

1. Regarding the conduction system of the heart which is **not** correct?
 - a) Infarction of the LAD can create a right bundle branch block and Left anterior superior hemiblock but very rarely a left posterior hemiblock
 - b) The AV ring (annulus fibrosus) insulates electrical activity from atria to ventricle
 - c) SA node is supplied 90% of the time from the right coronary artery and 10% from the left circumflex artery
 - d) The AV node has slow conduction velocity and a long refractory period to allow time for a 10% atrial "kick" and to protect against rapid conduction from the atria.

2. Regarding a normal ECG which of the following is true
 - a) Paper speed is usually 50mm/s
 - b) PR interval should be 0.12 to 0.2 seconds
 - c) QRS duration is usually <0.2 seconds
 - d) QT is usually between 0.4 to 0.5 seconds

3. Which of the following is true regarding treatment of unstable bradyarrhythmias
 - a) Emergent treatment is only needed if heart rate is <60 beats/min
 - b) Atropine has a class I recommendation and dose is 0.5mg Iv every 5 min with max dose 3mg
 - c) Transcutaneous should always be set in fixed mode
 - d) Atropine can be used cautiously post cardiac transplant but is unlikely to be effective due to lack of vagal stimulation

4. If ECG shows AF with irregular broad complex tachycardia which of the following drugs can be used to slow rate
 - a) Procainamide
 - b) Metoprolol
 - c) Verapamil
 - d) Digoxin

5. Which is **not** true of cardioversion or defibrillation
 - a) In synchronized cardioversion shock is usually delivered 10 milliseconds post the peak of a R wave to avoid VF
 - b) Myocardial damage is unusual in shocks <325J
 - c) Embolization occurs in 1.2% to 1.5% of patients with chronic AF
 - d) Arrhythmias secondary to shocks are less common if a patient is on digoxin

6. Which is **not** a treatment for torsades de pointes
- IV Magnesium 1-2g over 5 to 60 min
 - IV Ca gluconate 10% 20ml bolus
 - IV Isoprenaline starting at 2 mcg/min
 - Overdrive pacing at a rate of 100bpm
7. Which condition does **not** warrant an urgent or semi-urgent pacemaker
- Sick sinus syndrome
 - Trifascicular block
 - Wenckebach (mobitz type I)
 - Recurrent sustained VT as part of an automatic defibrillator system
8. Regarding SVTs which is true
- 80% of SVTs have re-entry within the AV node
 - Vagal maneuvers have success rate of 20-25%
 - The typical SVT rate is 150 beats per min
 - AV nodal reentrant tachycardia has wide QRS complexes
9. Which feature of WPW is correct
- ECG changes in WPW may mimic AMI or ventricular hypertrophy
 - >40% of arrhythmias are AF
 - Antidromic AV reentrant conduction occurs in 20% of WPW
 - Type B WPW has a dominant R wave in V1
10. Regarding atrial flutter which is **not** correct
- Usually associated with heart disease
 - May be transitional arrhythmia between sinus and atrial fibrillation
 - AV block is usually 2:1
 - 4:1 AV block produces a ventricular rate of 100 bpm
11. Atrial fibrillation
- If chronic has an annual embolic rate of up to 10% regardless of other risk factors
 - Cardioversion to sinus rhythm carries a 1-5 % risk of stroke
 - Up to 50% can be converted with 200J biphasic
 - Spontaneous cardioversion of paroxysmal AF typically occurs within 24 hours and is not considered persistent unless more than 3 days.

12. Junctional rhythms

- a) Can only occur if the sinus rhythm drops below 40 bpm
- b) If present with digoxin toxicity rate is usually between 40 and 60 bpm
- c) Supplemental K can be given for junctional tachycardias
- d) Junctional rhythms are usually preceded by a P wave

13. Regarding premature ventricular ectopics which is **not** true

- a) They can occur in healthy individuals
- b) PVCs usually do not affect the sinus node so there is usually a fully compensatory postectopic pause
- c) They are universally seen in AMIs and the more severe the coronary disease the greater the degree of PVCs
- d) Greater than 5 PVCs in a row is considered non sustained VT

14. Accelerated Idioventricular rhythms

- a) Are common post thrombolysis of an AMI
- b) Are associated with VF
- c) Are treated with lignocaine
- d) Always produce an adequate cardiac output

