IBHRE Prep Key

Practice Questions

Key
Question 1
The relative refractory period of the ventricular myocardium corresponds to which of the following phases of the action potential?

• A. (0)
• B. (1)
• C. (2)
• D. (3)
• E. (4)

Phases 0 to 2 correspond to the absolute refractory period. Phase 3 corresponds to the relative refractory period. Phase 4 is the resting transmembrane potential of myocardial cells.
A typical action potential, showing the various phases of depolarization and repolarization. In phase 0 (depolarization), sodium ions (Na\(^+\)) rapidly enter the cell through fast channels. In phase 1, the initial repolarization is primarily the result of activation of a transient outward potassium ion (K\(^+\)) current and inactivation of the fast Na\(^+\) current. In phase 2 (plateau), the net current is very small, although the individual Na\(^+\), Ca\(^{2+}\), and K\(^+\) currents are about an order of magnitude larger. Phase 3 (final repolarization) completes the cycle, with the Na\(^+\)-K\(^+\) pump bringing the membrane potential to a stable point at which inward and outward currents are again in balance. During phase 4 the cell is polarized and gradually undergoes slow depolarization.
Question 2
A dual chamber pacemaker programmed to the DDD mode recognizes which of the following as a PVC?

• A. Atrial pace coincident with a PVC (pseudo pseudofusion)
• B. Atrial pace with a PVC sensed in the safety pace window
• C. Loss of atrial capture followed by a junctional beat
• D. Sinus beat with a loss of atrial sensing

A dual chamber pacemaker programmed to the DDD mode recognizes a sinus beat with loss of atrial sensing as a PVC, because the pacemaker’s electronic definition of a PVC is any sensed ventricular activity not preceded by a sensed or paced atrial event. All of the other options have a sensed or paced atrial event prior to sensed ventricular activity.
Question 3
Select the appropriate definition for “coulomb.”

• B. The basic unit of frequency
• C. The basic unit of inductance
• A. The basic unit of capacitance
• D. The fundamental unit of electrical charge
• E. A metric unit of force

The Coulomb, symbol C, is the unit of measurement of an electric charge, and is defined in terms of the ampere: 1 coulomb is equal to the amount of electric charge (quantity of electricity) transported by one ampere of current for one second through a cross section of conductor. In pacing, charge is usually expressed in microcoulombs.
Question 4
Rapid upstroke of the Purkinje fiber action potential (Phase 0) is related to which of the following currents?

- A. ICa
- B. IK
- C. IMg
- **D. INa**
- E. IPu

Excitable tissues are characterized by their ability to generate and propagate a transmembrane action potential. The action potential is triggered by depolarization of the membrane of a resting potential of approximately -90mV to a threshold potential of approximately -60 to -70mV. Upon reaching the threshold transmembrane potential, specialized membrane-bound protein channels change conformation from an inactive state to an active state, which allows the free movement of Na+ ions through the channel. The upstroke of the action potential (phase 0) is a consequence of this sudden influx of Na+ into the myocyte and is associated with a change in transmembrane potential from -90mV to approximately -20mV.
Question 5
Energy requirements for pacing and defibrillation differ by a factor of which of the following?

• A. 10
• B. 100
• C. 10,000
• D. 100,000
• E. 1,000,000
Question 6
Which of the following is an advantage of polyurethane insulation in pacing leads?

- **A. Reduced interlead friction**
- B. Enhanced reliability
- C. Reduced polarization effect
- D. Resistance to lead displacement
- E. Resistance to metal ion induced oxidation

Polyurethane was introduced as an insulation material because of its superior tear strength and low coefficient of friction. These properties allow polyurethane leads to be constructed with smaller external diameter than those made with conventional silicone rubber. The smaller polyurethane leads have contributed to the increased acceptance of bipolar pacing, and have allowed two leads to be placed in a single vein.
Question 7
Select the appropriate definition for “farad.”

- **A. The basic unit of capacitance**
- B. The basic unit of frequency
- C. The basic unit of inductance
- D. The fundamental unit of electrical charge
- E. A metric unit of force

The farad (symbol F) is the unit of capacitance. A capacitor has a value of one farad when one coulomb of charge causes a potential difference of one volt across it. Since the farad is a very large unit, values of capacitors are usually expressed in microfarads, nanofarads, and picofarads.
Question 8
Which of the following findings is indicative of failure of the inner insulation of a bipolar pacing lead?

