Diagnostic Cardiology in the Office Setting

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Oxygenation Process

1. Deoxygenated blood enters into right atrium through superior or inferior vena cava
2. Tricuspid valve opens and blood drops into right ventricle
3. Pulmonary valve opens, and deoxygenated blood moves through it into pulmonary artery
4. Pulmonary artery sends the blood to the lungs where oxygenation occurs at the capillary beds
5. Oxygenated blood enters back into left atrium through pulmonary vein
6. Mitral valve opens and blood drops into left ventricle
7. Aortic valve opens and ventricular muscle pumps blood up and out into the body through the aorta
The Heart: Cardiac Cycle
The Heart:
Valves
• Coronary heart disease (CHD) is a narrowing of the small blood vessels that supply blood and oxygen to the heart. CHD is also called coronary artery disease.

• Coronary heart disease (CHD) is the leading cause of death in the United States for men and women.
Coronary heart disease is usually caused by a condition called atherosclerosis, which occurs when fatty material and a substance called plaque build up on the walls of your arteries. This causes them to get narrow. As the coronary arteries narrow, blood flow to the heart can slow down or stop. This can cause chest pain (stable angina), shortness of breath, heart attack, and other symptoms.
• Risk factors include:
  – Men in their 40s have a higher risk than women
  – Heredity
  – Diabetes
  – High blood pressure
  – Abnormal cholesterol levels
- Metabolic syndrome
- Smokers
- CKD
- Atherosclerosis in another part of the body
- Alcohol abuse, lack of exercise, stress
Tests may include:

- Electrocardiogram (ECG)
- Exercise stress test
- Echocardiogram
- Nuclear scan
- Electron-beam computed tomography (EBCT) to look for calcium in the lining of the arteries -- the more calcium, the higher your chance for CHD
Tests may include:

• CT angiography -- a noninvasive way to perform coronary angiography
• Magnetic resonance angiography
• Coronary angiography/arteriography -- an invasive procedure designed to evaluate the heart arteries under x-ray
Symptoms

- Chest pain or discomfort (angina) (most common)
- Chest heaviness/ Squeezing
- Pain usually occurs with activity or emotion, and goes away with rest / nitroglycerin.
- Shortness of breath
- Fatigue with exertion
• Estimates for the year 2006 are that 81,100,000 people in the United States have one or more forms of cardiovascular disease
  – High blood pressure — 73,600,000
  – Stroke — 6,400,000
  – Heart Failure — 5,800,000
• Coronary heart disease — 17,600,000.
  – Myocardial infarction (acute heart attack) — 8,500,000.

  – Angina pectoris (chest pain or discomfort caused by reduced blood supply to the heart muscle) — 10,200,000.
• Coronary heart disease caused 425,425 deaths in 2006 and is the single leading cause of death in America today.

• 17,600,000 people alive today have a history of heart attack, angina pectoris or both. This is about 9,200,000 males and 8,400,000 females.

• This year an estimated 1.26 million Americans will have a new or recurrent coronary attack.
• There are about 295,000 EMS-assessed out-of-hospital cardiac arrests annually in the United States.

• From 1996 to 2006 the death rate from coronary heart disease declined 36.4 percent.
In 2006, coronary heart disease death rates per 100,000 people were 176.3 for white males and 206.4 for black males; and 101.5 for white females and 130.0 for black females. (Death rates are per 100,000 population. The rates use the year 2000 standard population for age adjustment.)
CMS has defined the following three levels of physician supervision for diagnostic tests:

- General Supervision
- Direct Supervision
- Personal Supervision
<table>
<thead>
<tr>
<th>Cardiology Tests</th>
<th>CPT Code(s)</th>
<th>Supervision Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial Perfusion Studies</td>
<td>78464-78494</td>
<td>General</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>93303-93321</td>
<td>General</td>
</tr>
<tr>
<td>Cardiography</td>
<td>93000-93278</td>
<td>General</td>
</tr>
<tr>
<td>Stress Test</td>
<td>93015</td>
<td>Direct</td>
</tr>
<tr>
<td>Cardiac Catheterization</td>
<td>93501-93572</td>
<td>Personal</td>
</tr>
<tr>
<td>Electrophysiology Studies</td>
<td>93600-93660</td>
<td>Personal</td>
</tr>
</tbody>
</table>
• TC
• 26
• MPFSDB
If a provider performed only the professional component of a global procedure he/she would report the CPT code using the modifier 26. If a provider performed the technical portion of a global procedure he/she would report the CPT code using the modifier TC. Some diagnostic cardiology services are inherently professional or technical so they do not require the modifier 26 or TC.
• Used to diagnose cardiovascular disease