15. Which is **untrue** about VT

- a) QRS can be narrow in 5% of episodes
- b) Occurrence of 3 or more ventricular depolarizations faster than 100 bpm
- c) QRS axis usually constant
- d) Runs of VT is common occur in people without underlying heart disease

16. In differentiating VT and SVT with aberrancy, which is **not** a clinical risk factor for VT

- a) Age 30
- b) History of HOCM
- c) Previous AMIs
- d) History of pulmonary oedema

17. The ECG findings that suggest VT are all except

- a) QRS > 140 ms
- b) Varying bundle branch block

- c) Post ectopic fully compensated pause
- d) Fusion beats

18. Which of the conduction pathway in heart block is **incorrect**

- a) Left anterior superior fascicular block: Ventricular conduction inferior to superior and right to left
- b) Left posterior inferior fascicular block: Ventricular conduction superior to inferior and left to right
- c) Left bundle branch block: Ventricular conduction inferior to superior and right to left
- d) Right bundle branch block: Ventricular conduction superior to inferior and right to left

19. Which combination of heart blocks constitutes a trifascicular block

- a) RBBB with left anterior superior fascicular block
- b) Right posterior inferior fascicular block with 1st degree heart block
- c) LBBB with 1st degree heart block
- d) RBBB with 1st degree heart block

20. Which is true regarding Brugada syndrome

- a) ECG can be normal but may be unmasked by procainamide or flecainide
- b) ECG can show ST elevation and inverted T wave in V5 – V6
- c) Syncope is not a feature
- d) Provocative ECG tests should not be done as it can induce VT

21. Which of the following pacemaker issues will result in failure to capture?

- a) No battery output
- b) Electrolyte disturbance
- c) Programming problems with pacemaker
- d) Oversensing

22. Regarding lignocaine as an anti-arrhythmic which is **not** correct

- a) It is a class Ib acting on fast Na channels
- b) It preferentially acts on ischaemic myocardial tissue and tends to spare AV node
- c) Adverse effects are generally neurological with slurred speech, tinnitus, parasthesia, seizures and respiratory depression
- d) Lignocaine can be given if there is evidence of AV block.

23. Which of the following is true about procainamide
- a) It can cause cholinergic effects
 - b) It can cause myocardial depression
 - c) It is a class Ic antiarrhythmic
 - d) Contraindications include Myasthenia Gravis, prolonged QT, complete AV block and SVTs with WPW
24. Which is **incorrect** about Beta blockers
- a) Esmolol has an elimination half-life of <10 minutes
 - b) Labetalol has little effect on cerebral perfusion pressure and is thus good for hypertensive emergencies with intracranial pathology
 - c) Propranolol is a non-selective beta blocker and can potentially cause QRS prolongation with tachycardia and seizures
 - d) Sotalol has class I effects as well so can prolong QTc interval
25. Amiodarone has which of the following features
- a) Long term adverse effects include thyroid disease, pulmonary fibrosis, skin discoloration, hepatic dysfunction and corneal infiltrates
 - b) Short term administration is associated with proarrhythmic activity
 - c) It is only considered second line treatment for pulseless VT and VF
 - d) It should not be used to treat rapid AF with significantly decreased ejection fraction ie <40%
26. Regarding non-Dihydropyridines which is correct
- a) Diltiazem produces coronary vasoconstriction and is unhelpful in those with vasospastic angina
 - b) Concurrent use with Beta blockers do not have an additive effect
 - c) Verapamil is as effective as adenosine at terminating narrow complex SVTs and controlling heart rate in AF
 - d) Neither Diltiazem nor Verapamil have antihypertensive effects and thus should not be used for hypertension alone
27. Atropine
- a) Stimulates sympathetic activity
 - b) Maximal dose is 0.04 mg/kg unless in organophosphate overdoses
 - c) Is effective in PEA and asystolic arrests
 - d) When administered via ETT should be given at the same dose as IV

