



PVDOMICS: ECG Training

Cardiovascular Physiology Core
Cleveland Clinic, Cleveland OH
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NHLBI Pulmonary Vascular Disease Phenomics Program

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Electrocardiogram (ECG)

A routinely used, non-invasive procedure to monitor and assess the electrical activity in the heart.

Recognized as the gold standard for detecting heart arrhythmias and conduction delays.

All study participants will receive a 12-lead ECG. **The ECG must be done for the PVDOMICS study.** Results from an ECG prior to the study, even if recent, cannot be used.

40.3 Participant Contraindications and Safety

- ECG is a non-invasive procedure with little to no risk.
- If there is any question as to the suitability of the participant to receive an ECG, the site PI should be contacted.
- Persons performing the ECG for the PVDOMICS study should be:
 - Trained in the appropriate placement of the electrode leads
 - Competent at using the necessary equipment
 - Familiar with the PVDOMICS MOP
 - Certified in basic cardiac life support
 - Able to recognize abnormal rhythms and ST segment changes indicative of acute myocardial infarction (MI) on an ECG.



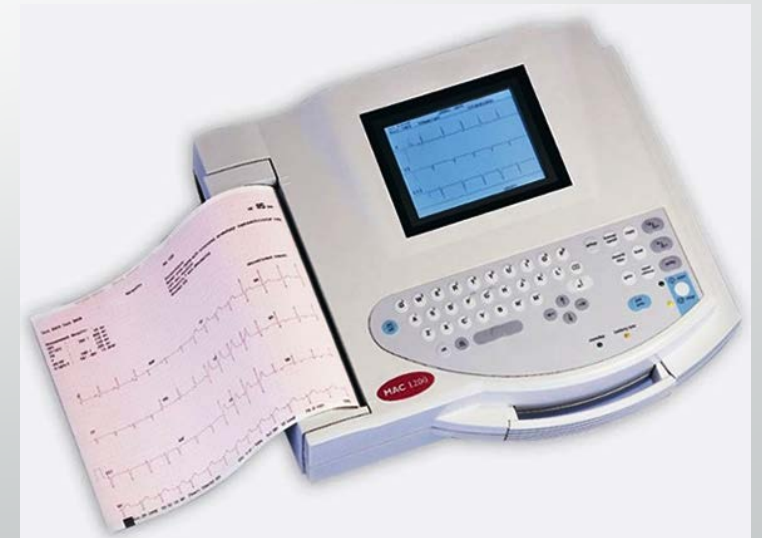
40.4 Equipment and Supplies

1. ECG system

- Should meet the specifications set by the American Heart Association (AHA), including a continuous display of a minimum of three leads
- Must have the capacity to print a copy of a 12-lead ECG
- System settings are on the next slide

2. Resuscitation cart with:

- Airway management equipment
- Defibrillator
- Emergency medications



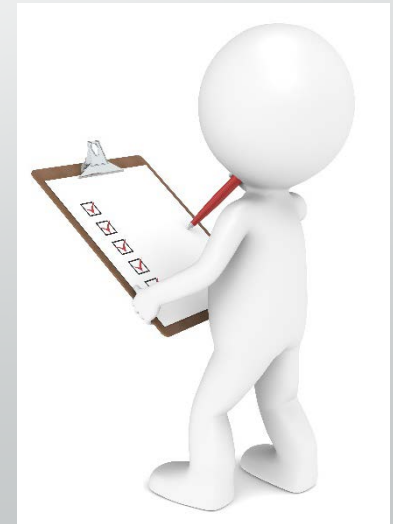


40.4 Equipment and Supplies: Cart System Setting

	Setting
Report Sequence	Standard
Rhythm Leads	I
Gain	10
Report Format	4x2.5R1
Number of copies	1
Delete ECG after transmission?	NO
Autosave ECG?	YES
Interpretation	YES
Print Interpretation	YES

40.5 Equipment Quality Control

- The ECG machine should be regularly checked for quality control and maintained as per the manufacturer's recommendations.
- Follow your normal site protocols



40.6 Subject Preparation: Pre-Test Instructions

- Identify participant using two separate identifiers
- Briefly explain the procedure & answer the participant's questions before the test
- Explain that the test requires access to the chest wall as this may be uncomfortable for some participants

40.6 Subject Preparation: Pre-Test Instructions

- Have the participant lie flat on their back for the duration of the procedure.
 - If they can't lie flat (orthopnea or other physical limitation), have them lie as flat as possible while still maintaining participant comfort.
- Use a drape across the chest, both for modesty and to prevent the participant from becoming chilled during the test.