<table>
<thead>
<tr>
<th></th>
<th>Unipolar Impedance</th>
<th>Bipolar Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>(B)</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>(C)</td>
<td>Low</td>
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</tr>
<tr>
<td>(D)</td>
<td>Normal</td>
<td>High</td>
</tr>
<tr>
<td>(E)</td>
<td>Normal</td>
<td>Low</td>
</tr>
</tbody>
</table>

- A.
- B.
- C.
- D.
- E.

Since unipolar pacing only uses the inner coil of a bipolar lead, a low bipolar pacing impedance with a normal unipolar impedance is indicative of inner insulation problems.
Question 9
A pulse generator showed standard power source depletion characteristics, and was replaced with a bipolar dual chamber pulse generator. Intraoperative testing of the leads was normal. The following real time telemetry data was obtained immediately after the procedure. Which of the following is the most appropriate course of action?

<table>
<thead>
<tr>
<th>Lead</th>
<th>Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Unipolar</td>
<td>750 Ohms</td>
</tr>
<tr>
<td>A Bipolar</td>
<td>&gt;3,000 Ohms</td>
</tr>
<tr>
<td>V Unipolar</td>
<td>940 Ohms</td>
</tr>
<tr>
<td>V Bipolar</td>
<td>1,000 Ohms</td>
</tr>
</tbody>
</table>

- A. Repair the atrial lead
- B. Replace the atrial lead
- C. **Tighten the atrial anode set screw**
- D. Tighten the atrial Cathode set screw
- E. No action is needed at this time

The impedance of the atrial bipolar lead is above the range while the atrial unipolar impedance (cathodal impedance) is well within normal range. Since all of these parameters were normal during the interoperative testing, damage of the lead is not the cause. The most appropriate action is to tighten the anodal set screw.
Question 10
Which of the following differentiates a 3.2-mm low-profile bipolar lead from an IS-1 bipolar lead?

• A. Different interelectrode spacing
• B. Larger diameter
• C. Longer terminal pin
• D. Shorter terminal pin
• E. Smaller diameter

The 3.2-mm low profile lead has a longer terminal pin compared to the IS-1 bipolar lead.
Question 11
Which of the following decreases the myocardium stimulation threshold?

• A. Exercise
• B. Hypercarbia
• C. Metabolic acidosis
• D. Metabolic alkalosis
• E. Sleep

Exercise increases the catecholamine state thereby shortening refractory periods in atrial, AV nodal, and ventricular tissue, thereby allowing for enhanced response to paced stimulation and lower threshold. The other answers produce either a relative acidemia (hypercarbia), no effect (metabolic alkalosis or acidosis), or heightened vagal tone (sleep) which either increases the stimulation threshold or have no effect at all.
Question 12
The ventricular stimulation threshold of a stable unipolar pacing lead is assessed eight weeks after implantation. At a programmed pulse duration of 2.0 ms the voltage threshold is 1.0 V. At a programmed pulse amplitude of 2.0 V, the pulse width threshold is 0.10 ms.

- A. Rheobase 2.0 V
- B. Chronaxie 2.0 ms
- C. Rheobase 0.10 V
- **D. Chronaxie 0.10 ms**
- E. Chronaxie 1.0 ms

Chronaxie (0.10ms in this patient) is defined as the pulse width for capture at twice the rheobase voltage. Rheobase (1V in this patient) derived from the stent duration curve, that indicates the minimum intensity of the steady cathode current that will stimulate the myocardium irrespective of the pulse duration. Rheobase indicates the point at which capture of myocardial tissue with a pacemaker output pulse will not be improved by an increase in the pulse duration.
Question 13
A dual chamber pacemaker is programmed DDD to a lower rate limit of 50 bpm, an upper rate limit of 125 bpm, and an AV delay of 175 ms that is reduced by 25 ms at an atrial rate of 100 bpm, and an atrial refractory period of 300 ms.

During a stress test the atrial rate is 128 bpm, the ventricular response is most likely to be which of the following?