28. Which is **not** true of adenosine
- a) It has transient negative chronotropic, dromotropic and inotropic effects on SA and AV node
 - b) Reentrant SVTs not involving AV node, or anterograde over accessory pathway, are not terminated by adenosine
 - c) Recent caffeine use compete for adenosine receptors and a higher dose may be needed
 - d) Its onset is 30 seconds with a duration of action of 60 - 90 seconds and a half-life of 1 minute
29. Which is **not** true of Digoxin
- a) It has negative chronotropic, dromotropic and inotropic effects
 - b) Symptoms of toxicity include anorexia, nausea, weakness, delirium, visual disturbance and seizures
 - c) Hypokalaemia increases the risk of digoxin toxicity and significant digoxin toxicity itself may produce hyperkalaemia
 - d) Calcium administration is contraindicated in digoxin toxicity with hyperkalaemia, instead digibind should be used in life threatening arrhythmias
30. Which indication / contraindication for the following medications is still recommended
- a) Low dose Dopamine for renal protective effects
 - b) Dobutamine as first line treatment in septic shock
 - c) Vasopressin for cardiac arrest caused by VT
 - d) Noradrenaline is contraindicated in mesenteric vascular thrombosis
31. Which is **not** a clinical feature of Systemic Inflammatory Response Syndrome SIRS
- a) Temperature < 36 degrees
 - b) $> 10\%$ immature forms or bands
 - c) SBP < 90
 - d) Heart rate > 90
32. Which of the following is **not** a good diagnostic indicator of a shocked state
- a) SBP < 90
 - b) Shock Index (HR/SBP) > 1.0
 - c) Presence of Multi-organ dysfunction
 - d) Composite of physical findings

33. Which is no longer a necessary indicator of the end point of resuscitation in Sepsis
- Urine output > 0.5 ml/kg/h
 - CVP 8 – 12
 - ScvO₂ > 70%
 - MAP 65 – 90 mmHg
34. Which is **not** part of the lethal triad of trauma
- Hypothermia
 - Hypotension
 - Coagulopathy
 - Acidosis
35. In an average 70kg adult
- Circulating blood volume is 8L
 - Circulating plasma volume is 5L
 - Percentage of circulating blood volume is 7% of ideal body weight
 - Extracellular compartment percentage of body water is 20%
36. Which class of hemorrhage matches % blood loss and clinical response
- Class I, 20% blood loss, tachycardia and narrow pulse pressure
 - Class II, 35% blood loss, mild to moderate hypotension and mild mental state changes
 - Class III, 50% blood loss, peripheral hypoperfusion and mental state changes
 - Class IV, 50% blood loss, limit of decompensation without aggressive intervention
37. Regarding fluid resus in trauma which is **not** true
- If 2-3 L of fluid only demonstrates minimal or modest hemodynamic improvement then blood transfusion is needed
 - There is no clear basis for the choice of colloid vs crystalloid for resus
 - Infusion of large volumes of crystalloid can cause increased neutrophil activation
 - Tibial IO access is acceptable method of resus even in major vascular injury with abdominal or pelvic trauma
38. In gauging response to fluid resus
- If CVP does not rise after 500ml of fluid then further fluid resus is not useful
 - If CVP rises by 5 - 7 mmHg after 500ml fluid bolus then vascular system is likely full

- c) A 25% difference in central venous oxygenation vs arterial oxygenation indicates an oxygen supply-demand imbalance
- d) Lactate and pH can be inconsistent and should not be used to measure response to fluid

39. Which is a part of the definition of massive transfusion

- a) Transfusion of >40ml/kg in children
- b) Replacement of total blood volume in 48 hours
- c) >50% blood volume loss in 12 hours
- d) Transfusion of >5 units of blood within first 24 hours

40. What is **not** a suggested criteria for activating massive transfusion protocol as per the Australia National Blood Authority

- a) Actual or anticipated 4 units blood RBC <4 hours + haemodynamically unstable
- b) Severe thoracic, abdominal or pelvic trauma
- c) Severe long bone trauma
- d) Major obstetric, gastrointestinal or surgical bleed

41. Which is **not** a parameter to aim for in massive transfusion protocol

- a) Temperature > 35 degrees
- b) pH > 7.2
- c) Calcium > 1.1 mmol/L
- d) INR < 2.0

42. Which is **not** a immunoglobulin responsible for anaphylaxis

- a) Ig E
- b) Ig M
- c) Ig G
- d) Complement

43. Which is true of monitoring and treatment for anaphylaxis

- a) Biphasic phenomenon peaks at 12 hours post exposure
- b) Corticosteroids has proven immediate benefit for life threatening anaphylaxis
- c) A child 6-12 years old should receive 150 mcg IM of adrenaline
- d) Injection into the thigh is more effective at achieving peak blood levels than into the deltoid