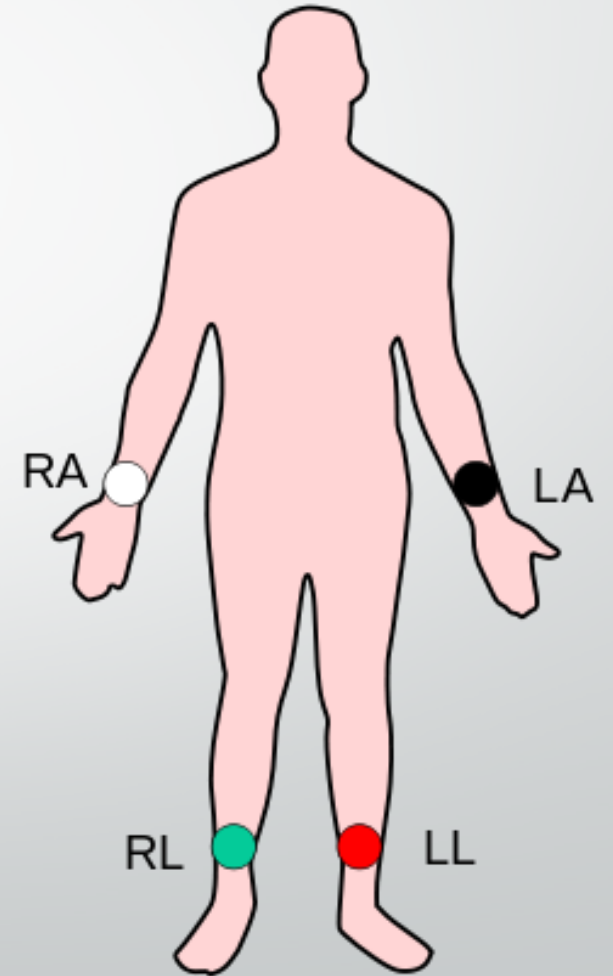


40.7 ECG electrode placement

- The standard 10-electrode configuration will be used for electrode placement when obtaining a 12-lead ECG.
 - 4 limb (2 arm and 2 leg) electrodes and 6 precordial (chest) electrodes
- For female participants, always place electrodes under the breast tissue rather than on the breast.
 - This consideration supersedes other placement criteria.
 - Take care to maintain participant comfort and avoiding “cupping” the breast tissue during electrode placement.

40.7 ECG electrode placement: Limb Leads

- The right arm (RA) and left arm (LA) electrodes should be placed on the ventral side of the arm, 2 to 3 inches above the wrist.
- The right leg (RL) and left leg (LL) electrodes should be placed on the anterior side of the leg, 2 to 3 inches above the ankle.

