same text for searches.
Previous reviews conducted for 2005 guidelines & ACLS worksheets.
Hand searches of bibliographies of reviewed papers.

State inclusion and exclusion criteria

Inclusion criteria: Children < 18 with wide complex tachycardia pre hospital or in hospital treated or not treated with drugs.

Exclusion criteria: Age >18; tachycardia other than wide complex.

Number of articles/sources meeting criteria for further review:

Multiple previous worksheets were used from 2005, including two by Atkins W20 and W21a, Rodrigues-Nunez W21b, Hickey W22a, Hammil W39a and W40, Samson W39b, and Tibballs W41a. 2005 ACLS work sheets for VT

Articles found in the literature searches: Google scholar search: 195, Pubmed: 761, paired down to 251, EMBASE 551, paired down to 90.
# Summary of evidence

## Evidence Supporting Clinical Question

| Good | | | | | | Burri, 2003 E  
Celiker, 1997 E  
Dorian 2002 B  
Kowey 1995 E  
Kudenchuk, 1999 B  
Levine, 1996 E  
Perry, 1996 E  
Somberg, 2002 B  
Scheinman, 1995 B |
|---|---|---|---|---|---|
| Fair | | | | | | Celiker, 1998 E  
Drago F, 1998 E  
Rokicki, 2004 E  
Strasburger, 2004 E  
Beder, 1998 E  
Perry, 1993 E |
| Poor | | | | | | |
| 1  | 2  | 3  | 4  | 5  |

### Level of evidence

- **A** = Return of spontaneous circulation
- **B** = Survival of event
- **C** = Survival to hospital discharge
- **D** = Intact neurological survival
- **E** = Other endpoint

*Bold = Pediatric study, Italics = Animal studies*
### Evidence Neutral to Clinical question

<table>
<thead>
<tr>
<th>Good</th>
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<td></td>
<td>Bardy, 1995 E &amp; 1996 E</td>
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<td></td>
<td></td>
<td>Faddy(ec) 2003 E</td>
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<td>Strickberger, 2003 E</td>
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<td></td>
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<td>Tibbals, 2004 E</td>
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<td></td>
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<td>Atkins, 2008 E</td>
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<td></td>
<td></td>
<td>Fogel 2000 E</td>
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<tr>
<td></td>
<td></td>
<td>Killingsworth (ec) 2002 A</td>
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<th>Level of evidence</th>
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</table>

**Level of evidence**

A = Return of spontaneous circulation  
B = Survival of event  
C = Survival to hospital discharge  
D = Intact neurological survival  
E = Other endpoint  

*Italic = Animal studies*  
*Bold = Pediatric study*  
*ec = electrical cardioversion*

### Evidence Opposing Clinical Question

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<thead>
<tr>
<th>Good</th>
<th>Fair</th>
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<tr>
<td></td>
<td>Saul, 2005 E</td>
<td></td>
<td>McAnulty, 1997 E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marill, 2006 A</td>
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<td></td>
<td>Galletly (ec) 2004 E</td>
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<td>AHA PALS 2005 E</td>
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<td></td>
<td>Jacobs(ec) 2003 E</td>
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<td>ERC PALS 2005 E</td>
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<td>Van der Watt, 1995 B</td>
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<td></td>
<td>October, 2008 E</td>
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<td>Armengol (ec) 1989 E</td>
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<td>Domanovitas (ec) 1999</td>
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<td>1997 E</td>
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<td>Herlitz 1997 C</td>
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<td>Marill, 2009 E</td>
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<td>Desanetis (ec) 1965 E</td>
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**Level of evidence**

A = Return of spontaneous circulation  
B = Survival of event  
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*Italic = Animal studies*  
*Bold = Pediatric study*  
*ec = electrical cardioversion*
In infants and children with unstable ventricular tachycardia (pre-hospital and in-hospital) (P), does the use of any drug, combination of drugs, or intervention (I) compared with not using drugs (C) improve outcome (eg, termination of rhythm, survival) (O)?

Caveats:
*The worksheet focus only addresses unstable ventricular tachycardia. We interpret unstable to mean that emergent intervention is required to restore critically compromised perfusion to avert a non-perfusing rhythm or cardiac arrest.
*Polymorphic ventricular tachycardias have special implications for mechanisms & treatment: Long QT (torsade de pointes), short QT; Catecholaminergic, Brugada syndrome. Nevertheless, we found no reasonable data relative to treating unstable PMVT. Thus, in the absence of historical information (pre-morbid QT, Hx of Brugada or catecholamine induced PMVT) it seems reasonable that all unstable PMVT be treated in a fashion similar to MVT.
*It is essential that correction of electrolyte abnormalities, hypoxia & hypoventilation be expeditious.