44. Which of the following collection of symptoms is **not** highly likely to be due to anaphylaxis
- Stridor, dyspnea and wheeze with no rash or angioedema
 - Dyspnea with Hives
 - Syncope and Incontinence with Hives
 - SBP < 90 after exposure to known allergen after several hours
45. Which is true of angioedema
- Hereditary angioedema is X linked recessive
 - Adrenaline IM has proven benefit in the treatment of ACE inhibitor induced angioedema
 - Hereditary angioedema is characterized by either low levels of C1 esterase inhibitor or elevated levels of dysfunctional C1 esterase inhibitor with low C4 between attacks
 - There is no effective treatment for hereditary angioedema as adrenaline, corticosteroids and antihistamines do not work

Answer

- C (SA node supplied 55% from RCA and 45% from circumflex, AV is 90% RCA and 10% LCx)
- B (paper speed 25mm/s, PR 0.12 – 0.2 s, QRS 0.06 – 0.1 s, QT 0.3 – 0.42 s but QTc , 0.47)
- D (Tintinalli states HR <50 and hypoperfusion whilst ARC guideline 11.9 NOV 2009 states HR <40 with BP <90 +/- ventricular arrhythmia +/- heart failure, atropine is class II or even class III only pacing is class I, transcutaneous pacing should be in demand mode unless transporting patient)
- A (can use procainamide; ibutilide; flecanide; Amiodarone; DC sync cardioversion. avoid b-blocker, ca channel, digoxin and adenosine. Cameron 4th edition page 238)
- D (arrhythmias are typically transient but are greater in the setting of digoxin and quinidine toxicity)
- B (MgSo4 recommendations vary 2g over 1-2 min: Cameron 4th edition page 237, hypokalaemia can cause torsades so can give IV KCl, cardioversion if unstable but torsades can be resistant, may use beta blocker for congenital long QT)
- C (“benign” rhythms 1st degree and mobitz type 1 and bifascicular block)
- B (60% AV nodal reentry; 20% bypass tract, typical SVT rate 160-200 bpm, AV nodal reentrant tachycardia has normal QRS complexes)
- A (10-20% AF; 5% flutter; 40-80% SVT, antidromic 5%, Type A dominant R wave in V1 and type B dominant S wave in V1. LITFL pre-excitation syndromes)
- D (1:1 300bpm, 2:1 150bpm, 3:1 100bpm, 4:1 75bpm)
- B (Chronic AF has embolic rate 5% or 2% as per CHADS2 score of zero, monophasic 100J 60% conversion 200J >80% greater success with biphasic, spontaneous conversion typically <24h and within 7 days)

12. C (Can occur if sinus rhythm 40 to 60, digoxin toxicity with junctional rhythm rate is usually 70 to 130 bpm, hypokalaemia; CHF; myocarditis and dig toxicity are causes, Rhythm is usually QRS without p wave)
13. D (greater than 3 PVCs in a row is considered non sustained VT)
14. A (reperfusion arrhythmias, can be associated with VT but not VF, giving lignocaine may cause asystole, the loss of atrial contraction may decrease cardiac output)
15. D (VT rare in people without underlying heart disease)
16. A (VT likelihood increases with age >35, structural heart disease, ischaemic heart disease, congestive heart failure, cardiomyopathy, family history of sudden death suggesting: Brugada, long QT, HOCM, arrhythmogenic right ventricular dysplasia. All from LITFL)
17. B (others: extreme northwest axis, AV dissociation, capture beats, positive or negative concordance V1-6, RSR with taller left rabbit ear, Brugada and Josephson's signs. From LITFL)
18. D (RBBB is left to right, LAD = LASF block, RAD = LPIF block)
19. C (trifascicular: RBBB + LASF + 1st degree; RBBB + LPIF + 1st degree; LBBB + 1st degree; Alternating RBBB and LBBB)
20. A (type I: ST elevation in V1-V3 with TWI, syncope & family history of sudden death are risk factors, provocative ECG tests are warranted if brugada suspected but not proven on ECGs)
21. B (failure to output "pace" no spike: oversensing; wire fracture; lead displacement; interference; battery exhaustion, failure to capture no QRS after spike: electrode displacement; wire fracture; electrolyte deranged; AMI; exit block; battery exhaustion but no spike if no battery output. LITFL)
22. D (if lignocaine is given in AV block can cause asystole)
23. B (Class Ib, adverse effects: long QT; VT; prolonged QRS; AV block; torsades; myocardial depression; haematological effects; contraindicated in myasthenia gravis)
24. D (Sotalol has class III effects that can prolong QTc and cause torsades)
25. A (proarrhythmia long term effect, short term effect bradycardia and hypotension, it is first line treatment for VT and VF arrest, it is indicated to treat AF with decreased ejection fraction)
26. C (Diltiazem is drug of choice for vasospastic angina as it preferentially dilates coronary vasculature allowing for decreased oxygen consumption, use cautiously with beta blockers and digoxin effects may be additive, long acting diltiazem and verapamil can be used in HT)
27. B (Competitively antagonizes acetylcholine and blocks vagal activity, is rarely effective in PEA or asystole, dose via ETT is 2 to 2.5 that of IV)
28. D (half-life < 10 seconds)
29. A (it is a positive inotrope)
30. D (Controversial areas, low dose dopamine definitely not indicated for renal protection anymore, 1st line treatment of septic shock is Noradrenaline SURVIVING SEPSIS GUIDELINE 2012 TABLE 6, ANZCOR GUIDELINE 11.5 JAN 2016 suggests against using vasopressin for cardiac arrest, most recommendations for Noradrenaline states caution with mesenteric thrombosis but can be used if for lifesaving purposes UPTODATE 19.3 NORADRENALINE)
31. C (SIRS: temp >38 or <36, HR > 90, RR > 20, WCC >12 or >10% immature cells or bands)
32. A (blood pressure not good to detect global tissue hypoxia)
33. C (No difference in usual therapy vs goal directed therapy)
34. B