• A. 1:1 AV conduction
• B. 2:1 AV block
• C. 3:1 Sinoatrial block
• D. Pseudo Mobitz type II AV block
• E. Pseudo Wenckebach AV block

In the DDD mode, acceleration of the sinus rate results in a sensed P wave terminating the Atrial Escape Interval (aka V-A interval), and initiating an AV Delay. If the PR interval is longer that the PV interval, P-wave synchronous pacing will occur in a 1:1 relationship between the lower rate limit and the programmed upper rate limit (aka maximum tracking rate and ventricular tracking interval). When the sinus rate is above the TARP rate (60,000 / AV Delay + PVARP) every other P wave will occur in PVARP, causing the ventricular paced rate to occur at a 1:2 ratio with the intrinsic P waves, resembling 2nd degree AV block I. A sinus driven ventricular paced rhythm at a rate above the MTR and below the TARP rate will resemble 2nd degree AV block Wenckebach. In the above example, the MTR is 125 bpm, and the TARP rate is 133 bpm.
The principal purpose of PVARP in the dual chamber pacemaker timing cycle is prevention of which of the following?

- **A. Atrial sensing of a retrograde atrial impulse**
- B. Atrial sensing of the ventricular pacing stimulus
- C. Ventricular sensing of the T wave
- D. Ventricular sensing of the atrial pacing stimulus

Post Ventricular Atrial Refractory (aka PVARP) was added to dual chamber pacing systems to prevent and treat pacemaker mediated tachycardia (aka endless loop tachycardia). Pacemaker mediated tachycardia occurs when a ventricular depolarization travels retrograde, and is sensed by the atrial lead. If the retrograde signal is sensed during PVARP, an AV delay will not be initiated.
Question 15
The graph demonstrates the intracardiac signals of a pacemaker. Which of the following is the correct description of each of the four sections on the recording?

- A. (A)
- B. (B)
- C. (C)
- D. (D)
- E. (E)

T waves usually have low frequency (less than 10 Hz). R waves have medium frequencies (10-100 Hz), and high amplitudes. P waves have similar frequencies to R waves, but lower amplitudes. Myopotentials have very high frequencies, but low amplitudes.
Question 16
A patient with complete heart block has a dual chamber pacemaker programmed to the DDDR mode. Which of the following is most likely to occur at sensor indicated rates higher that the maximum tracking rate?

• A. AV sequential pacing
• B. Crosstalk
• C. Mode switching
• D. Pseudo wenckebach 2\textsuperscript{nd} degree AV block
• E. Pseudo 2\textsuperscript{nd} degree AV block mobitz II

Since they can be independently programmed, the maximum sensor rate (sensor input causing the atrium to be paced faster than the lower rate limit.) may be programmed faster then the maximum tracking rate (AV delay is initiated after a sensed atrial event above the lower rate limit and not occurring in an atrial refractory period.). Sensor driven atrial paced events do not exhibit upper rate behaviors (pseudo Wenckeback and 2:1 block) when the atrially paced rate is above the maximum tracking rate.
Question 17
In a patient with an ICD, which of the following is the result of using enhanced detection algorithms to inhibit therapy for SVT.

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Increased</td>
<td>Increased</td>
</tr>
<tr>
<td>B</td>
<td>Decreased</td>
<td>Decreased</td>
</tr>
<tr>
<td>C</td>
<td>Increased</td>
<td>Decreased</td>
</tr>
<tr>
<td>D</td>
<td>Decreased</td>
<td>Increased</td>
</tr>
</tbody>
</table>

• A. (A)
• B. (B)
• C. (C)
• D. (D)

An ICD programmed to a single zone (VF) with no detection enhancements is greater than 99% sensitive in detecting and treating ventricular rates above the cutoff. The addition of enhanced detection algorithms such as onset, stability, afib rate threshold, and morphology will aid the device in distinguishing rapidly conducted SVT’s from VT, therefore making the sensing more specific (Increased specificity). However, there is a risk of misdiagnosing a ventricular arrhythmia as an SVT, and therefore the ICD is less sensitive in zones where detection enhancements are programmed (decreased sensitivity).
Question 18
Which of the following was the most important requirement in sensing evoked potentials for ventricular capture confirmation used with the St. Jude Autocapture algorithm?

• A. High impedance lead
• B. Low pacing threshold
• C. Low polarization lead
• D. R-wave amplitude
• E. Steroid eluting lead

The most common technique used to accomplish autocapture is to measure the evoked response. The evoked response is the local intracardiac signal that occurs in response to the pacing stimulus when capture is achieved. The pacing stimulus may be 350 times greater than the signal to be measured (3.5 V for pacing vs. 10mV for ventricular evoked response). Polarization occurs at the electrode-myocardium interface due to the electrical current from the tip of the electrode to the tissue, and refers to the remnants of the stimulus afterpotential that can remain long after the pacing pulse is complete. After the stimulus is delivered, electrical signals are generated due to ion movement in the extracellular spaces around the electrodes. The polarization effect increases as the electrode surface area is reduced. The afterpotential must be removed within 50 to 100 msec to delineate the evoked response accurately.
Question 19
Which of the following medications is most likely to elevate the myocardial stimulation threshold after implantation of a dual chamber pacing system?

