



**Manual 5**

**Electrocardiography Assessment**

**January 14, 2008 - Version 1.0**

Study website - <http://www.csc.unc.edu/hchs/>

# Electrocardiography Assessment

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## 1. INTRODUCTION

The electrocardiogram (ECG) will be recorded during the first 3 years of the recruitment phase only, at this point in planning. Nevertheless, the Central ECG Reading Center (EPICARE) will continue to provide analytic service to the study for future application of newly predictive ECG parameters as they arise (and have often arisen in other studies managed by EPICARE). Also, in the event of any future desire to repeat the ECG in the study participants, standardized serial change methodological programming is available for establishing ECG events and significant change in key measurements such as continuous measurement of left ventricular hypertrophy (LVH), spatial T-wave axis, etc.

## 2. FIELD CENTER PROCEDURES

The field center procedures include ECG acquisition and transmission to the ECG reading center (EPICARE) and local ECG reading by the clinic physician. The ECG transmission will be detailed under directory management procedures (section 4)

### 2.1 ECG Acquisition

#### 2.1.1 Electrocardiograph

The electrocardiograph, to be used for ECG acquisition and transmission for the HCHS/SOL study, is the GEMSIT MAC 1200 portable electrocardiograph. These machines will be formatted by EPICARE prior to their shipment to the clinics at the beginning of the study. [NOTE: Contact EPICARE before making any changes to the internal setup of your MAC1200]. It is intended that the MAC1200 ECG be used for resting real-time ECG recording not for use as a vital signs physiological monitor. Although designed as a portable device, it should be powered from a wall power outlet unless in transit. The unit should be used exclusively for the HCHS/SOL study and not shared between studies; otherwise ID labeling error will occur.

#### 2.1.2 Equipment and Supplies

Equipment and supplies needed for recording and transmitting ECGs are summarized in Table 1.

Table 1

Equipment
GEMSIT MAC1200 Electrocardiograph with its 10 lead acquisition module and attached modem
HEARTSQUARE
Telephone jack cable
Scissors
Felt tip non-toxic washable markers
EPICARE contact list (Appendix 1)
Reference guides for "Patient Data Entry" (Appendix 2)
Reference guide for "Transmission of ECG" (Appendix 3)
ECG directory Log (Appendix 5)
GEMSIT MAC1200 operation manual
Supplies (always order in advance)
MAC1200 ECG paper
GEMSIT disposable silver chloride electrodes
Alcohol swabs and gauze pads
Cotton surgical tape
Examining table disposable paper

#### 2.1.3 Preparation for ECG Recording

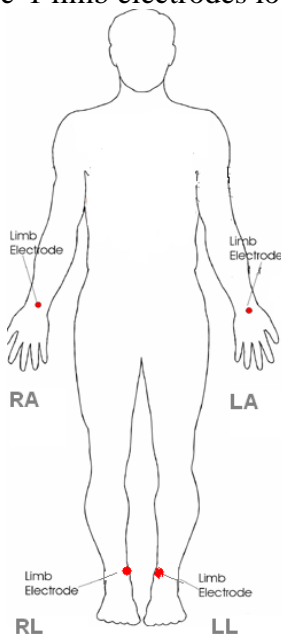
All ECGs will be conducted on participants while FASTING at least 8 hours (overnight fasting). Prior to electrode placement, there are some steps and precautions to be followed. For example, participants should be relaxed and comfortable in a supine or semi-recumbent position. Examination table/bed should be adequate to comfortably accommodate the participant. A drape for exposed upper torso will be needed. An additional covering may be needed to prevent the participant from becoming chilled. Make sure ankles and wrists are accessible for electrode application. ECG electrode placement should always be performed with the technician standing to the participant's left side. Supplies needed for ECG acquisition should be assembled and arranged efficiently.