35. C (blood volume is 5L or 7% of ideal body weight or 11% of body water, plasma is 3L and RBC 2L, extracellular is 33% of body water)
36. D (class 1, <15% <750ml, minimal or no tachycardia and no hypotension; class 2, 15 – 30%, tachycardia, narrow pulse pressure, mild to mod hypotension, compensatory peripheral vasoconstriction, mild mental state change; class 3, 30 – 40%, worsening hypotension, tachycardia, peripheral hypoperfusion, mental state changes; class 4, limit of decompensation without aggressive intervention)
37. D (vascular access above diaphragm is prudent if there major abdo or pelvic trauma with vascular injury)
38. B (If CVP does not rise after 250 or 500 ml then the vascular system is still very compliant, >50% to 60% extraction ratio indicates an oxygen supply – demand imbalance, lactate and pH can be useful in serial assessment)
39. A (AUSTRALIAN RED CROSS WEBSITE 24/2/16, >1 blood volume in 24 hours, >50% blood volume in 4 hours, >40ml/kg in children over 1 month is approx. 80ml/kg, Tintinalli states >10 units within first 24 hours)
40. C (Severe multiple long bone trauma, NATIONAL BLOOD AUTHORITY AUSTRALIA APPENDIX G)
41. D (temp > 35, pH > 7.2, BE < -6, lactate < 4, Ca > 1.1 mmol/L, platelet > 50, APTT < 1.5 x normal, INR ≤ 1.5, Fib > 1.0, NATIONAL BLOOD AUTHORITY AUSTRALIA APPENDIX G)
42. B (IgE, IgG and immune complex complement)
43. D (biphasic peaks at 4 to 8 hours, corticosteroids or antihistamines or antileukotrienes have no proven immediate benefit on life threatening anaphylaxis RCH GUIDELINES ANAPHYLAXIS NOV 2015, child < 6yo 150mcg IM, child 6-12 300mcg IM, child > 12 500mcg IM)
44. A (Acute onset minutes to several hours with involvement of skin and/or mucosa including hives; pruritus; flushing; swollen mucosa and at least respiratory compromise or hypotension with end organ dysfunction including collapse; syncope; incontinence. OR two or more involvement of skin; respiratory; hypotension and end organ dysfunction; persistent GI symptoms. OR hypotension SBP < 90 or age appropriate hypotension or >30% drop in SBP for children with exposure to known allergen minutes to several hours. Sampson et al. Second symposium on the definition and management of anaphylaxis: summary report–Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network symposium. J Allergy Clin Immunol. 2006)
45. C (ACE Inhibitor angioedema is not IgE mediated so adrenaline antihistamines and steroids have not been clearly demonstrated to be of benefit, Hereditary angioedema is autosomal dominant is characterized by either low levels of C1 esterase inhibitor or elevated levels of dysfunctional C1 esterase inhibitor with low C4 between attacks and successful treatments with Icatibant; C1 esterase inhibitor; FFP can be used.
http://www.allergy.org.au/images/stories/pospapers/ASCIA_HAE_Action_Plan_Au_2013.pdf)