- A. Digoxin
- B. Diltiazem
- C. Flecanide
- D. Mexilitine
- E. Sotalol

Class 1C agents (including flecainide and propafenone) may dramatically increase pacing thresholds, and in some cases can result in loss of capture of the pacing output in either the atrium or ventricle.
Question 20
Which of the following best characterizes the results of empiric antitachycardia pacing for fast ventricular tachycardia (VT) with rates between 210 and 250 bpm?

<table>
<thead>
<tr>
<th></th>
<th>Conversion of VT (%)</th>
<th>Acceleration of VT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>C</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>D</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>E</td>
<td>75</td>
<td>10</td>
</tr>
</tbody>
</table>

From the Pain Free Rx trial (Walthen, et al. Circulation 2004) that randomized patients undergoing ICD implantation to a Fast VT zone ATP regimen of two burst pacing runs or no ATP. The results of this large randomized prospective trial showed that almost 80% of VT’s, even fast VT’s can be pace terminated with a very low risk of acceleration.
Question 21
Which of the following is demonstrated on this recording?

• A. Appropriate ventricular capture during atrial fibrillation
• B. Atrial overdrive pacing
• C. Failure of ventricular sensing caused by lead displacement
• D. Failure of ventricular sensing caused by lead fracture
• E. Ventricular safety pacing during atrial fibrillation

The surface and intracardiac electrogram strip demonstrates a patient with atrial fibrillation and appropriate sensing in the ventricle. The atrial fibrillation causes only intermittent mode switching and occasionally (two times on this strip) the pacemaker is in a tracking mode where an R wave falls during the post atrial blanking period which then triggers ventricular safety pacing (an AV delay of 100-125 ms dependent on the device, here it is 125 ms) in order to avoid AV sequential or P wave synchronous ventricular pacing at the programmed AV delay and possible R on T phenomenon. Ventricular capture is not identified due to the two paced beats occurring during the refractory period of the intrinsic ventricular beats,
Question 22
The recording shown is from a 62 year old woman with an ICD that was implanted because of malignant ventricular arrhythmias. Which of the following is demonstrated?

• A. Atrial trigeminy
• B. AV dissociation
• C. R-wave alternans
• D. Sinus bradycardia
• E. Ventricular bigeminy

The patient represented in this strip has atrial lead far field sensing of R waves, or less likely paced ventricular beats. The patient’s own atrial rate is approximately 1800 ms, and represents marked sinus bradycardia. The rhythm appearing bigeminal, is due to sinus bradycardia with a ventricular escape beat after the delay, not from a premature ventricular paired beat (a marker of bigeminy).
Question 23

Which of the following antiarrhythmic drugs is most likely to decrease ICD defibrillation thresholds while having minimal effects on the cycle length of spontaneously occurring sustained monomorphic ventricular tachycardia?

- A. Amiodarone
- B. Flecanide
- C. Lidocaine
- D. Procainamide
- E. Sotalol

Sotalol is a class III antiarrhythmic, and is the only medication among the choices that has been shown to decrease ventricular defibrillation threshold. The others either increase, or have no consistent effect on changing the defibrillation threshold.
Question 24
See next page.
Question 24
A 64 year old man with a dual chamber ICD, and a history of coronary artery disease with left ventricular dysfunction and COPD comes to the clinic after receiving two shocks from the device 12 hours ago. The electrogram and episode report shown on the previous page are retrieved from the data log of the ICD. Based on these findings, which of the following is the initial arrhythmia detected.

• A. Atrial fibrillation with rapid ventricular response
• B. Atrial flutter with 2:1 conduction
• C. Atrial tachycardia with varying ventricular response
• D. Orthodromic supraventricular tachycardia
• E. Simultaneous atrial tachyarrhythmia and ventricular tachycardia

The intracardiac electrogram reveals that atrial tachycardia at a rate of 150 bpm, while the ventricular rate is faster than 300 bpm with AV dissociation. This suggests separate atrial tachycardia and ventricular tachycardia. The ventricular tachycardia was terminated with a second shock, with continued atrial tachycardia and resumption of 1:1 AV conduction after several beats.
Question 25

78 year old man with prolonged P-R interval and left bundle branch block with ischemic cardiomyopathy despite optimal medical therapy underwent implantation of a biventricular pacing system two years ago. The 12-lead ECG, shown on the previous page, obtained during a current routine evaluation. Which of the following best describes these findings.