• One of the most widely used diagnostic tests for heart disease

• Advantage – non-invasive
• Can show:
  – Size/shape of heart
  – Pumping capacity
  – Location/extent of damage
  – Abnormalities in pattern of blood flow
  – Assess motion of heart wall
TTE – transthoracic echocardiogram

Echocardiography transducer (or probe) is placed on the thorax of the patient, and images are taken through the chest wall.
This is a non-invasive, highly accurate and quick assessment of the overall health of the heart.
TEE – transesophageal echocardiogram

A specialized probe containing an ultrasound transducer at its tip is passed into the patient's esophagus. This allows image and Doppler evaluation which can be recorded.
CPT Codes

• 93303 – 93352

• Congenital cardiac anomalies

• 93306 “Super Code”

• Complete v Follow-up
WHEN YOU THINK YOU HAVE HAVE HAD A ROUGH DAY ON THE JOB....
Photograph of a Complete Electrocardiograph, Showing the Manner in which the Electrodes are Attached to the Patient, In this Case the Hands and One Foot Being Immersed in Jars of Salt Solution
EKG/ECG – electrocardiogram

A transthoracic interpretation of the electrical activity of the heart over time. This is captured and externally recorded by skin electrodes. Unlike echocardiography, EKGs cannot reliably measure the pumping ability of the heart.
RA = Right Arm
LA = Left Arm
RL = Right Leg
LL = Left Leg

RA - White
LA - Black
RL - Green
LL - Red
<table>
<thead>
<tr>
<th>Electrode label (in the USA)</th>
<th>Electrode placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>On the right arm, avoiding thick muscle.</td>
</tr>
<tr>
<td>LA</td>
<td>In the same location that RA was placed, but on the left arm this time.</td>
</tr>
<tr>
<td>RL</td>
<td>On the right leg, lateral calf muscle</td>
</tr>
<tr>
<td>LL</td>
<td>In the same location that RL was placed, but on the left leg this time.</td>
</tr>
<tr>
<td>$V_1$</td>
<td>In the <em>fourth</em> intercostal space (between ribs 4 &amp; 5) just to the <em>right</em> of the sternum (breastbone).</td>
</tr>
<tr>
<td>$V_2$</td>
<td>In the <em>fourth</em> intercostal space (between ribs 4 &amp; 5) just to the <em>left</em> of the sternum.</td>
</tr>
<tr>
<td>$V_3$</td>
<td>Between leads $V_2$ and $V_4$.</td>
</tr>
<tr>
<td>$V_4$</td>
<td>In the fifth intercostal space (between ribs 5 &amp; 6) in the mid-clavicular line (the imaginary line that extends down from the midpoint of the clavicle (collarbone)).</td>
</tr>
<tr>
<td>$V_5$</td>
<td>Horizontally even with $V_4$, but in the anterior axillary line. (The anterior axillary line is the imaginary line that runs down from the point midway between the middle of the clavicle and the lateral end of the clavicle; the lateral end of the collarbone is the end closer to the arm.)</td>
</tr>
<tr>
<td>$V_6$</td>
<td>Horizontally even with $V_4$ and $V_5$ in the midaxillary line. (The midaxillary line is the imaginary line that extends down from the middle of the patient's armpit.)</td>
</tr>
</tbody>
</table>
• Limb Leads – Leads I, II, and III

• Unipolar and bipolar leads
  – Leads I, II, and III are bipolar
  – All others on a 12-lead EKG are unipolar

