Management of patients with palpitations: a position paper from the European Heart Rhythm Association

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Palpitations are a symptom defined as *awareness of the heartbeat* and are described by patients as a *disagreeable sensation of pulsation or movement* in the chest and/or adjacent areas that may be associated with discomfort, alarm and less commonly pain.
Palpitations account for 16% of the symptoms that prompt patients to visit their general practitioner.

Are second only to chest pain as the presenting complaint for specialist cardiologic evaluation.
• **Contractions of the heart which are too rapid, irregular or particularly slow**
  
  Cardiac arrhythmias, mental disturbance, systemic diseases, drugs

• **Very intense contractions and anomalous movements of the heart in the chest**
  
  Structural heart diseases with ↑ stroke volume

• **Anomalies in the subjective perception of the heartbeat**
  
  Psychosomatic disorders

**Pathophysiology**
Table 1. Main causes of palpitations

- Cardiac arrhythmias
- Structural heart diseases
- Psychosomatic disorders
- Systemic causes
- Effects of medical and recreational drugs
<table>
<thead>
<tr>
<th>Cause</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac arrhythmias</td>
<td>41%</td>
</tr>
<tr>
<td>Structural heart diseases</td>
<td>3%</td>
</tr>
<tr>
<td>Psychosomatic disorders</td>
<td>31%</td>
</tr>
<tr>
<td>Systemic causes</td>
<td>4%</td>
</tr>
<tr>
<td>Effects of medical &amp; recreational drugs</td>
<td>6%</td>
</tr>
<tr>
<td>No specific cause</td>
<td>16%</td>
</tr>
</tbody>
</table>

Prognosis

- Generally benign
- Low rates of mortality (1.6% at 1-year)
- Recurrence of symptoms very frequent (up to 77%)
- Quality of life seriously impaired (cause of anxiety and frequent visits to the emergency department)
Duration & Frequency

- Short-lasting / Persistent
- Daily / Weekly / Monthly / Yearly
<table>
<thead>
<tr>
<th>Type of palpitation</th>
<th>Subjective description</th>
<th>Heartbeat</th>
<th>Onset and termination</th>
<th>Trigger situations</th>
<th>Possible associated symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrasystolic</td>
<td>“Skipping/missing a beat”, “sinking of the heart”</td>
<td>Irregular, interspersed with periods of normal heartbeat</td>
<td>Sudden</td>
<td>Rest</td>
<td>Syncope, dyspnea, asthenia, chest pain</td>
</tr>
<tr>
<td>Tachycardiac</td>
<td>“Beating wings” in the chest</td>
<td>Regular or irregular, markedly accelerated</td>
<td>Sudden</td>
<td>Physical effort, cooling down</td>
<td></td>
</tr>
<tr>
<td>Anxiety-related</td>
<td>Anxiety, agitation</td>
<td>Regular, slightly accelerated</td>
<td>Gradual</td>
<td>Stress, Anxiety attacks</td>
<td>Tingling in the hands and face, lump in the throat, atypical chest pain, singing dyspnea</td>
</tr>
<tr>
<td>Pulsation</td>
<td>Heart pounding</td>
<td>Regular, normal frequency</td>
<td>Gradual</td>
<td>Physical effort</td>
<td>Asthenia</td>
</tr>
</tbody>
</table>
Figure 1. Diagnostic flow-chart of patients with palpitations

1. History, physical examination, ECG, psychosomatic counselling
2. Definitive diagnosis or suspected diagnosis
3. Confirmation
   - +: Treatment
   - -: unexplained palpitations
4. Heart disease or abnormal ECG
   - +: Echo, AECG, MRI, Stress Test, EPS
     - +: Treatment
     - -: ILR
   - -: no heart disease and normal ECG
     - frequent or severe
     - rare or well tolerated
     - stop

**Table 5. Main Questions to Ask**

*Circumstances prior to the beginning of palpitations*  
- Activity (rest, sleeping, during sport or normal exercise, change in posture, after exercise)  
- Position (supine or standing)  
- Predisposing factors (emotional stress, exercise, squatting or bending)

*Onset of palpitations*  
- Abrupt or slowly arising  
- Preceded by other symptoms (chest pain, dyspnoea, vertigo, fatigue….)