Limitations:
- There is no data comparing electrical therapy to pharmacological interventions.
- There are no placebo controlled drug studies.
- Most evidence is gleaned from small case studies &/or extrapolated from adult data which probably represents a different pathophysiology or from animal studies.
- Many of the included pediatric studies focused on secondary prevention of VT in children with pre-existing dysrhythmia or were conducted in children following open heart surgery neither of which are representative of the physiologic perturbations of more common events such as near drowning or asphyxiation.

Discussion:
Recent studies give us better insight into the incidence and outcome of cardiorespiratory arrest in children. Prospective data of out of hospital cardiac arrest (OHCA) demonstrated that the incidence of OHCA in infants is comparable to that reported in adults but is less frequent in children and adolescents. Moreover, survival amongst all pediatric age groups was 6.4% (lower for infants than children or adolescents) VS 4.5% in adult populations. The investigators also found that the initial cardiac rhythm is predictive of outcome with patients in ventricular fibrillation or pulseless ventricular tachycardia being more likely to survive than those presenting with asystole or pulseless electrical activity. But in spite of gaining much useful information relevant to EMS interventions none is specific regarding treatment of unstable (but with a pulse) ventricular tachycardia,(Atkins et al 2008. 168). Other prospective data on in hospital (HCA) cardiorespiratory arrest also demonstrate that initial arrest rhythm has similar outcome implications. The most common initial rhythm in this study (Tibbals & Kinney 2006, 310) was bradycardia associated with hypotension (66%) followed by asystole (15%), ventricular fibrillation or pulseless ventricular tachycardia (9%), pulseless electrical activity (9%). Survival rates were 38%, 12%, 40% and 30% respectively. Unfortunately, there is no data on VT with a pulse. In both studies, secondary VF/VT lead to worse survival. Neither of these studies nor other similar retrospective studies reveals the incidence or potential treatment options for VT with a pulse. Thus, we might infer from these & other studies that VT with a pulse is a rare and/or transient event in the pediatric population. And that VT with a pulse and compromised perfusion is even more rare and fleeting.

No direct comparative data exists for electrocardioversion vs. medical management of unstable ventricular tachycardia in children or in adults. Indeed, no high level, direct evidence exists demonstrating the effectiveness of electrotherapy. Most articles in this review focus on medical management. In one case series, a subset of adults with unstable ventricular dysrhythmias, no difference in survival was noted between those treated with antiarrhythmics or electricity (Fogel 2000, 690). In a study evaluating implantable defibrillators vs. chronic amiodarone, no difference was found in survival. (Strickberger 2003, 1707). Since most of the materials reviewed are adult data extrapolation to pediatric populations is required. Many of the publications in pediatric populations are case series and/or retrospective in nature which further weakens the evidence. However, the majority of articles opposing amiodarone use in unstable VT are studies conducted in pediatric patients.

The issue of delivering electrocardioversion rather than medical therapy in a conscious but hemodynamically unstable child is problematic. The risks of sedation and its likely/potentially destabilizing consequences must be carefully weighed against humanitarian and compasionate care. A similar degree of caution might be considered before using amiodarone as the ensuing hypotension might lead to dire hemodynamic consequences in an already compromised child. While data in adults leads us to believe that it is a safe and effective drug for use in that population this has not been proved to be true in children. Moreover, children have relatively less physiologic reserve than adults so even slight increases in vasodilation in the setting of unstable VT could be adverse. Thus, when facing a patient with compromised perfusion in VT, the prudent course of action would be to effect electrical cardioversion. This is consistent with the 2005 AHA PALS guidelines (p.167), 2005 ERC PALS guidelines (Biarent, 2005, S97) and the 2006 Australian and New Zealand PALS guidelines (Galletly, 2004, 1193; Jacobs, 2003, 451).