• Augmented limb – Modification to Leads I, II, and III

• Precordial leads – V1 – V6
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR interval</td>
<td>The interval between an R wave and the next R wave is the inverse of the heart rate. Normal resting heart rate is between 50 and 100 bpm.</td>
</tr>
<tr>
<td>P wave</td>
<td>During normal atrial depolarization, the main electrical vector is directed from the SA node towards the AV node, and spreads from the right atrium to the left atrium. This turns into the P wave on the ECG.</td>
</tr>
<tr>
<td>PR interval</td>
<td>The PR interval is measured from the beginning of the P wave to the beginning of the QRS complex. The PR interval reflects the time the electrical impulse takes to travel from the sinus node through the AV node and entering the ventricles. The PR interval is therefore a good estimate of AV node function.</td>
</tr>
<tr>
<td>PR segment</td>
<td>The PR segment connects the P wave and the QRS complex. This coincides with the electrical conduction from the AV node to the bundle of His to the bundle branches and then to the Purkinje Fibers. This electrical activity does not produce a contraction directly and is merely traveling down towards the ventricles and this shows up flat on the ECG. The PR interval is more clinically relevant.</td>
</tr>
<tr>
<td><strong>QRS complex</strong></td>
<td>The QRS complex reflects the rapid depolarization of the right and left ventricles. They have a large muscle mass compared to the atria and so the QRS complex usually has a much larger amplitude than the P-wave.</td>
</tr>
<tr>
<td><strong>J-point</strong></td>
<td>The point at which the QRS complex finishes and the ST segment begins. Used to measure the degree of ST elevation or depression present.</td>
</tr>
<tr>
<td><strong>ST segment</strong></td>
<td>The ST segment connects the QRS complex and the T wave. The ST segment represents the period when the ventricles are depolarized. It is isoelectric.</td>
</tr>
<tr>
<td><strong>T wave</strong></td>
<td>The T wave represents the repolarization (or recovery) of the ventricles. The interval from the beginning of the QRS complex to the apex of the T wave is referred to as the <em>absolute refractory period</em>. The last half of the T wave is referred to as the <em>relative refractory period</em> (or vulnerable period).</td>
</tr>
<tr>
<td><strong>ST interval</strong></td>
<td>The ST interval is measured from the J point to the end of the T wave.</td>
</tr>
<tr>
<td><strong>QT interval</strong></td>
<td>The QT interval is measured from the beginning of the QRS complex to the end of the T wave. A prolonged QT interval is a risk factor for ventricular tachyarrhythmias and sudden death. It varies with heart rate and for clinical relevance requires a correction for this, giving the QTc.</td>
</tr>
<tr>
<td><strong>U wave</strong></td>
<td>The U wave is not always seen. It is typically low amplitude, and, by definition, follows the T wave.</td>
</tr>
<tr>
<td><strong>J wave</strong></td>
<td>The J wave, elevated J-Point or Osborn Wave appears as a late delta wave following the QRS or as a small secondary R wave. It is considered pathognomonic of hypothermia or hypocalcemia. [24]</td>
</tr>
<tr>
<td>Condition</td>
<td>Cause</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Shortened QT interval</td>
<td>Hypercalcemia, some drugs, certain genetic abnormalities.</td>
</tr>
<tr>
<td>Prolonged QT interval</td>
<td>Hypocalcemia, some drugs, certain genetic abnormalities.</td>
</tr>
<tr>
<td>Flattened or inverted T waves</td>
<td>Coronary ischemia, left ventricular hypertrophy, digoxin effect, some drugs.</td>
</tr>
<tr>
<td>Hyperacute T waves</td>
<td>Possibly the first manifestation of acute myocardial infarction.</td>
</tr>
<tr>
<td>Prominent U waves</td>
<td>Hypokalemia.</td>
</tr>
</tbody>
</table>
CPT Codes

- 93000 – 93010
- Global breakdown of codes
- No modifier 26 or TC necessary
THE RUC PROCESS

• The RUC, Specialty Society Relative Value Scale Update Committee, is an independent group that makes recommendations to CMS

• It is an expert panel comprised of 29 members

• Is supported by and Advisory Committee of 100 specialty societies and health care professional organizations

• CMS has adopted 95% of its work value recommendations
• In 2006 the Medicare Payment Advisory Commission (MedPAC) sited concerns over the RUCs ability to identify overvalued services, so a Five-Year Review Identification Workgroup was created (the Workgroup). In 2008 it was approved for the Workgroup to conduct reviews on an ongoing basis.

• The Workgroup and CMS have identified over 800 services to date
• The screens that have been used to date are as follows:
  – Site of Service Anomalies
  – High Volume Growth
  – CMS Fastest Growing Procedures
  – High IWPUT
  – Services Surveyed by One Specialty and Now Performed by a Different Specialty
  – Harvard Valued
  – Codes Inherently Performed Together
• Out of the more than 800 services identified by the Workgroup, over 600 codes have completed the review process.