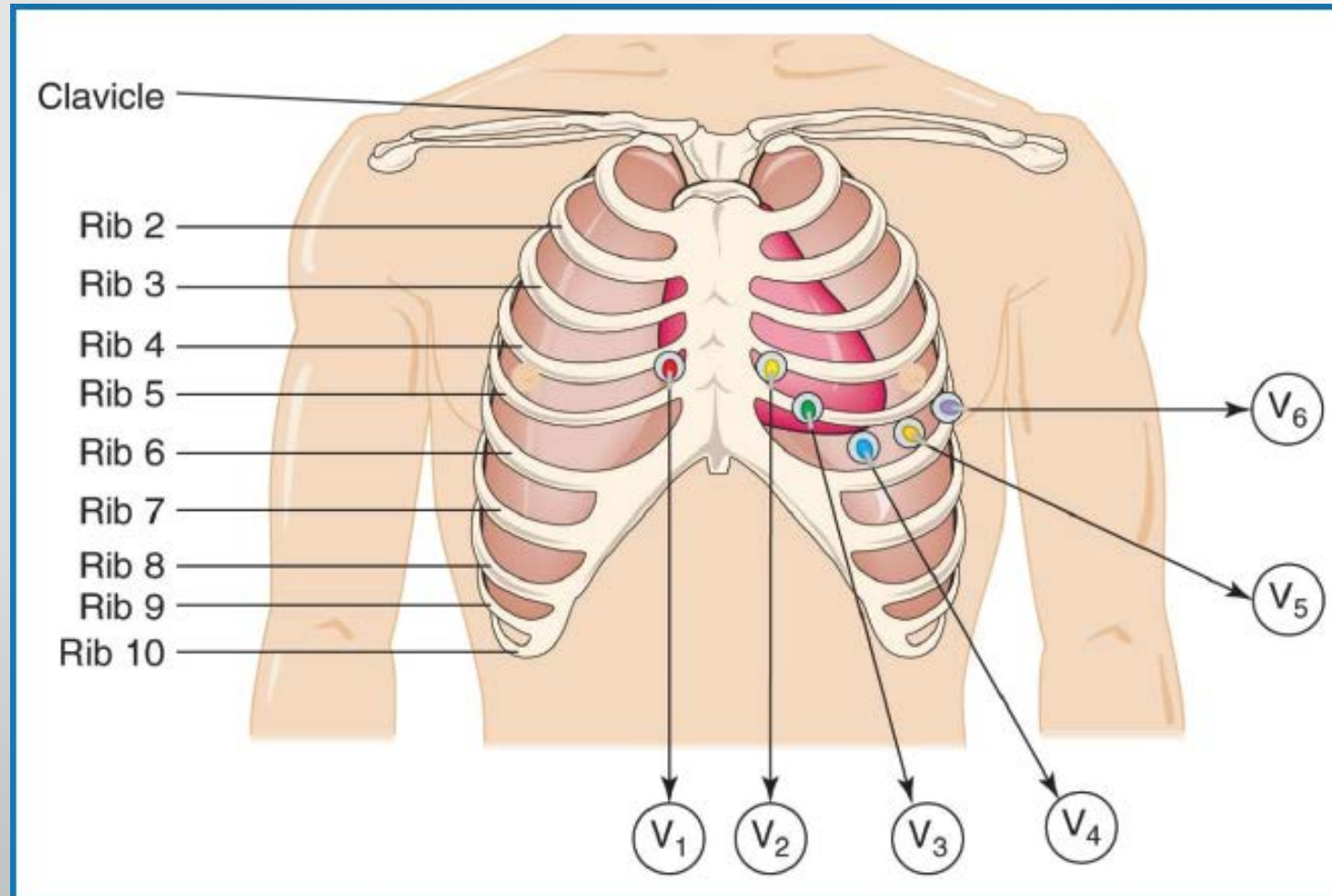


40.7 ECG electrode placement: Precordial Leads

- The precordial leads (V₁-V₆) are placed as follows:
 - V₁:** 4th intercostal space at the right sternal border
 - V₂:** 4th intercostal space at the left sternal border
 - V₃:** midway between V₂ and V₄
 - V₄:** 5th intercostal space at the midclavicular line
 - V₅:** 5th intercostal space, midway between V₄ and V₆
 - V₆:** 5th intercostal space at the midaxillary line

40.7 ECG electrode placement: Precordial Leads

Figure 40.7.1: Precordial Lead Placement for 12-lead ECG



12-Lead ECG for Acute and Critical Care Providers
2006, Pearson Education, Inc. Upper Saddle River, NJ

40.7 ECG electrode placement: Skin Preparation

- Essential to reduce surface resistance and ensure a good ECG signal
- At the discretion of the person performing the ECG, you can:
 - Use alcohol wipes to remove surface oils
 - Shave hair (if applicable)
 - Abrade skin with fine emery cloth, 240 grit sandpaper or other appropriate mechanical skin preparation device

40.8 Procedure

- Enter participant data into the ECG machine as per the table on page 5 of the MOP (reproduced below)
- If your machine does not have one of the fields listed below, don't enter that information.
- If your machine has a field that is not listed below, leave it blank.

Field Listed on ECG Machine	Information Entered by the ECG Technician
New Patient?	YES
Last Name	PVDOMICS
First Name	Enter 2 digit alphacode assigned to this participant. (Obtain this ID from local site study coordinator.)
Participant ID	Enter 6 digit Identification Number assigned to this participant. (Obtain this ID from local site study coordinator.)
Secondary ID	Enter 2 digit alphacode assigned to this participant. (Obtain this ID from local site study coordinator.)

40.8 Procedure

Field Listed on ECG Machine	Information Entered by the ECG Technician
Pacemaker	Select YES or NO as appropriate
Gender	Select MALE or FEMALE as appropriate
Height	Enter Height in centimeters, rounded to the nearest whole number. Note: if height measurement is recorded on Form 120 Study Visit Vital Signs (taken on day one), record that height rounded to the nearest whole number.
Weight	Enter Weight in kilograms, rounded to the nearest whole number. Note: if weight measurement is recorded on Form 120 Study Visit Vital Signs (taken on day one), record that weight rounded to the nearest whole number.
Race	Select the appropriate predefined race category (as self-reported by the participant).
Age	Enter participant's age as a whole number.

40.8 Procedure

Field Listed on ECG Machine	Information Entered by the ECG Technician
Referring Physician	Enter the local site PVDOMICS Study PI.
Reason for Test	RESEARCH
Technician	Select or enter the technician's PVDOMICS username. (PVDOMICS username is first 6 digits of last name followed by first initial.)
Location	Leave blank if system allows, or leave the default setting in place.

