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Update on resuscitation 2006

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Cardiovascular mortality remains the second most important cause of mortality in Singapore after cancer. With an ageing population, sudden death and emergency cardiac resuscitation will be increasingly important, both out-of-hospital and in-hospital. Cardiopulmonary resuscitation (CPR) teaching is thus vitally important for the medical, paramedical and layperson. CPR protocols continue to change because of attempts at international standardisation. This has been championed by the International Liaison Committee on Resuscitation (ILCOR) and the first ILCOR guidelines were published in 2000.[1] Based on those recommendations, the first Singapore Guidelines on CPR was published as a supplement in the Singapore Medical Journal.[2-4]

However, with the increasing emphasis on evidence-based medicine, an extensive review of the guidelines based on animal and human studies was done in 2004. This has resulted in the most recent International Guidelines 2005 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care guidelines which was published in November 2005.[5] It was, however, recognised that although universal science consensus is possible, there was still a need for the local organisations to adopt the guidelines and modify them according to what is best suited for the country. The Singapore National Resuscitation Council has examined the guidelines and modified them for use in Singapore. This editorial highlights the changes that have been recommended by the Singapore National Resuscitation Council for use in Singapore.

CARDIOPULMONARY RESUSCITATION AND THE CHAIN OF SURVIVAL

The chain of survival outlines the actions that must be done once a collapse or near collapse occurs (Fig. 1). Early access remains very important and too often, there is a delay before a cardiopulmonary collapse is recognised and CPR initiated. Early identification of the high-risk patients and the immediate arrival of a Medical Emergency Team (also known as Code Blue Team) may help save a person with near collapse or a cardiac arrest. The 2005 guidelines recommend introduction of a medical emergency team system for adult hospital in-patients.[5] In the out-of-hospital setting, bystander CPR rate remains low. A local study on out-of-hospital cardiac arrest showed a bystander CPR rate of only 37% in the witnessed cardiac arrest patient and 1.7% in the unwitnessed cardiac arrest patient.[6]

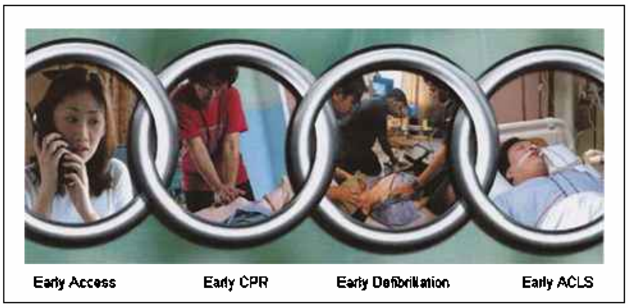

Fig. 1 Chain of survival.

MAJOR NEW CHANGES RECOMMENDED FOR SINGAPORE

Compression ventilation ratio of 30:2. The 2006 guidelines recommend giving 30 chest compressions for every two breaths instead of the traditional 15 compressions for every two breaths. This applies to both adults and children (with the exception of neonates). This is based on studies showing that circulating blood increases with each chest compression in a series and must be built back up after interruptions. Also, during the initial phase of ventricular fibrillation (VF) cardiac arrest, the pulmonary vein, heart and the arterial system is still filled with oxygenated blood. The initial goal of CPR is to maximise the time spent in circulating this still oxygenated blood to the brain and heart. Hence, more emphasis is put on chest compression and maintaining circulation.[7-8] In addition, the quality and rate of chest compression is emphasised, with the depth of each compression being 4–5 cm in an adult at a rate of 100 compressions per minute.

Minimal interruption of chest compression. It has been noted that there is too much interruption of chest compression during CPR. These interruptions lower coronary perfusion pressure and decrease rates of survival from cardiac arrest.[9] Thus, the second major change emphasises that checks to heart rhythm, inserting airway devices, and administration of drugs should be done without delaying compressions. Accordingly, the advice is to reduce the time involved in mouth-to-mouth resuscitation so that breathing into a patient is reduced from two seconds to one second, again leaving more time for chest compressions. Similarly, providers should not interrupt chest compression to check the rhythm after a shock is delivered, until about 1–2 minutes of CPR are provided.