In spite of a paucity of high level prospective pediatric evidence for using electrical therapy to treat unstable ventricular tachycardia in children (van der Watt,1995, 508; Descanctis,1965, 632; Armengol,1989, 254; Domamovitas, 1999, 19) the global experience over the past four plus decades supports it use.
1. Electrocardioversion: the evidence reviewed for its use remains relatively unchanged. The 2005 AHA PALS Guidelines (p. 167), 2005 ERC PALS guidelines (Biarent, 2005, S97) and the 2006 Australian and New Zealand PALS guidelines (Galletly, 2004, 1193; Jacobs, 2003, 451) recommend defibrillation as first line therapies in ventricular tachycardia both with a pulse and without a pulse. Publications (Bardy, 1995, 1768 1996, 2507; Faddy 2003, 9) compared monophasic vs. biphasic electrocardioversion. Monophasic required lower amounts of energy to achieve the same outcome. Marill et al 2006, (pg. 217) published a retrospective case series found that amiodarone was poorly effective in terminating ventricular tachycardia. Based on their data, they recommend to proceed with direct cardioversion. Recent laboratory data exploring new algorithms that would correctly identify VT in pediatric patients has potential to deploy this therapy to commonly distributed AEDs. (Atkins 2008,168) In an animal model, a reasonable safety margin appears to exist in using higher levels of energy, such as what AEDs are programmed to deliver, than what current guidelines might recommend. (Killingsworth 2002, 177) New Zealand and Australia issued a consensus reports on energy recommendations for electrocardioversion in pediatric patients, which is consistent with available information. (Galletly 2004, 1193; Jacobs 2003, 451) Longterm management found that implantable defibrillators to be superior to longterm amiodarone. (McAnulty 1997, 1576)

2. As a diagnostic tool when the etiology of the dysrhythmia is unclear, specifically SVT with aberrancy vs. VT, a dose of adenosine may be employed to either achieve cardioversion or a diagnosis. (Marill et al, 2009, 2512) While this study is in adults and retrospective, thereby forcing extrapolation to pediatric data, the data and conclusions are reasonable. However, synchronized cardioversion should not be delayed when it is a definitive therapy for both etiologies in the unstable patient.

3. For unstable patients with unstable wide complex/ventricular tachycardia, medical therapies should remain second line in pediatric patients, consistent with 2005 guidelines. Saul et al 2005 (pg. 3470) published their findings in a prospective double-blinded pediatric study evaluating amiodarone’s efficacy in treating incessant tachyarrrhythmias in children 87% of whom had significant adverse events related to amiodarone: hypotension, vomiting, bradycardia, atrioventricular block and nausea. Pediatric patients often lack IV access, which results in delayed effective therapy. Most of the supportive data for choice medical therapy supports using amiodarone or lidocaine in patients with these unstable dysrhythmias in pediatric patients. Nonetheless, in randomized adult studies, amiodarone was found to be superior to lidocaine, bretylium, and placebo. (Dorian 2002, 884; Kowey 1995, 3255; Kudenchuk 1999, 871; Scheinman 1995, 3264; Somberg 2002, 853) In a retrospective case series, lidocaine was found to increase return of spontaneous circulation, but survival may not be improved. (Herlitz 1997, 199) One animal pk/pd study demonstrated that amiodarone can take up to 5 or 10 minutes to be effective, leaving synchronized cardioversion as first line therapy. (Beder, 1998, 204) Multiple case series support amiodarone’s use in pediatric patients. (Burri 2003, 880; Celiker 1997, 219; 1998, 567; Drago 1998, 445; Perry 1993, 95; 1996, 1246) In a small case series amiodarone was found to be effective in controlling fetal dysrhythmias, including VT. (Strasburger 2004, 375) A recent publication evaluating the use of medications in arrests for ventricular fibrillation and tachycardia found that pediatric patients were more likely to receive lidocaine as well as some combination of both lidocaine and amiodarone than were adults. The paucity of pediatric events limited the overall analysis. (October 2008, 126) In refractory VT, adjunct medical therapies should be considered standard of care in achieving and maintaining a stable rhythm.

The primary data is sparse and severely limited in pediatric patient populations due to relatively rare event. There is no consensual methods/evidence for supporting a particular approach, specifically cardioversion or medical management, which increasingly favor amiodarone. Virtually all of the pediatric data is limited to case series or retrospective data. Several of the pediatric case series articles discussed long term management, propanolol, amiodarone, AICD, etc., once stabilization had occurred. Moreover, most studies/articles focus on either medication or electrocardioversion. No direct comparisons of medical therapy vs. electrocardioversion vs monitoring were found. Thus, comparative outcome data does not exist. Perhaps larger multi-population based studies will reveal the incidence, duration and identify viable therapeutic options.

Acknowledgements:

Citation List

AHA PALS, 2005
Part 12: Pediatric Advanced Life Support, Circulation. 2005;112;IV-167-IV-187; originally published online Nov 28, 2005;

Consensus statements from the American Heart Association on pediatric resuscitation. In VF/VT algorithm, the recommendation is defibrillation as the first option.