- Be sure that the technician's name selected matches the technician actually performing the test and the technician name listed on Form 245!



40.8 Procedure

- Participants should breathe normally and NOT move their extremities.
- The machine should automatically print a copy of the ECG and store the data if another copy needs to be printed later.
- Record any circumstances that may explain abnormal results on Q5-7 on Form 245 (Center Electrocardiogram Data Transmittal Form)
 - Extreme obesity will be judged on a case-by-case basis by the local site PI or the technician performing the procedure and should be noted if the participant's weight or excess body tissue may have interfered with the results of the test.



40.9 ECG Transmission to the CPC

- Scan/convert each ECG into Portable Document Format (PDF)
- Transmit PDF of ECG report (one per participant) to the Cardiovascular Physiology Core (CPC) through the secure portal
- Reports must be de-identified!!!
- The only unique identifiers on the ECGs submitted to the CPC will be the PVDOMICS ID and alphacode.



40.9 ECG Transmission to the CPC

1. De-identify the ECG printout:

- i. Verify that the ECG has the participant's 6 digit ID #, participant's alphacode, and the date of ECG test indicated on it somewhere
- ii. If one of the 3 elements mentioned above is missing, add it to the printout (hand write, add with Adobe, use a sticker, etc.)
- iii. Verify that no identifying information exists on the ECG printout
- iv. Cross off/obscure any identifying information that does exist on the printout (e.g. name, date of birth, SSN, MRN, initials, etc.)

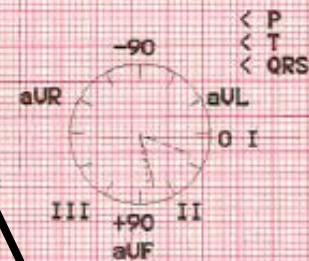
GEMS IT MAC1200 XY PVDOMICS 0000990002, ERIC CLEVELAND
Male, Caucasian, 19 yr, 95.0 kg

PVDOMICS 6-digit ID#

HR 82 bpm

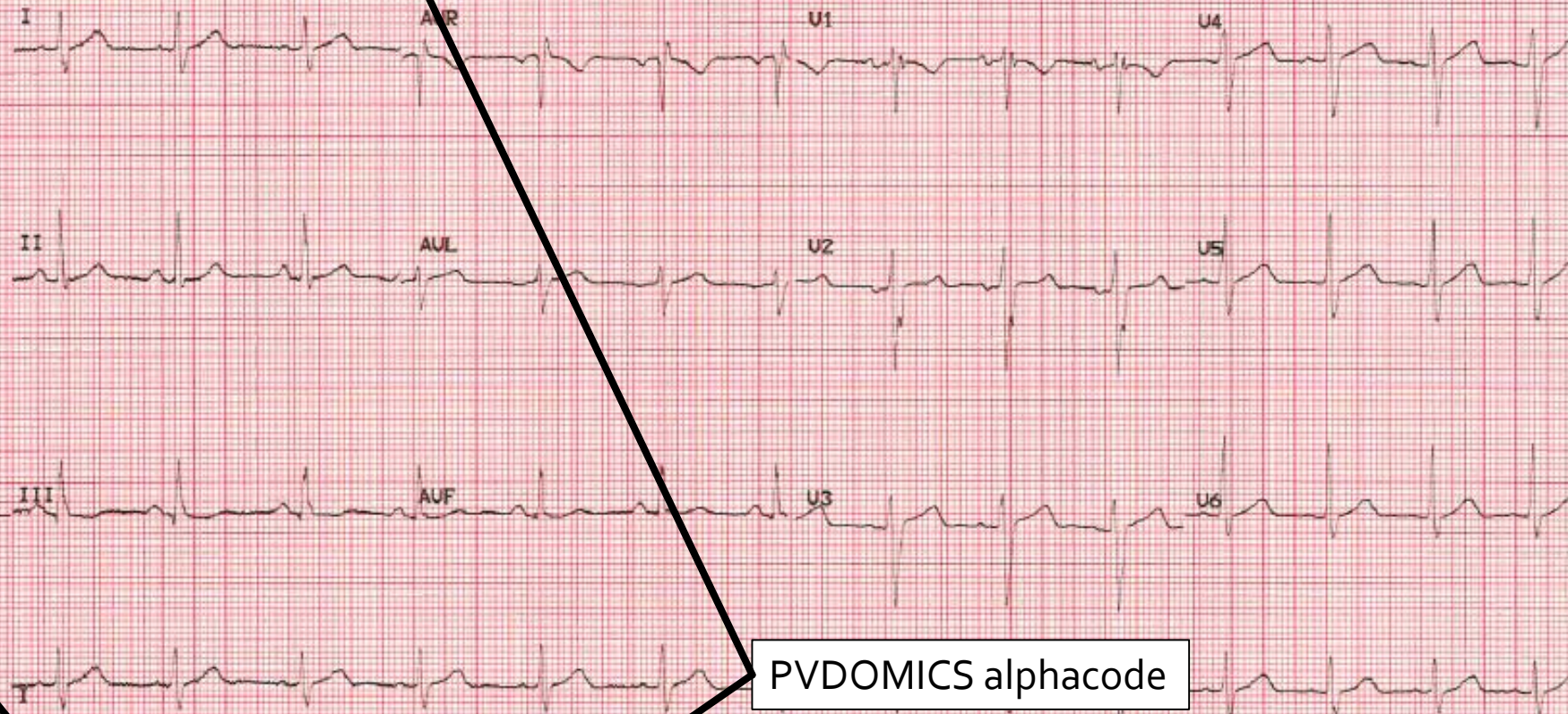
Measurements Results:
QRS 114 ms
QT/QTcB 380 / 443 ms
PR 140 ms
P 102 ms
RR/PP 734 / 730 ms
P/QRS/T 80/ 74/ 23 degrees