• A. Biventricular pacing
• B. Loss of atrial sensing
• C. Loss of left ventricular capture
• D. Loss of right ventricular capture
• E. Ventricular safety pacing

The ECG clearly reveals 2 separate ventricular pacing spikes within about 40 msec of each other. The QRS morphology is consistent with left ventricular pacing (V1 shows RBBB), and thus the most likely etiologies of the two closely spaced spikes is one pacing in the LV and one pacing in the RV.
Question 26
For the following condition, select the most appropriate ACC/AHA classification of indications for permanent pacing in children and adolescents:

Transient postoperative third degree AV block with a return to normal AV conduction within seven days.

- A. Class I
- B. Class II
- **C. Class III**

In a young patient with transient postoperative 3rd degree AV block, a permanent pacemaker is not indicated (class III)
Question 27
A 79 year old man has no sign of structural heart disease. Based on the ECG rhythm strip, which of the following is the most appropriate mode of pacing?

- A. AAIR
- B. DDI
- C. DDIR
- D. VDD
- E. VVIR

The ECG demonstrates complete A-V block with a sinus rhythm that demonstrates chronotropic competence. The best pacing mode for this patient is pacing in the ventricle while tracking the atrium to maintain A-V synchrony. This can be done by either VDD or DDD.
Question 28
For the following condition select the most appropriate ACC/AHA classification of indications for permanent pacing in children and adolescents:

Sinus node dysfunction with correlation of symptoms during age inappropriate bradycardia.

- **A. Class I**
- B. Class II
- C. Class III

Symptomatic sinus node dysfunction with documented symptoms due to age inappropriate bradycardia is a class I indication for a permanent pacemaker.
Question 29
See next page
Question 29
A 65 year old woman who underwent placement of a dual chamber ICD two years ago because of conduction disorder and documented ventricular tachycardia presents to the emergency department with shortness of breath. A 12-lead ECG recording is shown on the previous page. Which of the following is the most appropriate immediate management?

• A. Enable the discrimination algorithms
• B. Increase the atrial output
• C. **Obtain measurement of electrolyte levels**
• D. Repeat the ECG at a slower paper speed
• E. Test the defibrillation threshold

The ECG reveals very wide QRS and tall peaked T waves, which are signs of hyperkalemia
Question 30
A 70-year woman with paroxysmal atrial fibrillation and bifascicular block had frequent episodes of syncope over the past two days. The episodes occurred after she began taking sotalol 80 mg twice daily. Which is the most appropriate management?

- A. Continue sotalol and implant a permanent pacemaker
- B. Continue sotalol and implant a temporary pacemaker
- C. Continue sotalol and implant an ICD
- D. Discontinue sotalol and implant an ICD
- E. Discontinue sotalol and implant a permanent pacemaker

The medication for a non-life threatening condition. The patient had many episodes of syncope while taking Sotalol. Her syncope would not be definitely stopped if the Sotalol were to be continued after the pacemaker is implanted. A pacemaker is indicated due to complete heart block in the face of baseline bifascicular block and bradycardia dependent long QT. An ICD is not indicated for atrial fibrillation alone, and should not be implanted in order to continue the Sotalol. In other words, Sotalol treatment for atrial fibrillation should not include an ICD.
Question 31
The 3 channel ECG recording shown is obtained during sleep hours from a 23 year old woman who is being evaluated because of palpitations. Examination shows no other abnormalities. Which of the following is the most likely step in her management?

- A. Administration of metoprolol 50 mg twice a day
- B. Implantation of a dual chamber pacemaker
- C. Implantation of a single chamber pacemaker
- D. Recommend a repeat ECG every year
- E. Observation

The ECG reveals high grade AV block which is not uncommon during sleep due to high vagal tone. In this young patient without any history of syncope the best course of action is observation. There is no indication for a pacemaker. Beta blockers would worsen the AV block.
Question 32
Over the past three months, a 24 year old man, who works as a truck driver, has had frequent episodes of presyncope and syncope usually while standing. A recording during a tilt table test is shown. Which of the following are most likely the diagnosis

- A. Artifact
- B. Complete AV block
- C. Isorhythmic AV dissociation
- **D. Neurocardiogenic syncope**
- E. Sick sinus syndrome

The ECG reveals gradual increase of the P-P interval (bradycardia) followed by high grade AV block which appears to be orthostatic. This most consistent with neurocardiogenic syncope in a young patient.
Question 33
A diagnosis of arrhythmogenic right ventricular dysplasia is confirmed in a 35 year old man who is evaluated because of an episode of syncope. Electrophysiologic study shows three distinct morphologies of ventricular tachycardia with cycle lengths between 280 and 320ms. An echocardiogram and MRI show severe right ventricular dysfunction.