## 2.2 Location of the ECG Electrodes

**2.2.1 Location of Limb Leads (Figure 1).** RIGHT LEG (RL) AND LEFT LEG (LL): The right leg electrode serves as a ground connection, and problems there will influence all other leads. On the inner side of the right leg (above the ankle), rub briskly an area about 1-2 inches in diameter with an alcohol swab and a gauze pad using firm, circular motions. Mark the position to place the electrode later. Repeat this procedure for the left leg (LL). In amputees, the limb lead electrode may be placed higher up on the limb or even on the torso.

RIGHT ARM (RA) AND LEFT ARM (LA): Rub the inner side of right arm (RA) above the wrist similar to what you did with the RL and LL. Mark the position to place the electrode later. Repeat the process for the Left Arm (LA). In amputees, the arm electrode may be placed on the shoulder, below the clavicle.

Figure 1 limb electrodes locations



### 2.2.2 Location of Chest Leads

V1 AND V2: First locate the sternal angle which is about the width of the 3 middle fingers below the sternal notch (Figures 2). Feel the sternal angle between the index and middle fingers of your right hand, keeping the fingers wide apart and moving your fingers firmly up and down. While feeling the sternal angle, move your fingers to the left side of the sternum and feel the 2<sup>nd</sup> rib between your fingers, where it joins the sternal angle. Move your middle finger to the interspace below the second rib and with your index finger locate the interspace below the next rib (3<sup>rd</sup>) and again below the next (4<sup>th</sup>) rib. This is the 4<sup>th</sup> intercostal space. Mark an X at this level at the midsternal line. X is the reference level for V1 and V2. Mark their locations at the right and left sternal borders

Figures.2 and 3 Location of Chest Leads

Figure 2

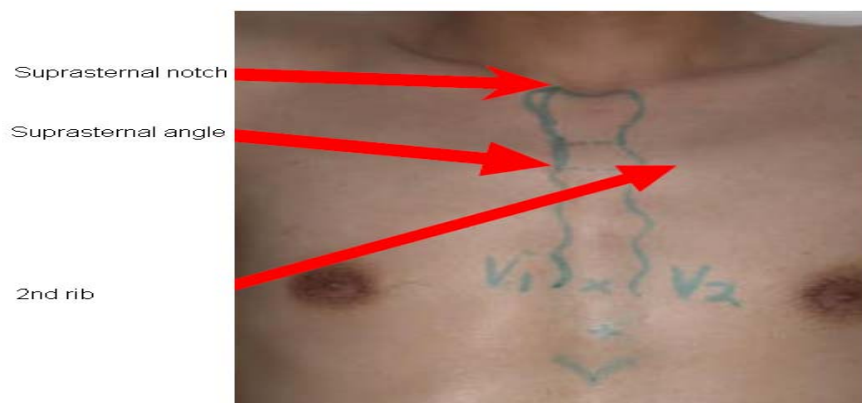
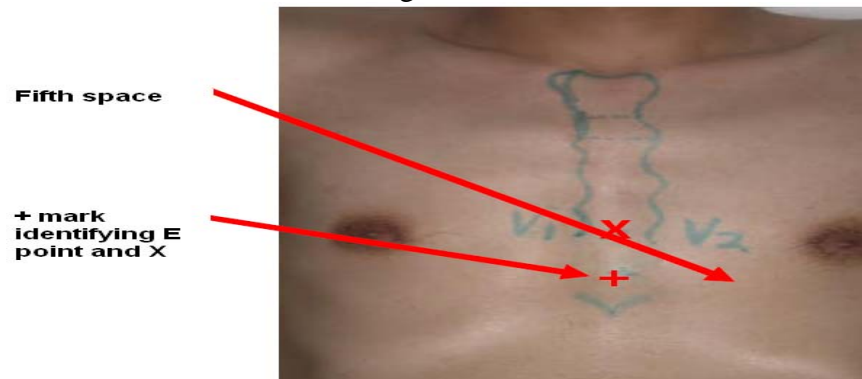


Figure 5.3



REFERENCE POINT E FOR LOCATING V4, V5 AND V6: From the location of V2, palpate with the middle finger of your right hand the intercostal space and follow it laterally outside the sternal border and at a slight angle down. Feel the 5<sup>th</sup> rib between your index and middle fingers and feel the 5<sup>th</sup> intercostal space with your index finger.