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No more stack shocks. The third major change in the recommendation advises that instead of administering three shocks in succession, as is the current practice, only one shock should be given and compressions resumed for 1–2 minutes. Previously, when using stack shocks, the cycle of analysis, shock, and reanalysis is repeated three times before compressions. This has resulted in a delay of at least half a minute or more before the compressions are started. This prolonged delay in chest compression is no longer acceptable.

Change in shock energy level. When using monophasic defibrillators, the highest energy level of 360 J is used as the first and subsequent shock energy level. The rationale for this is to use the most effective defibrillation with the first shock. With biphasic defibrillators, the provider is free to start within a range of 150–360 J shocks with the option of using either fixed or escalating energy levels, depending on the type of biphasic defibrillator available and institutional preferences.

Compression first versus shock first for VF sudden cardiac arrest. Weisfeldt and Becker introduced the concept of a three-phase time-dependent concept of cardiac arrest caused by VF.[10] The first phase is the electrical phase, which lasts approximately five minutes. During this phase, the most important intervention is defibrillation. The second phase of cardiac arrest is the circulatory phase, which lasts between approximately 5–15 minutes of the arrest. During this time, generation of adequate cerebral and coronary perfusion pressure is critical to neurologically normal survival. Thus, if an automatic external defibrillator is the first intervention applied during this phase, survival is much less likely than if CPR is performed prior to defibrillation. The third phase, which occurs late (somewhere after 15 minutes) during a cardiac arrest, is the metabolic phase. Resuscitation during this phase is rarely successful, although the application of hypothermia may be useful.

Thus, when a defibrillator is available and a cardiac arrest is witnessed, immediate defibrillation is still recommended. However, in the event of unwitnessed arrest, especially if cardiac arrest is suspected to have been longer than 4–5 minutes, CPR is recommended for the first 1–2 minutes before defibrillation is performed. During these 1–2 minutes, the patient would be connected to a defibrillator, and other life support and monitoring devices are set in place. In two studies of out-of-hospital VF arrests when the time from the first shock was ≥ 4 minutes, a period of CPR before attempted defibrillation improved survival rates.[11-12]

Advanced Cardiac Life Support (ACLS) drugs. Vasopressin is no longer mentioned in the algorithm for persistent or recurrent VF. This is because a meta-analysis of five randomised out-of-hospital trials showed no significant difference between vasopressin and adrenaline for return of spontaneous circulation, death within 24 hours or death before hospital discharge.[13] For a narrow complex tachycardia, verapamil is now recommended to be given as an infusion of 1 mg/min (up to a maximum of 20 mg) rather than as a bolus injection.[14]

ACLS algorithms. The above recommendations have resulted in some changes in the ACLS algorithms, which are illustrated in Figs. 2–7c.

CONCLUSION

CPR is vital in the management of the patient with life-threatening conditions or cardiac arrest. Guidelines have helped to standardise the teaching of CPR, and enabled the doctors and nurses to work together rapidly and as a coordinated team in the resuscitation of the critically-ill patient. These guidelines set by the National Resuscitation Council of Singapore however remain as guidelines only, and would be correct for the majority of patients. Occasionally, individualised therapy may be needed, depending on the clinical circumstances. As more evidence from controlled randomised studies becomes available and new International Guidelines are established, these guidelines also need to be reviewed periodically.