*Episode of palpitations*  
- Type of palpitations (regular or not, rapid or not, permanent or not)  
- Associated symptoms (chest pain, syncope or near syncope, sweating, pulmonary edema, anxiety, nausea, vomiting…..)
Table 5. Main Questions to Ask

**End of the episode**
- Abrupt or slowly ↓, end or perpetuation of accompanying symptoms, duration, urination
- Spontaneously or with vagal manoeuvres or drug administration

**Background**
- Age at the first episode, number of previous episodes, frequency during the last y or m
- Previous cardiac disease
- Previous psychosomatic disorders
- Previous systemic diseases
- Family history of cardiac disease, tachycardia or sudden cardiac death
- Medications at the time of palpitations
- Drug abuse (alcohol and/or others)
- Electrolytes imbalance
Table 4. **Clinical features suggesting arrhythmic cause**

- Structural heart disease
- Primary electrical heart disease
- Abnormal ECG
- Family history of sudden death
- Advanced age
- Tachycardiac palpitations
- Palpitations with hemodynamic impairment
**Table 6. ECG features suggesting arrhythmic cause**

<table>
<thead>
<tr>
<th>Ventricular pre-excitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• AV reciprocating tachycardia</td>
</tr>
<tr>
<td>• Atrial fibrillation</td>
</tr>
</tbody>
</table>

**P-wave abnormalities, SV premature beats, SB**

| • Atrial fibrillation |

**Left ventricular hypertrophy**

| • Ventricular tachycardia |
| • Atrial fibrillation |
### Table 6. ECG features suggesting arrhythmic cause

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequent ventricular premature beats</strong></td>
<td>• Ventricular tachycardia</td>
</tr>
<tr>
<td><strong>Q wave, signs of ARVC or Brugada syndrome</strong></td>
<td>• Ventricular tachycardia/fibrillation</td>
</tr>
<tr>
<td><strong>Long or short QT</strong></td>
<td>• Polymorphic ventricular tachycardia</td>
</tr>
<tr>
<td><strong>A-V block, tri or bifascicular block</strong></td>
<td>• Torsades de pointes</td>
</tr>
<tr>
<td></td>
<td>• Paroxysmal A-V block</td>
</tr>
</tbody>
</table>
Figure 1. Diagnostic flow-chart of patients with palpitations

- History, physical examination, ECG, psychosomatic counselling*

  - Definitive§ or suspected diagnosis
    - Confirmation
      - +
      - -
        - Treatment

  - Unexplained palpitations
    - Heart disease or abnormal ECG
      - Echo, AECG, MRI*, Stress Test*, EPS*
        - +
        - -
          - Treatment
          - ILR
    - No heart disease and normal ECG
      - Frequent or severe
      - Rare or well tolerated
        - Stop

Echocardiography is of paramount importance to evaluate patients with structural heart disease.

Magnetic resonance imaging should be reserved to patients with structural normal hearts.
Recommendations of Stress Testing

Stress testing is indicated if the palpitations are associated with physical exertion, in athletes and when coronary heart disease is suspected.
Ambulatory electrocardiogram monitoring is certainly the most important investigation in patients with palpitations of unknown origin and serves to document the cardiac rhythm during an episode of palpitations.
<table>
<thead>
<tr>
<th>Device</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holter monitoring</td>
<td>Utilizes external recorders connected to the patient by means of skin electrodes; these recorders are able to perform continuous beat-to-beat electrocardiographic monitoring via several leads (up to 12 in the latest models).</td>
</tr>
<tr>
<td>Event recorders</td>
<td>Small, easy-to-use, portable devices that are applied to the patient's skin whenever symptoms are experienced. They provide prospective one-lead electrocardiographic recording for a few seconds.</td>
</tr>
<tr>
<td>External loop recorders</td>
<td>Connected continuously to the patient by means of skin electrodes and equipped with a memory loop, these devices provide one to three-lead electrocardiographic recording for a few minutes before and after activation by the patient when symptoms arise. The latest devices are also able to self-activate automatically when arrhythmic events occur.</td>
</tr>
<tr>
<td>Device</td>
<td>Characteristics</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mobile cardiac outpatient telemetry</td>
<td>Made up of an external loop recorder connected to the patient by means of skin electrodes, and of a portable receiver that is able to transmit an electrocardiographic trace to a remote operating centre or to a dedicated website via the telephone. In this way, the patient's rhythm can be monitored in real time.</td>
</tr>
<tr>
<td>Implantable loop recorders</td>
<td>Similar in size to a pacemaker, these devices are implanted beneath the skin through a small incision of about 2 cm in the left precordial region. They are equipped with a memory loop and, once activated by the patient through an external activator at the moment when the symptoms arise, record one-lead electrocardiographic trace for several minutes before and after the event. They are also able to record any arrhythmic event automatically (i.e. with no intervention by the patient). In general, monitoring lasts either until a diagnosis is reached or until the battery runs down. On completion of monitoring, the device is removed from the patient.</td>
</tr>
<tr>
<td>Pacemakers/ICDs</td>
<td>Provided by an internal memory, they are able to detect and store an atrial and ventricular IEGM separately (dual chamber devices), and to record any arrhythmic events automatically. Some models may also be activated manually by the patients when palpitations occur.</td>
</tr>
</tbody>
</table>
Table 9. Advantages, limitations, and indications of the different ambulatory electrocardiogram monitoring devices