At the level of the 5<sup>th</sup> intercostal space, mark a (+) at the midsternal line below your X mark for V1-V2 level. This (+) is the reference level E for V4, V5 and V6 (Figure 3). In overweight persons and in women with tender breast tissue, it is often difficult to locate the 5<sup>th</sup> intercostal

space. In such a case, mark the + for E 1 ¼ in (3 cm) below your reference level X for V1 and V2 (in smaller adults, 1 inch. (2.5 cm) is enough)

**APPROXIMATE LOCATION OF V6:** Move the left elbow laterally without moving it anteriorly or posteriorly, while observing the anterior and posterior axillary folds. The left elbow must be supported properly. Follow a line exactly in the vertical midplane of the thorax (mid-axillary line) down where the line meets the horizontal plane of Point E. Using your marker, make a vertical one inch long line there as an approximate location of V6.

**EXACT LOCATION OF V6:** Exact location of V6 is determined by using the HEARTSQUARE (see instruction on the accompanying DVD). Place the HEARTSQUARE with the wider arm (E arm) horizontally at level E (Figure.4). [NOTE THAT THERE S AN ACCOMPANYING DVD DEMONSTRATING THE USE OF THE HEARTSSQUARE]

Slide the V6 arm of the HEARTSQUARE towards the midaxillary line until the arrow points to the mark at the midaxillary line. Mark the exact location of V6 at the level of the arrow on the V6 arm.