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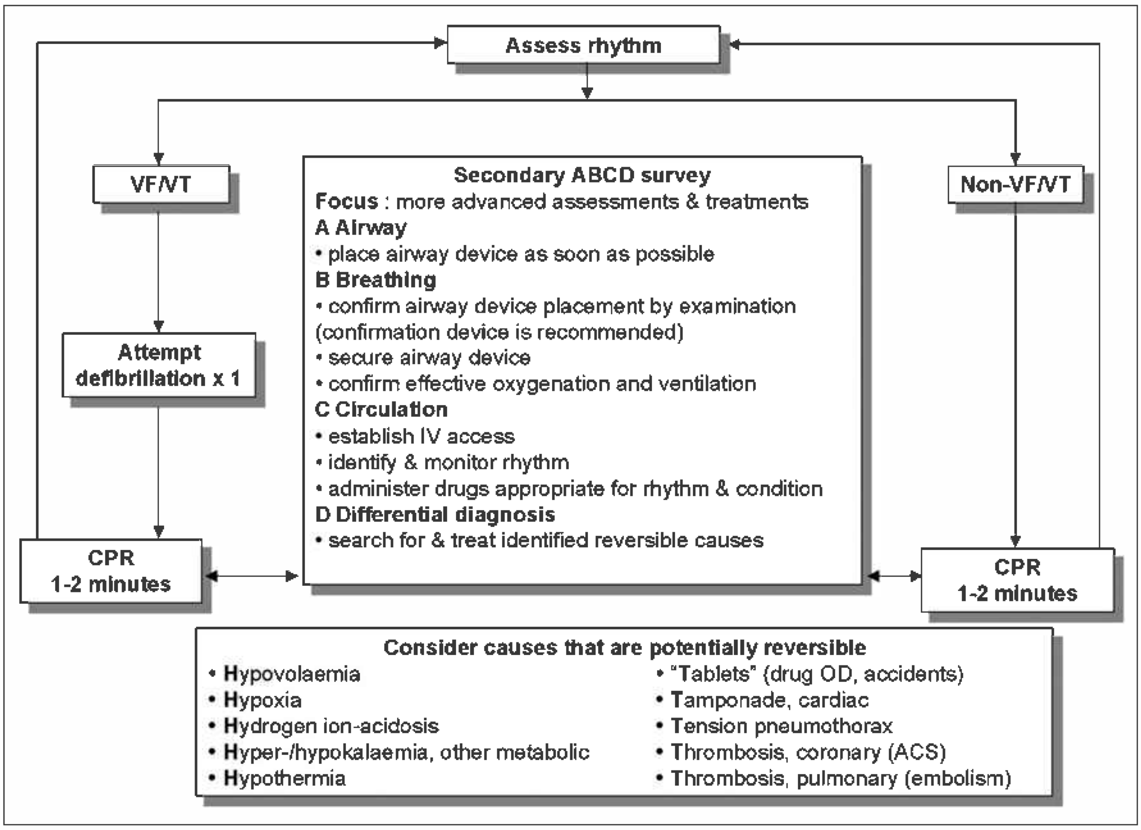

Fig. 2 Universal ACLS algorithm.

