Section 12.2 Antiarrhythmics in children

Review of need

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For WHO Secretariat
Antiarrhythmics in children

Background

The Committee requested a review to determine whether antiarrhythmics medicines should be added to the WHO list of essential medicines for children. This report summarizes relevant information to make this decision. It includes a definition of arrhythmias, their epidemiology, prognosis, the structural heart conditions associated with arrhythmias in children, and a summary of the evidence of the current recommended treatment.

Definition

Cardiac arrhythmias can be defined as an alteration of the normal (sinus) cardiac rhythm and can be classified according to different criteria:

1) According to the rate (slow or bradyarrhythmias and fast or tachyarrhythmias)
2) According to the morphology of the QRS complex (wide or narrow)
3) By the location of the abnormal rhythm (supraventricular-SVT- or ventricular).

The table below includes examples of some terms used for arrhythmias commonly found in children (Ladusans 2008).

<table>
<thead>
<tr>
<th>Some of the arrhythmias found in children</th>
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<tbody>
<tr>
<td>Sinus tachycardia</td>
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<tr>
<td>Atrial flutter</td>
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<tr>
<td>Atrial ectopic tachycardia</td>
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<tr>
<td>Atrial Fibrillation</td>
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<tr>
<td>Wolf Parkinson White (SVT)</td>
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<tr>
<td>Incessant junctional reciprocating tachycardia</td>
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<tr>
<td>Long QT syndrome</td>
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<tr>
<td>Idiopathic monomorphic VT</td>
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Epidemiology and prognosis

Although the information regarding the epidemiology of paediatric arrhythmias is limited, the existing data suggest they are rare. For example a study recorded an arrhythmia in only 1.25% of elementary school students and 2.32% of junior high school students (Niwa 2004). Most were ectopic beats or bundle-branch block, which generally do not have clinical implications. In another study a retrospective analysis review of ED visits found that arrhythmias in pediatric populations accounted for 55.1 per 100,000 patients evaluated in pediatric emergency departments. Among them sinus tachycardia was the most common arrhythmia found (50%),
followed by supraventricular tachycardia (13%), nonspecific arrhythmias (10.6%), bradycardia (6%), and atrial fibrillation (4.6%) (Sachetti 1999).

**Treatment**

Many of the arrhythmias detected in children do not require further treatment as they resolve spontaneously. For those that require treatment, there are two important issues that should be taken into consideration. First prognosis in children with arrhythmias is primarily influenced by the structural underlying conditions, and second the evidence about the effectiveness of antiarrhythmics in children is limited.

*Structural heart disease in children*

Congenital heart disease

Arrhythmias are one of the most prominent complications in children with congenital heart diseases (Kahiry 2009). These can be defined as malformations of heart structure existing at birth and they are associated with a variety of arrhythmias. The most important management strategy for children with congenital heart diseases is to correct the underlying congenital heart disease, rather than to just treat the arrhythmia. Unfortunately, most children with congenital heart disease will not receive the appropriate surgical treatment in developing countries. This is due, among other reasons, to a combination of late diagnosis, and lack of facilities and human resources for diagnosis and treatment (Bode-Thomas 2012).

Rheumatic heart disease

Acute rheumatic fever, due to an autoimmune response to infection with group A streptococcus is common in children living in developing regions (Carapetis 2005). The permanent damage to the heart valves due to this condition can be associated with arrhythmias but these changes usually manifest many years after the acute infection when patients are already adults.

Cardiac arrest

In contrast to adults, cardiac arrest in children is usually the terminal result of progressive respiratory failure or shock. Asphyxia begins with hypoxemia, followed by hypercapnea, and acidosis, and progresses to bradycardia, culminating in cardiac arrest (Kleinman 2010).

*Effectiveness of antiarrhythmic in children*

For evaluating the evidence for the effectiveness of antiarrhythmic in children a PubMed search with the terms: "Anti-Arrhythmia Agents"[Mesh] AND Practice Guideline[ptyp] AND ("infant"[MeSH Terms] OR "child"[MeSH Terms] OR "adolescent"[MeSH Terms]) was conducted. The only two relevant guidelines identified for treating arrhythmias in children were the Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care in children from the American Heart Association and from the Australian and New Zealand Resuscitation Councils (Kleinman 2010; ARC & NZRC 2011). As it can be seen from the figures
below the drugs (epinephrine and amiodarone) included in the two guidelines are already included in the WHO list of essential medicines for adults.

Figure 1: Pediatric Advanced Life Support for pulseless arrest from the AHA (Kleinman 2010)
In addition, the reviews from the Cochrane Heart Group were searched. There are three Cochrane reviews evaluating the effect of antiarrhythmics (Cordina 2005; Lafuente-Lafuente 2012; Holdgate 2006) and all of them exclude children. There are, however, narrative reviews that include recommendations (see table below from Ladusans 2008). Most of the medicines recommended are already included in the WHO list of essential medicines for adults.

<table>
<thead>
<tr>
<th>Arrhythmia</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrial flutter</td>
<td>Amiodarone, or Flecainide + Digoxine</td>
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<tr>
<td>Wolf Parkinson White</td>
<td>Beta-blockers, flecainide, or amiodarone</td>
</tr>
<tr>
<td>SVT (AV nodal re-entry tachycardia)</td>
<td>Beta-blockers, or flecainide + digoxin</td>
</tr>
<tr>
<td>Incessant VT</td>
<td>Flecainide or amiodarone</td>
</tr>
<tr>
<td>Left posterior fascicular tachycardia</td>
<td>Verapamil</td>
</tr>
<tr>
<td>Long QT syndrome</td>
<td>Beta blockers</td>
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</tbody>
</table>
Conclusions and recommendations

Arrhythmias in children are uncommon and frequently resolve spontaneously. Congenital heart diseases are one of the common structural heart conditions that predispose arrhythmia in children. However, surgical treatment rather than the medical management of arrhythmias is the main current limitation of the medical management of this population in developing countries. For arrhythmias that require treatment, the evidence is limited but current recommendations include drugs that are already listed in the WHO list of essential medicines for adults. Therefore, considering all the current available information, there is not a strong rationale to add antiarrhythmics to the WHO list of essential medicines for children.
References