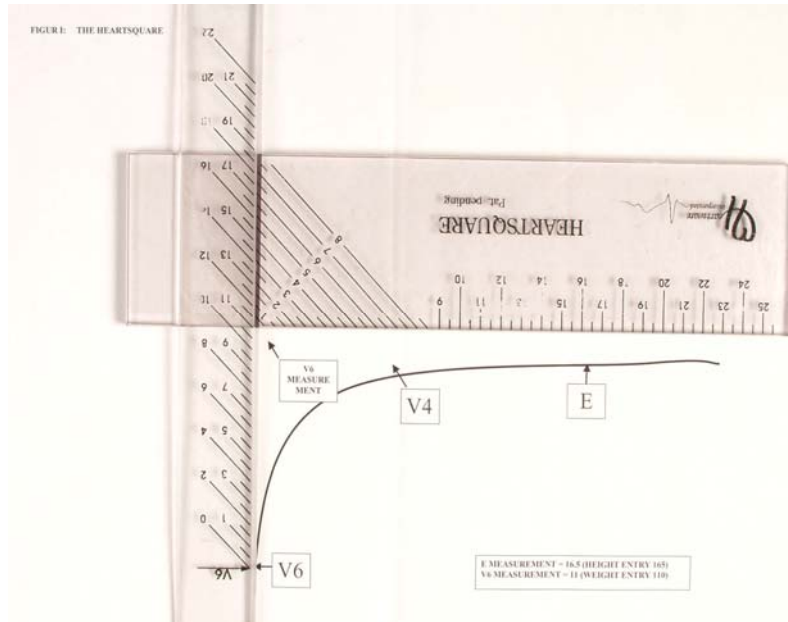
Figure 4  
**E point**



**Exact V6 location**

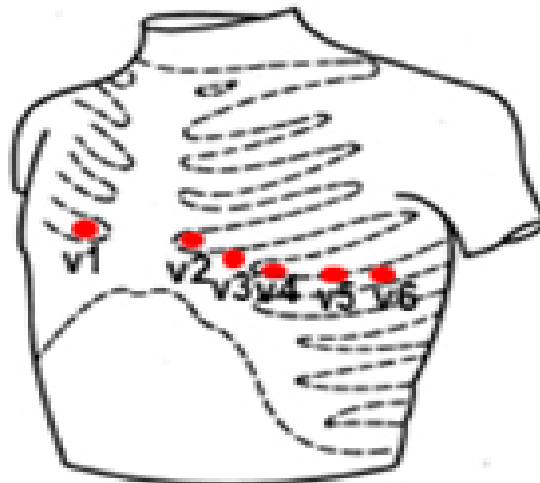
**EXACT LOCATION OF V4:** Keeping the HEARTSQUARE in the horizontal position with the arrow on the V6 arm pointing toward the V6 position, observe the reading at E point (Figure 5). Use this E reading on the centimeter scale on the V6 arm, and follow this same E reading along the 45 degree lines towards the torso to locate the exact position of V4. Once you have located V6 and V4, secure the V6 arm with your thumb to prevent it from sliding. Note the V6 reading which is the distance from the arrow on the V6 arm to where this arm intersects the E arm at right angles. You may then remove the HEARTSQUARE. Write down the E and V6 measurements for later entry to the patient information according to table 2. Enter the E measurement in the HEIGHT field of your MAC1200 patient set-up (by pressing the pat info key in the ECG machine) and the V6 measurement in the WEIGHT field (do not enter the HEIGHT and WEIGHT of the participant). E and V6 measurements should be entered as three digits. For example, figure 5 shows that the E and V6 measurements should be entered as 160 and 120 for the readings of 16.0 cm and 12.0 cm, respectively.

Figure 5 HEARTSQUARE



LOCATIONS OF V3 AND V5: Mark V3 exactly halfway between V2 and V4. Mark V5 exactly halfway between V4 and V6 (Figure 6)

Figure 6



### 2.3 Attaching the Electrodes

After you have located electrode positions, rubbed them with alcohol swabs and gauze pads, and marked their position with a water-soluble marker, you may apply the electrodes. Do not place electrodes directly over bone. Attach lead wires in same, correct order every time to establish a

routine and to eliminate lead swaps. Attaching a lead wire to a wrong location can result in abnormal ECG patterns that can not be corrected. Position the MULTI-LINK on the patient's abdomen. Grasp each lead at the MULTI-LINK attachment point. Follow lead wire to the electrode attachment end. Attach wire to electrode, making sure clip is not in contact with electrode adhesive. Make sure lead wires have some slack and are hanging loosely. Secure the lead wire to the skin by applying paper tape 1-inch below the clip, if the ECG shows baseline noise despite careful preparation.

## 2.4 ECG Recording

Once the Electrocardiograph is initiated, the machine will go into self-testing. The ECG machine is set up to simultaneously acquire 12 leads of ECG for a period of 10 seconds. However, before you start recording the ECG, participant data must be entered. Table (2) summarizes the data entry process. After participant data entry, by pressing the Start" key, the machine will print a copy of the ECG and will automatically store the data electronically for later transmission to EPICARE.

Table 2

CATEGORY LISTED ON MAC1200	ENTRY TO MACHINE BY THE ECG TECHNICIAN
NEW PATIENT	Yes
LAST NAME	Enter the 1 <sup>st</sup> letter of the participant's last name plus last 2 digits of birth year (e.g., H-60)
FIRST NAME	Enter the visit number (000 for baseline.) DO NOT ENTER FIRST NAME
PARTICIPANT ID	Enter the 8-digit number assigned by the HCHS/SOL Coordinating Center
SECONDARY ID	Enter same as participant ID
PACEMAKER	Select YES or NO
GENDER	Select male or female
HEIGHT	Enter E measurement of HeartSquare (e.g., if E=16.0, enter 160) DO NOT ENTER HEIGHT
WEIGHT	Enter V6 measurement of HeartSquare (e.g., if V6=12.0, enter 120) DO NOT ENTER WEIGHT
RACE	Choose "Other" and highlight defined race codes (defined on the MAC1200)
REFERRING PHYSICIAN	No action, the data will be pre-programmed.
TECHNICIAN	Choose "Other" and highlight technician's last name. Make sure that the technician's name matches the technician performing the ECG
LOCATION	Clinic site name has been pre-programmed. Press Enter



## 2.5 Local ECG Reading

ECG findings as reported to the Coordinating Center by the Central ECG Reading Center (EPICARE) will be provided to the study participants and their personal physicians, along with other results of clinical value, 5 to 6 weeks after the field center has transmitted a satisfactory ECG to the ECG Center. . A local clinic reading of the ECG at the time the of the field center examination is part of HCHS/SOL protocol for safety purposes, primarily to identify ECG abnormalities defined as “alerts” because of their potential severity.