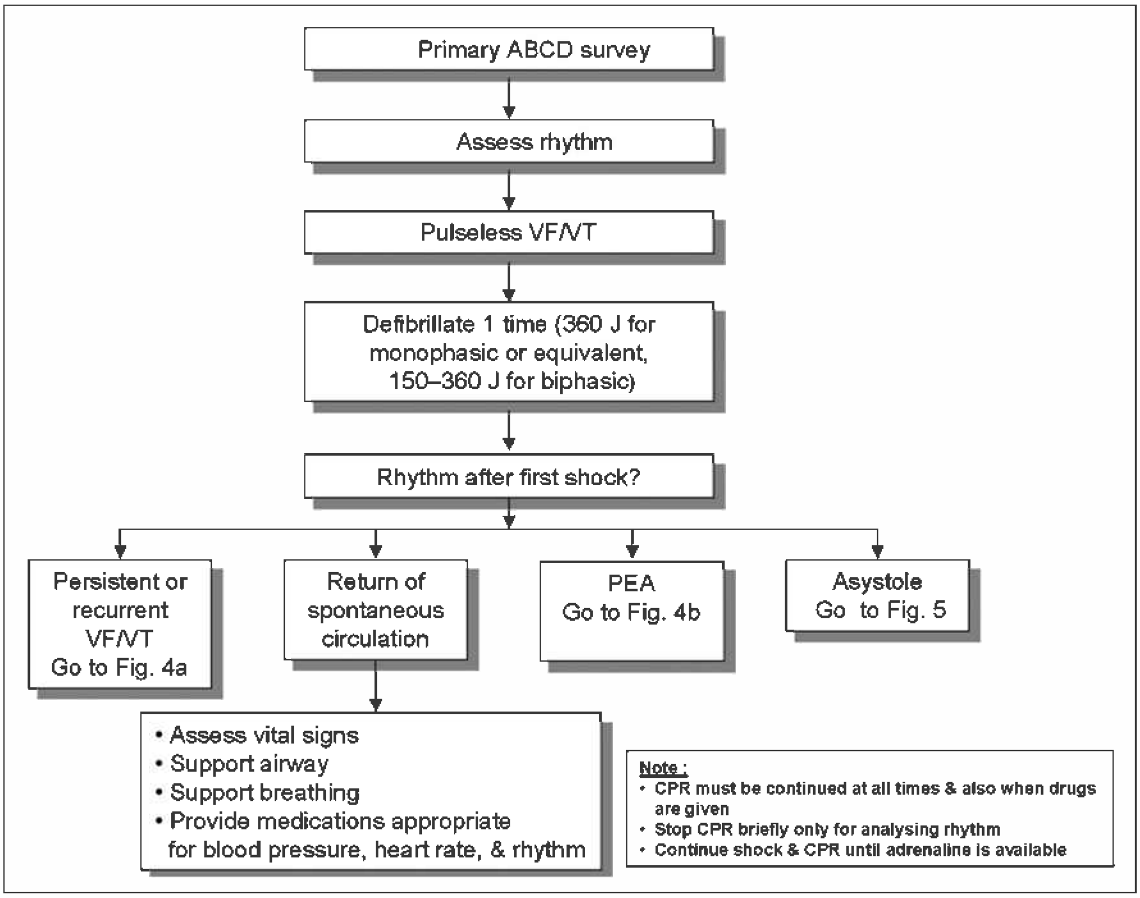

Fig. 3 Ventricular fibrillation/pulseless VT algorithm.

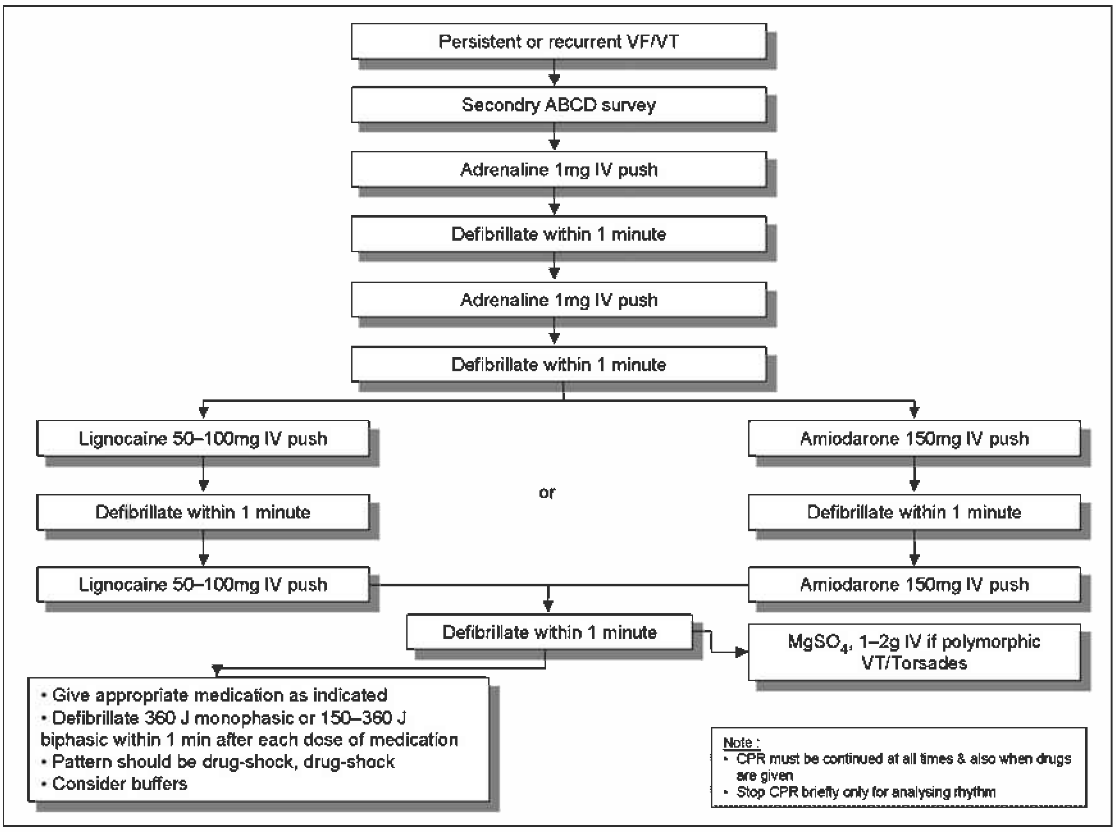

Fig. 4a Persistent or recurrent VF/VT algorithm.