Refer. Physician : PVDOMICS PI
Technician : KIRSOPJ



Interpretation:
Sinus rhythm with sinus arrhythmia
Normal ECG

Unconfirmed report.



Date of Test

PVDOMICS alphacode

Card# 992
Aug. 26, 2016
PH 2009032-002

Site# 108
11:58:21

Secondary ID XY

ADS

60Hz

0.08

- 150Hz

4x2.5R1

12 Lead

PRINTED IN U.S.A.

U5.21

M121 (2)

12SLBv231

40.9 ECG Transmission to the CPC

2. Scan the de-identified ECG printout into a secure computer and save it as a PDF file.
3. Name the PDF file according to the following convention:

*Make sure you use
"ECG" not "EKG"*

ECG_#####_ac_mmddyyyy.pdf

↑ ↑ ↑ ↑

Type of Test PVDOMICS ID# Alphacode Date of Test File Type



40.9 ECG Transmission to the CPC

4. Submit ECG to DCC.

- Use the secure WinSCP portal to transmit all ECG printouts

5. Document the date you uploaded the ECG on Form 245 (Q8)

(See next page)



PVDOMICS STUDY
Center Electrocardiogram (ECG)
Data Transmittal Form #245

Instructions: The ECG must be done specifically for the PVDOMICS Study. Form 245 is completed by the local technician or study coordinator and entered into the database once for each participant who consents to the PVDOMICS Study. Data will be reviewed by the Cardiovascular Physiology Core (CPC) at the DCC.

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1. Identification Number

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2. Alphacode

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3. Date of most recent ECG (mm/dd/yyyy)

4. Was a 12-lead ECG performed? (0=No, complete 4a; 1=Yes, skip to Q5)

a. Primary reason ECG was not done

1=Participant refused

2=Participant has other medical condition that makes completing ECG difficult

3=Equipment malfunction or lack of supplies

Skip to Q200

5. ECG results status? (0=Normal (skip to Q7), 1=Abnormal)

6. Are any circumstances in Q6a-c present that may explain an abnormal result? (0=No (skip to Q7), 1=Yes)

a. Extraneous movement/tremors? (0=No, 1=Yes)

b. Extreme obesity? (0=No, 1=Yes)

c. Medications causing bradycardia? (0=No, 1=Yes)

(Medications may include but are not limited to: beta-blockers [propranolol, atenolol, metoprolol], verapamil, diltiazem, digoxin (toxicity), opiates [opium, morphine, and codeine])

7. Is the ECG technician name known (0=No, 1=Yes)

a. If yes, Username of ECG Technician who performed test

(Note: Username of ECG Tech is the first 6 letters of last name and first initial of first name)

8. Date PDF of rhythm strip transmitted to CPC? (mm/dd/yyyy) / /

200. Date form completed (mm/dd/yyyy) / /

201. Username of person completing/reviewing completeness of this form

Clinical Center Use Only

Date Form Entered (mm/dd/yyyy) ____/____/____

Username of person entering this form _____



40.9 ECG Transmission to the CPC

6. Enter Form 245 into the PVDOMICS Study database.
 - CPC results cannot be entered into the database until Form 245 has been entered!
7. File the original paper copies of participant's ECG and completed Form 245 in their study record.

For Questions Please Contact

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