LOE 5, good, Against E
<table>
<thead>
<tr>
<th><strong>Armengol, 1989</strong></th>
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</thead>
<tbody>
<tr>
<td>LOE 5, fair quality, opposing, E (Acute termination Lidocaine but indirect support for electrical cardioversion).</td>
</tr>
<tr>
<td>A case series of 31 episodes of wide complex VT was obtained by retrospectively reviewing a computerized database of ECGs. Time period taken into consideration is not specified. Termination of tachycardia was considered to be temporally related to lidocaine when termination of arrhythmia occurred within 15 min from administration of one or more IV boluses. All but 3 pts had coronary artery disease. All but one case ware initially managed in the ED. Lidocaine boluses given ranged 75 to 400 mg. Termination of wide complex VT was temporally related to lidocaine administration in only 19% of cases (n=6/31). There was no difference in the dose of lidocaine administered between episodes that responded and those that did not. When not effective, alternative therapy was effective (cardioversion, 13; procainamide, 5; verapamil, 1; amiodarone, 1) or VT spontaneously cardioverted few hours later (2 episodes). When judged effective, response to lidocaine was not reproducible (n=2/5) or could be explained by concomitant therapy with other drug (n=3/5). The authors conclude that lidocaine was usually ineffective for termination of sustained monomorphic VT. No mention of adverse effects of lidocaine is noted. <em>No comment about industry funding.</em></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th><strong>Atkins, 2008</strong></th>
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<tbody>
<tr>
<td>Level 5 Supportive. E Electrocardioversion. High impact case series, using laboratory analysis of pediatric dysrhythmias by new algorhythm. AEDs can accurately and safely be programmed for pediatric dysrhythmias.</td>
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<table>
<thead>
<tr>
<th><strong>Bardy, G. H, 1996</strong></th>
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<tbody>
<tr>
<td>LOE 5 Adult data, good quality. E Comparative study of 4 shock schedules (biphasic shock 115J, 130J; Monophasic 200, 360J) in 284 adults (after exclusions) with electrically induced VF during ICD ventricular threshold testing after delivery of failed transvenous shock, immediate application. Also study of ECG changes. Average shock schedule /patient = 1.7. ? persisting effect of previous transvenous shock or previous test shock.</td>
</tr>
<tr>
<td>First shock efficacies: biphasic 130 J 86% (CI 81-92, n 166); monophasic 200J 86% (CI 81-91, n 166); biphasic 115J 89% (CI 82-95, n 97); monophasic 360J 96% (CI 92-100, n 83). Biphasic 130J vs Monophasic 200J p=0.97</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>ST changes 10 secs after shock in 151 patients: monophasic 200J &gt; biphasic 130J (p&lt;0.0001)</td>
</tr>
<tr>
<td>LOE 5 Adult data, good quality. E</td>
</tr>
<tr>
<td>Comparison of biphasic (115J, 130J) shocks and monophasic (200J) shocks in adults undergoing electrophysiologic testing during implantation of ICD but using transthoracic electrodes.</td>
</tr>
<tr>
<td>Each patient had already received a failed transvenous shock in the course of determining the ICD defibrillation threshold, thus the efficacy of a subsequent transthoracic shock may have been altered.</td>
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<tr>
<td>Randomisation was ‘random allocation’ to one of three shock types/energy</td>
</tr>
<tr>
<td>All 3 waveforms/energy were 97% effective at first shock in 30 patients.</td>
</tr>
<tr>
<td>Level of evidence: 6 E</td>
</tr>
<tr>
<td>Supportive.</td>
</tr>
<tr>
<td>LOE 5, good, Against E</td>
</tr>
<tr>
<td>LOE Good supportive.5 E</td>
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<tr>
<td>Case series with 6 of 22 infants with VT successfully treated with amiodarone.</td>
</tr>
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</table>

LOE 5 E

Amiodarone was effective in two patients with VT who had depressed systolic function and life-threatening arrhythmias.

fair quality, supportive

Desanctis RW, 1965


LOE 5, poor quality, neutral E (Acute termination).

A case series that first highlights the great effectiveness of DC-shocks when VT is not responding to antiarrhythmic agents. The novelty of the study lies in the use of electrical therapy even early, well before overt signs of hemodynamic decompensation. Only 8 of the 21 episodes were classified as hemodynamic unstable. Electrical therapy, although at that time its use was heterogeneous and ill defined (i.e. both AC and DC shocks at various energy range were used), was successful in 20/21 episodes of refractory VT.