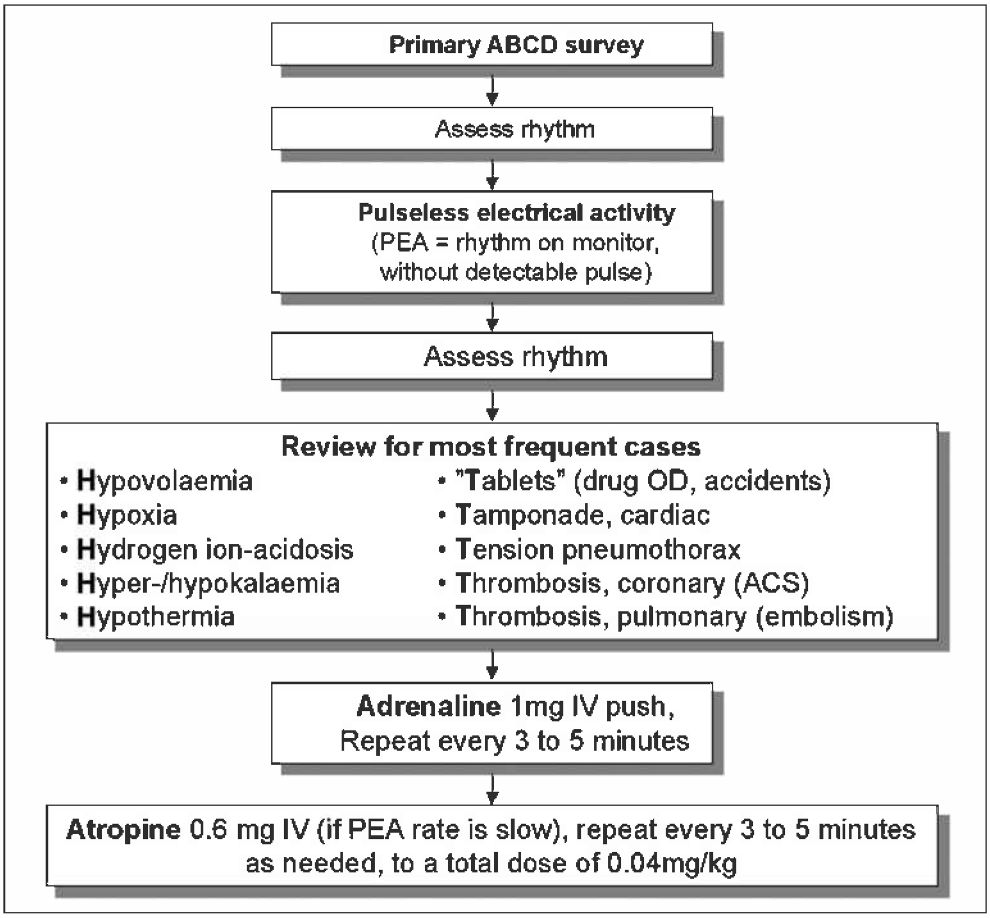

Fig. 4b Pulseless electrical activity algorithm.

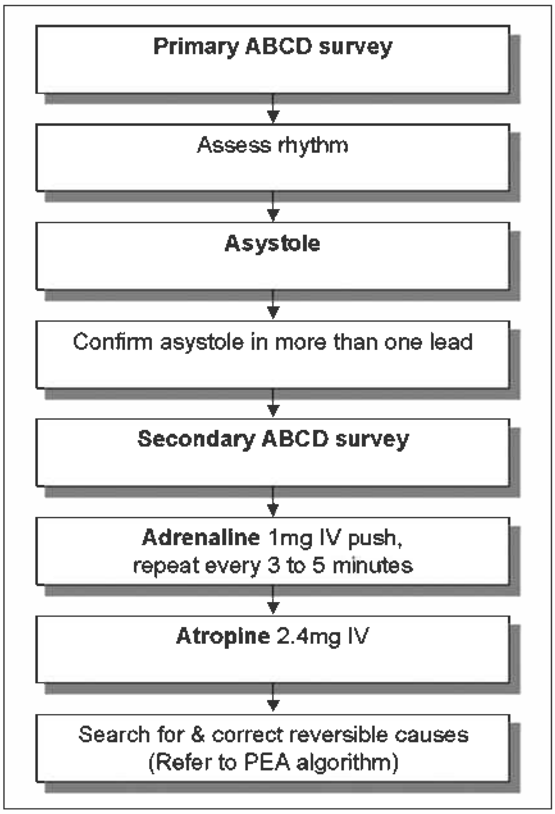

Fig. 5 Asystole: the silent heart algorithm.