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Holter monitoring</th>
<th>Event recorders</th>
<th>External loop recorders/ MCOT</th>
<th>Implantable loop recorders</th>
<th>Pacemakers/ ICDs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low cost; possibility to record asymptomatic arrhythmias</td>
<td>Low cost; easy to use</td>
<td>Retrospective and prospective ECG records; possibility to record asymptomatic arrhythmias automatically</td>
<td>Retrospective and prospective ECG records; quite good ECG records; monitoring capability up to 36 months; possibility to record asymptomatic arrhythmias automatically</td>
<td>Better discrimination between ventricular and supraventricular arrhythmias, due to dual chamber IEGM recordings; better definition of arrhythmic burden; monitoring duration for many years (corresponding to the expected life of the device); possibility to record asymptomatic arrhythmias automatically</td>
</tr>
</tbody>
</table>
Table 9. Advantages, limitations, and indications of the different ambulatory electrocardiogram monitoring devices

<table>
<thead>
<tr>
<th>Limitations</th>
<th>Holter monitoring</th>
<th>Event recorders</th>
<th>External loop recorders/MCOT</th>
<th>Implantable loop recorders</th>
<th>Pacemakers/ICDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring limited to 24 h to 7 days; size may prevent activities that may trigger the arrhythmias; patients often fail to complete adequately the clinical diary upon which the correlation between symptoms and the arrhythmias recorded is based</td>
<td>Monitoring cannot be carried out for more than 3–4 weeks; very brief arrhythmias are not recorded; arrhythmic triggers are not revealed; poor ECG records</td>
<td>Monitoring cannot be carried out for more than 3–4 weeks; continual maintenance is required; devices are uncomfortable; quite poor ECG records</td>
<td>Invasiveness; risk of local complications at the implantation site; higher cost; limited memory and specificity</td>
<td>Invasiveness; risk of early and late local and systemic complications; high costs</td>
<td></td>
</tr>
</tbody>
</table>
Table 9. Advantages, limitations, and indications of the different ambulatory electrocardiogram monitoring devices

<table>
<thead>
<tr>
<th>Indications</th>
<th>Holter monitoring</th>
<th>Event recorders</th>
<th>External loop recorders/ MCOT</th>
<th>Implantable loop recorders</th>
<th>Pacemakers/ ICDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>From daily to weekly palpitations; patients who are unable to use other ambulatory ECG monitoring devices</td>
<td>From weekly to monthly, fairly long-lasting palpitations not accompanied by haemodynamic impairment; compliant patients</td>
<td>From weekly to monthly, short-lasting palpitations associated to haemodynamic impairment; very compliant patients</td>
<td>From monthly to yearly palpitations associated with haemodynamic compromise; when all the other examinations prove inconclusive; non-compliant patients without haemodynamic compromise when a clinically significant arrhythmic cause is likely or must be ruled out</td>
<td>Only for patients with conventional indications to pacemakers and ICDs</td>
<td></td>
</tr>
</tbody>
</table>
**Recommendations of EPS**

**EPS** (intracardiac electrophysiological study) is the preferable examination in patients with structural heart disease, in case of palpitations preceding syncope or associated with hemodynamic compromise, and when ablation during the same procedure is perceived as a therapeutic option and accepted by the patient.
Figure 1. Diagnostic flow-chart of patients with palpitations

1. History, physical examination, ECG, psychosomatic counselling*

2. Definitive§ or suspected diagnosis
   - Confirmation
     - +
       - Treatment
     - -

3. Unexplained palpitations
   - Heart disease or abnormal ECG
     - Echo, AECG, MRI*, Stress Test*, EPS*
       - +
         - Treatment
       - -
         - ILR
     - -
       - Frequent or severe
     - -
       - No heart disease and normal ECG
         - Rare or well tolerated
           - Stop

### General recommendations for the treatment of palpitations

- Therapy should be directed towards the aetiological cause.
- Patients should be reassured in case of a benign cause.
- Use of adrenergic substances such as caffeine or alcohol-containing beverages should be restrained.
- Good control of cardiovascular risk factors, specifically of hypertension, should be ensured.
- If there is a recent stressful life-event, psychiatric counselling may be of help.
• In patients with severe symptoms of anxiety and depression, a specific therapy is warranted.
• If a specific arrhythmia is found the appropriate therapy may be antiarrhythmic drugs, ablation, or even an implantable defibrillator.
• In the case that arrhythmias are found to be related to systemic diseases or to the use of pro-arrhythmic drugs, therapy, of course, must aim to remove the underline conditions.
**Table 11. Criteria for the hospitalization of patients with palpitations**

**Diagnostic purposes**

- Severe structural heart disease, suspected or ascertained
- Primary electrical disease, suspected or ascertained
- Family history of sudden death
- Need to perform EPS, invasive investigations or in-hospital telemetric monitoring
**Table 11. Criteria for the hospitalization of patients with palpitations**