No comment about industry funding.

Domanovits H, 1999


LOE 4, quality, neutral, E (Acute termination).

A retrospective analysis of medical records of patients presenting at Vienna General Hospital ED with spontaneous sustained VT between December 1993 and August 1998. In 57 months, 75 patients presented with sustained VT: 58 hemodynamically stable, 17 unstable. Overall 77% of the patients were hemodynamically stable at presentation, underlining the fact that it is misleading to believe that VT always causes severe hemodynamic compromise. Out of the 58 stable 56 had monomorphic VT, while of the unstable 12 out of 17 had a monomorphic pattern. All unstable pts successfully responded to electrical therapy. Stable patients (including 2 polyVT) received a first line therapy with antiarrhythmic drugs (AAD): 3 (5%) cardioverted spontaneously before any therapy, 33 (57%) responded to drugs, 22 (38%) to second line electrical therapy. When administered, the success rate of AAD was 60%. Drug used were: lidocaine (28 pts, successful in 12), Ajmalin (8/15), Amiodarone (5/14), Sotalol (1/4), Propaphenone (0/1), Others (7/14). Again all patientes treated with electrical therapy responded successfully (100%). The life threatening nature of VT is underlined by the fact that 7% of our patients died within 48 h and 17% still required intensive care after 48 h. Adverse drug effects are not reported. Follow up was max 48h.

No comment about industry funding.

Dorian 2002

LOE is 5 B (excellent, adults, supportive of amiodarone, negative for lidocaine) as it is a RCT directed at the specific question. However, subjects were adults, so data must be extrapolated to children. Patients treated with amiodarone were twice as likely to survive to hospital admission than patients treated with Lidocaine. The earlier the patients received amiodarone, the better their survival. Does not address question of no medical therapy.

VF primary dysrhythmia, not VT. Limited utility for present question.

<table>
<thead>
<tr>
<th>Drago F, 1998</th>
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<tbody>
<tr>
<td>Level 5 E.</td>
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<tr>
<td>An expanded case series with relevance to present question. Amiodarone alone or in combination with propranolol in 27 infants and children with life-threatening tachyarrhythmias. 7 with VT.</td>
</tr>
<tr>
<td>Evidence: Neutral</td>
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<tr>
<td>Quality of evidence: Good to Fair.</td>
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<tr>
<th>Faddy, 2003</th>
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<tr>
<td>Worksheet author comments;</td>
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<tr>
<td>LOE 5 Neutral E</td>
</tr>
<tr>
<td>Meta-analysis of 7 trials of which one had been presented in abstract form [Echt DS et al. (1993) Pacing Clin Electrophysiol 16; 1914]</td>
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<tr>
<td>Adult data, but relevant.</td>
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<th>Fogel 2000</th>
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<tbody>
<tr>
<td>LOE 5, fair quality, neutral E</td>
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<tr>
<td>Adult data: long term amiodarone vs. ICD (post EP studies).</td>
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<tr>
<td>Galletly, 2004</td>
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<tr>
<td>Statement by New Zealand Resuscitation Council recommending use of biphasic defibrillation at 200, 200 and 360J for adults and 2,2 and 4 J/kg for children.</td>
</tr>
<tr>
<td>LOE 5 (for pediatric biphasic defibrillation) E</td>
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<tr>
<td>Expert panel, consensus.</td>
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<th>Herlitz, 1997</th>
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<tr>
<td>LOE 5. Fair, retrospective review. C</td>
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<tr>
<td>Adult data. No difference in outcome using lidocaine or not, higher incidence of hospitalization.</td>
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<tr>
<th>Jacobs, 2003</th>
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Worksheet Author Comments

1. LOE 5 (for pediatric dose of biphasic defibrillation) E

<table>
<thead>
<tr>
<th>Killingsworth, 2002</th>
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<tr>
<td>LOE 5. Animal study A</td>
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<tr>
<td>Not a comparative study of biphasic and monophasic</td>
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<tr>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Establishes that threshold for biphasic defibrillation in a pediatric swine model (3.8-20.1 kg) is 2.3 J/kg but larger supra-DFT shocks (up to 360 J) produced only transient ST segment and hemodynamic changes leading the authors to suggest that with use of AED shocks, doses of 50-100 J may be appropriate for a child of approx 25 kg.</td>
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<th>Kowey 1995</th>
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LOE 5. Adult data. Good quality, supportive E.