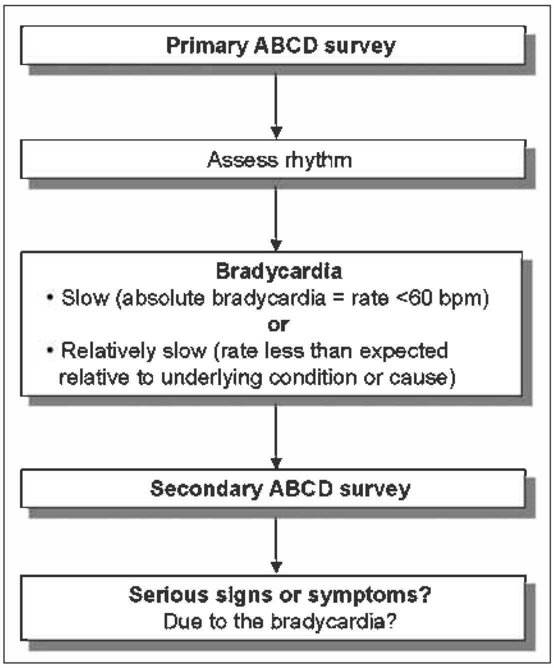

Fig. 6a Bradycardia algorithm.

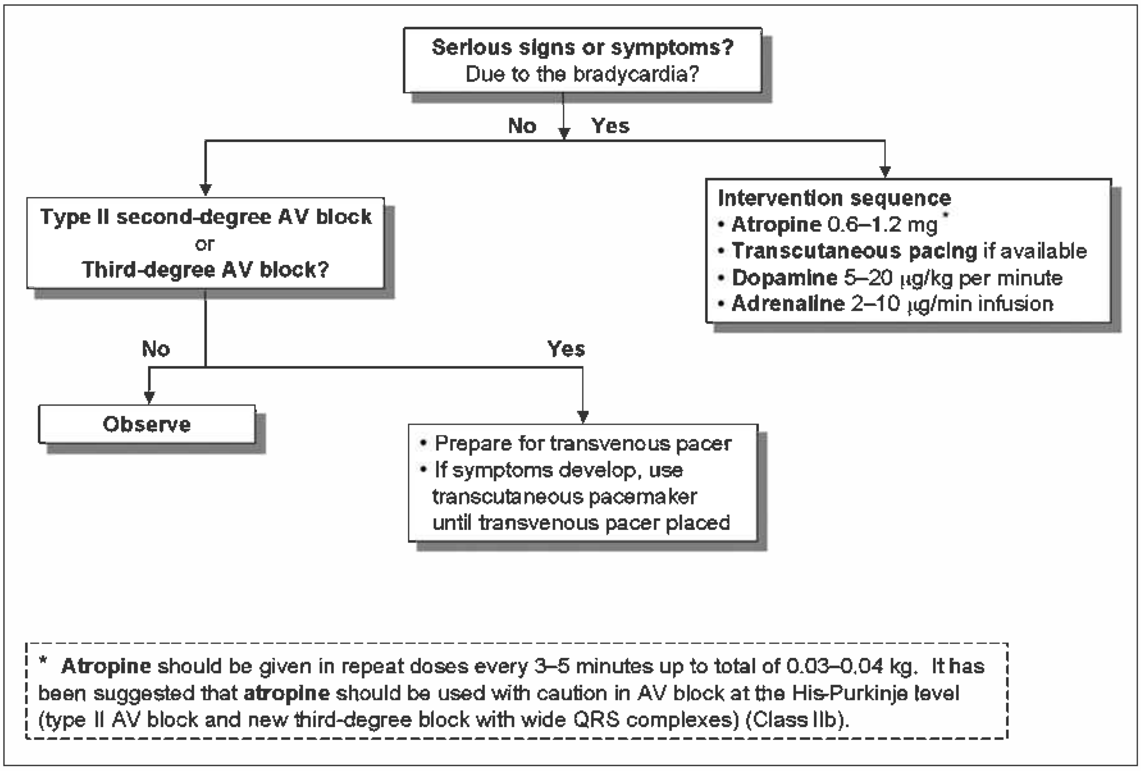

Fig. 6b Bradycardia algorithm.