*Therapeutic purposes (1)*

- Bradyarrhythmias requiring PM implantation
- Pacemaker/ICD malfunction not rectifiable by re-programming
- Ventricular tachyarrhythmias requiring immediate interruption and/or ICD implantation or catheter ablation
- Supraventricular tachycardias requiring interruption immediately or in a short time, or catheter ablation
Table 11. Criteria for the hospitalization of patients with palpitations

**Therapeutic purposes (2)**

- Presence of heart failure or other symptoms of hemodynamic impairment
- Severe structural heart diseases requiring surgery or interventional procedures
- Severe systemic causes
- Severe psychotic decompensation
Table 1. *Main causes of palpitations*

<table>
<thead>
<tr>
<th><strong>Cardiac arrhythmias</strong></th>
<th><strong>Structural heart diseases</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Supraventricular/ventricular extrasystoles</td>
<td>Mitral valve prolapse</td>
</tr>
<tr>
<td>Supraventricular/ventricular tachycardias</td>
<td>Severe mitral regurgitation</td>
</tr>
<tr>
<td>Bradyarrhythmias: severe sinus bradycardia, sinus pauses, 2° -3° degree AV block</td>
<td>Severe aortic regurgitation</td>
</tr>
<tr>
<td>Anomalies in the functioning and/or programming of pacemakers and ICDs</td>
<td>Congenital heart diseases with significant shunt</td>
</tr>
<tr>
<td></td>
<td>Cardiomegaly and/or heart failure of various aetiologies</td>
</tr>
<tr>
<td></td>
<td>Hyperthrophic cardiomyopathy</td>
</tr>
<tr>
<td></td>
<td>Mechanical prosthetic valves</td>
</tr>
</tbody>
</table>
Table 1. **Main causes of palpitations**

- **Psychosomatic disorders**
  - Anxiety, panic attacks
  - Depression, somatization disorders

- **Systemic causes**
  - Hyperthyroidism, hypoglycaemia, postmenopausal syndrome, fever, anaemia, pregnancy, hypovolaemia, orthostatic hypotension, postural orthostatic tachycardia syndrome, pheochromocytoma, arteriovenous fistula

- **Effects of medical and recreational drugs**
  - Sympathomimetics in pump inhalers, vasodilators, anticholinergics, hydralazine
  - Recent withdrawal of β-blockers
  - Alcohol, cocaine, heroin, amphetamines, caffeine, nicotine, cannabis, synthetic drugs
  - Weight reductions drugs
<table>
<thead>
<tr>
<th>Type of arrhythmia</th>
<th>Heart beat</th>
<th>Trigger situations</th>
<th>Associated symptoms</th>
<th>Vagal maneuvers</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVRT, AVNRT</td>
<td>Regular with periods of elevated heart rate of sudden onset</td>
<td>Physical effort, changes in posture</td>
<td>Polyuria, frog sign</td>
<td>Sudden interruption</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>Irregular with variable heart rate</td>
<td>Physical effort, cooling down, post meal, alcohol intake</td>
<td>Polyuria</td>
<td>Transitory reduction in heart rate</td>
</tr>
<tr>
<td>Atrial Tachycardia and atrial flutter</td>
<td>Regular (irregular if A-V conduction is variable) with elevated heart rate</td>
<td>Physical effort</td>
<td></td>
<td>Transitory reduction in heart rate</td>
</tr>
<tr>
<td>Ventricular tachycardias</td>
<td>Regular with elevated heart rate</td>
<td>Physical effort</td>
<td>Signs/symptoms of hemodynamic impairment</td>
<td>No effect</td>
</tr>
</tbody>
</table>
**Table 7. List of electrocardiographic signs indicative of primary electrical heart diseases**

<table>
<thead>
<tr>
<th>ECG signs</th>
<th>Suspected disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected QT interval $&gt;0.46$ s</td>
<td>Long QT syndrome</td>
</tr>
<tr>
<td>Corrected QT interval $&lt;0.32$ s</td>
<td>Short QT syndrome</td>
</tr>
<tr>
<td>Right bundle branch block with coved type/saddle type ST segment elevation in the right precordial ECG leads (V1–V3) either spontaneous or provoked by flecainide or ajmaline</td>
<td>Brugada syndrome</td>
</tr>
<tr>
<td>$\varepsilon$-wave and/or T-wave inversion with QRS duration $&gt;110$ ms in the right precordial ECG leads (V1–V3); ventricular ectopic beats with left bundle branch block and right-axis deviation morphology</td>
<td>Arrhythmogenic right ventricular cardiomyopathy</td>
</tr>
<tr>
<td>High voltage in the precordial leads, Q wave, ST changes</td>
<td>Hypertrophic cardiomyopathy</td>
</tr>
</tbody>
</table>