Limitations: Relevance limited: adult data, comparing bretylium with amiodarone, and bretylium no longer available.

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<th>Kudenchuk, 1999</th>
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LOE is 5 B (excellent, adults, supportive of amiodarone) as it is a RCT directed at the specific question. Subjects were all adults with VF or pulseless VT so data is extrapolated to children. Patients who received amiodarone had a higher survival to hospital admission but survival to hospital discharge could not be tested due to insufficient power.
Levine, 1996


LOE 5 Adult data. E
Good quality, prospective randomized trial, adult data, hospital discharge not a primary endpoint. Amiodarone effective in decreasing acute events, no clear dose titration effect.

Marill, 2006


Level 5, Good A: retrospective small adult study. Data support direct cardioversion over amiodarone.

McAnulty, 1997


LOE 5 Opposing, E (1 and 2 year survival outcomes)
Excellent quality, adult data.
Implantable devices superior to amiodarone in near-fatal ventricular dysrhythmias.

October, 2008


LOE 5, quality of evidence fair, neutral. E
Large retrospective study, n = 29,552. Pediatric patients, n=553: 49% received antiarrhythmic drug of which 67% received amiodarone and lidocaine. Primary data source unable to delineate order of agents use. More likely to receive amiodarone if on antiarrhythmic agent. Descriptive study of current practice. No specific outcomes identified/commented relative to pediatric patients.

**Perry, 1993**


LOE is 5 E (fair, supportive of amiodarone). Small uncontrolled case series in post op open heart patients. N=7, Effective in 4 of the 7 patients with VT. Time to effect ~ 10 minutes based on loading protocol. Hypotensi

**Perry, 1996**


LOE is 5 E (good, supportive of amiodarone). Patients had post-operative arrhythmias; there were no controls. Patients were children. Patients were loaded with amiodarone over 1 hour and then given IV infusion. Ventricular dysrhythmias: n=12, 7 converted, 6 died, none attributed to drug.

**Rokicki, 2001**


LOE 5, fair quality, supportive E

Note: N=37. Very high effectiveness of long term treatment for ventricular arrhythmias. Side effects in 24% of pts treated and therapy interrupted in 19%.

**Saul, 2005**

Intravenous Amiodarone for Incessant Tachyarrhythmias in Children A Randomized, Double-Blind, Antiarrhythmic Drug Trial

J. Philip Saul, MD; William A. Scott, MD; Stephen Brown, MD; Pablo Marantz, MD; Valeria Acevedo, MD; Susan P. Etheridge, MD; James C. Perry, MD; John K. Triedman, MD; Susan W. Burriss, BSN, MS; Paul Cargo, RN; Jay Graepel, PhD; Eeva-Kaarina Keskela, PhD; Rebecca Wang, MD; for the Intravenous Amiodarone Pediatric Investigators

Circulation. 2005;112:3470-3477.

Level of evidence: 2 E Prospective uncontrolled phase 4 dose-response- safety and efficacy pediatric multi-center trial. Only 4 VT patients. Multiple adverse events related to medication. 36% rate of hypotension.

**Scheinman, 1995**


Comments: Randomized blinded trial in adult patients with refractory, recurrent hemodynamically
destabilizing ventricular tachycardia or ventricular fibrillation treated with three regimen doses.

**LOE 5. Adult data. Good quality. B Amiodarone effective in refractory recurrent ventricular dysrhythmias in adults, hospital discharge/survival not primary endpoint.**

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<tr>
<th><strong>Somberg, 2002</strong></th>
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<td>LOE 5, supportive good quality. Adult data, small study.B Amiodarone more efficacious than lidocaine.</td>
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<th><strong>Strasburger, 2004</strong></th>
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<tr>
<td>Note: Amiodarone effective in fetal tachycardia however N with VT low LOE 5, fair quality, supportive E</td>
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<th><strong>Strickberger, 2003</strong></th>
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<td>LOE 5. Neutral. Good quality.E Prospective randomized trial. Primary difference between amiodarone and ICD is cost at 1 year. Beyond one year, cost analysis not included for three year data.</td>
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<th><strong>Tibbals, 2004</strong></th>
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<td>Level 5 Good Neutral E, prospective descriptive study evaluating the outcomes of pediatric arrest. No control groups, no comparison of therapies.</td>
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<th><strong>Van der Watt, 1995</strong></th>
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<td>Level 4 Good evidence B. Prospective data. small number for VT.</td>
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Articles not included:


Case report.