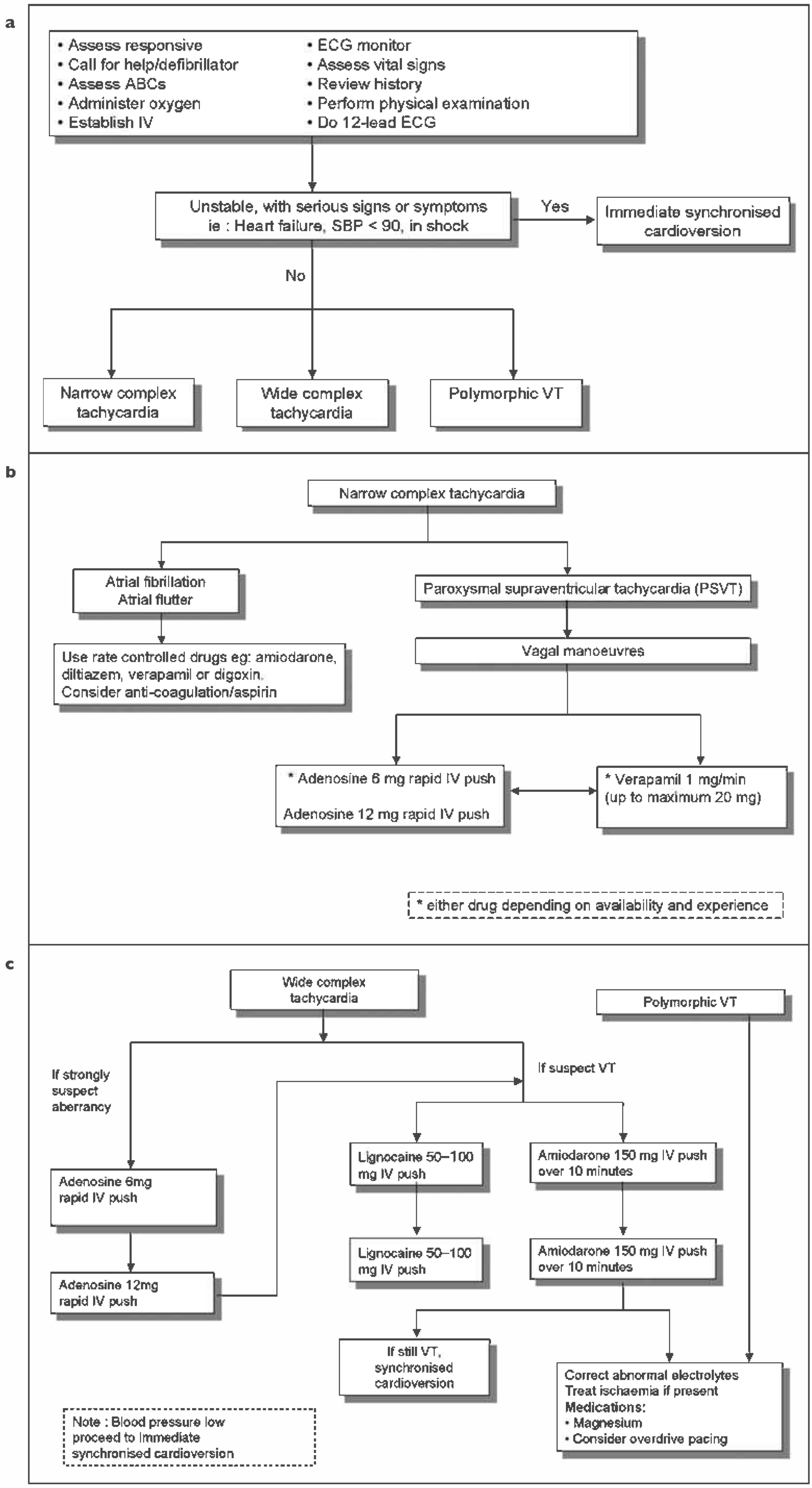

Fig. 7a–7c Tachycardia algorithm.