  – Work and PE Maintained
  – Work Increased
  – Work Decreased
  – Direct Practice Expense Reviewed
  – Deleted from CPT
Validating RVUs

• Section 3134 of ACA requires CMS to establish formal process to validate RVUs under the physician fee schedule. This may include validation of the work elements (pre-post-and intra-service work).

• CMS is required to validate a sample of the RVUs identified via any of the 7 previously listed categories (high volume growth, site of service anomalies, etc.)
CPT codes 93224, 93227, 93230, 93233, and 93237 were identified by the Five-Year Review Identification Workgroup’s Harvard Valued – Utilization over 100,000 screen.

CMS in the 2009 Final Rule asked the RUC to assess the work valuation of CPT code 93230 and 93233 (used to report 24 hours of cardiac monitoring) because these services have the same work RVU (0.52) as codes 93628 and 93272, which are used to report 30 days of cardiac event monitoring.
• The specialty society submitted a coding proposal to address the ambiguity in the current family of external monitoring codes by adding introductory language, deleting codes, revising the current descriptors, and grouping the family of codes into the following three families under Cardiovascular Monitoring Services:

  – Holter monitoring codes for recording up to 48 hours (93224-93227)

  – Mobile cardiovascular telemetry codes (93228-93229)

  – Event monitoring codes (93268-93272)
• Cardiovascular monitoring services are diagnostic medical procedures using in-person and remote technology to assess cardiovascular rhythm (ECG) data. Holter monitors (93223-93227) include up to 48 hours of continuous recording. Mobile cardiac telemetry monitors (93228, 93229) have the capability of transmitting a tracing at any time, always have internal ECG analysis algorithms designed to detect major arrhythmias, and transmit to an attended surveillance center. Event monitors (93268-93272) record segments of ECGs with recording initiation triggered either by patient activation or by an internal automatic, pre-programmed detection algorithm (or both) and transmit the recorded electrocardiographic data when requested and do not require attended surveillance.
CPT Descriptors

• Attended Surveillance: is the immediate availability of a remote technician to respond to rhythm or device alert transmissions from a patient, either from an implanted or wearable monitoring or therapy device as they are generated and transmitted to the remote surveillance location or center.

• Electrocardiographic rhythm derived elements: elements derived from recordings of the electrical activation of the heart including, but not limited to heart rhythm, rate, ST analysis, heart rate variability, T-wave alternans.
• Mobile cardiovascular telemetry (MCT): continuously records the electrocardiographic rhythm from external electrodes placed on the patient’s body. Segments of the ECG data are automatically (without patient intervention) transmitted to a remote surveillance location by cellular or landline telephone signal. The segments of the rhythm, selected for transmission, are triggered automatically (MCT device algorithm) by rapid and slow heart rates or by the patient during a symptomatic episode. There is continuous real time data analysis by preprogrammed algorithms in the device and attended surveillance of the transmitted rhythm segments by a surveillance center technician to evaluate any arrhythmias and to determine signal quality.
The surveillance center technician reviews the data and notifies the physician depending on the prescribed criteria.

- ECG rhythm derived elements are distinct from physiologic data, even when the same device is capable of producing both. Implantable cardiovascular monitor (ICM) device services are always separately reported from implantable cardioverter-defibrillator (ICD) services.
• New guideline added under code grouping to direct coder to append modifier 52 for less than 12 hours of continuous recording.
Holter Monitor

A portable device for continuously monitoring various electrical activity of the central nervous system for an extended period of time.
It may be used to diagnose:

- Atrial fibrillation/flutter
- Multifocal atrial tachycardia
- Palpitations
- Paroxysmal supraventricular tachycardia
- Reasons for fainting
- Bradycardia
- Ventricular tachycardia
• **External Wearable electrocardiographic rhythm derived monitoring for 24 hours recording up to 48 hours by continuous original waveform rhythm recording and storage, with visual superimposition scanning; includes recording, scanning analysis with report, physician review and interpretation**
CPT Codes

- 93224-93227

- Use of modifier 52

- Global breakdown of codes

- No modifier 26 or TC necessary
THE BEST THING YOU CAN DO IS GIVE UP SMOKING, DRINKING AND FRIED FOOD.

WHAT'S THE SECOND BEST?
Thank you. I hope you enjoyed conference!

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