Which of the following is the most appropriate management.

• A. Administration of amiodarone
• B. Administration of metoprolol
• C. Administration of sotalol
• D. Catheter ablation
• E. Placement of an ICD

The best management for this patient with arrhythmogenic right ventricular dysplasia, syncope, and several VT morphologies is implantation of an ICD. Due to the diffuse nature of this disease, ablation of VT is not a first line therapy, and would be more appropriate if the patient has recurrent frequent shocks from the ICD. There is no data that antiarrhythmic therapy in these patients reduces the risk of sudden cardiac death.
Question 34
The normal range for ICD shock lead impedance falls within which of the following ranges?

- **A. 10 to 99 ohms**
- B. 100 to 499 ohms
- C. 500 to 999 ohms
- D. 1000 to 1499 ohms
- E. 1500 to 2000 ohms

The normal range for ICD shock impedance is between 10 to 99 ohms. Higher impedances indicate lead conductor fracture. Lower impedances indicate insulation fracture.
Question 35

A 71 year old man has dyspnea after walking 50 feet two years after undergoing a catheter ablation of his AV node, and implantation of a single chamber pacemaker for refractory atrial fibrillation. LVEF is now 15%, and the left ventricle is enlarged. At the time of the ablation his LVEF was 55%, and he was considered NYHA Class I.

Which of the following is the most appropriate step in his management?

- A. Change the pacemaker to a single chamber ICD
- B. Referring the patient for heart transplantation
- C. Surgical maze procedure
- **D. Upgrading to a biventricular ICD**
- E. Upgrading to a dual chamber system

It has been shown that prolonged RV pacing may result in LV dysfunction by causing functional dyssynchrony. Upgrading to biventricular pacing in this patient may improve LV function by eliminating the dyssynchrony. His low EF also makes him a candidate for an ICD.
Question 36
Which of the following 12 lead ECG patterns is most indicative of transseptal perforation, and endocardial pacing of the left ventricle?

• A. Anterior hemiblock
• B. Inferior axis deviation
• C. Left bundle branch block
• D. Posterior hemiblock
• E. Right bundle branch block

While RV pacing generally elicits a LBBB pattern, pacing in the LV elicits a RBBB pattern. When a RBBB pattern is observed with pacing, the possibility of LV pacing through a perforation of the septum, or via the coronary sinus should be suspected.
Question 37
See next page
Question 37
A 32 year old man with late stage hypertrophic cardiomyopathy received an ICD. The ICD was functioning normally at his last follow-up. He has renal insufficiency with a baseline creatinine of 2.6, and is now hospitalized with pneumonia and septic shock. In the ICU, he receives a shock from his ICD. His rhythm has not changed significantly on telemetry. The stored ICD EGM is shown on the previous page. The R-R interval reads “470-170-470-170-470-170.” Which of the following would you recommend?

- A. Replace the ICD pulse generator
- B. Replace the epicardial leads with a transvenous lead
- C. Reprogram detection to least sensitive
- D. Turn off tachy therapy while in the ICU
- E. Administer metoprolol, 5mg IV x 3

There is intermittent double counting. The double counting results from oversensing of the wide and bizarre electrogram during sinus tachycardia, which is the result of metabolic disturbances from the sepsis and renal failure. The best thing to do while the patient is in the ICU and extremely ill, is to treat the underlying disease and shut off tachy therapy until he is stable.
Question 38
For the following condition, select the most appropriate ACC/AHA classification of indications for permanent pacing in adults with acquired AV block:

Left ventricular dysfunction, and congestive heart failure, with prolonged P-R interval.

• A. Class I
• B. Class II
• C. Class III

LV dysfunction with clinical CHF and prolonged P-R interval is a class II indication for permanent pacemaker implantation. There is some evidence that restoring AV synchrony by reducing the paced P-R interval in these patients may improve their symptoms.