Minor, clinically insignificant ECG findings are commonly found in samples drawn from the general population; most of these do not need immediate attention. "ALERT" ECGs on the other hand should be reviewed by the clinically trained HCHS/SOL personnel at the field center and evaluated for possible referral. Although specific directions for HCHS/SOL personnel to follow are provided for each alert condition, a physician can override these instructions according to individual circumstances. In reviewing the ECG tracings HCHS/SOL staff don't make diagnoses or convey information that may alarm the participant. A list of ECG abnormalities defined as alerts follows.

Figure 7. Atrial fibrillation.

Diagnosis key points: irregular QRS complexes (heart rate) and absence of the P wave

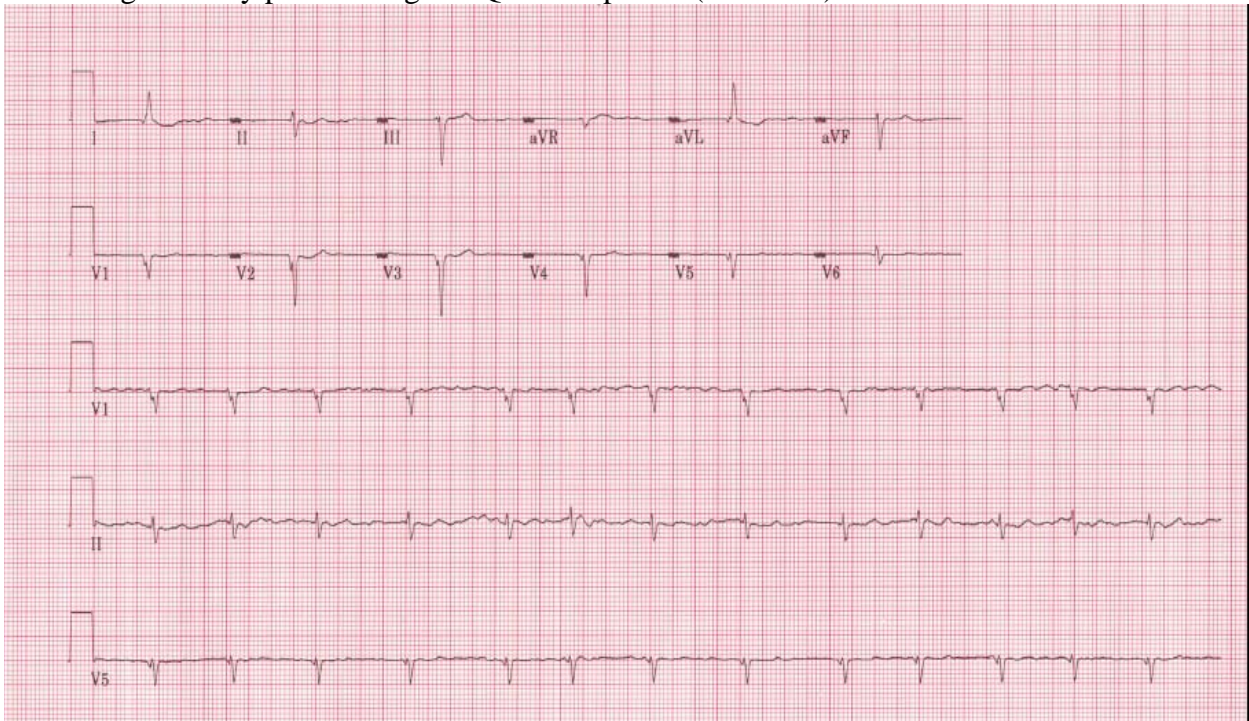


Figure 8. Atrial flutter.

Diagnosis key points: multiple P waves; saw-teeth pattern (as in V1), mostly regular but could be irregular with a certain pattern (regular irregularity)

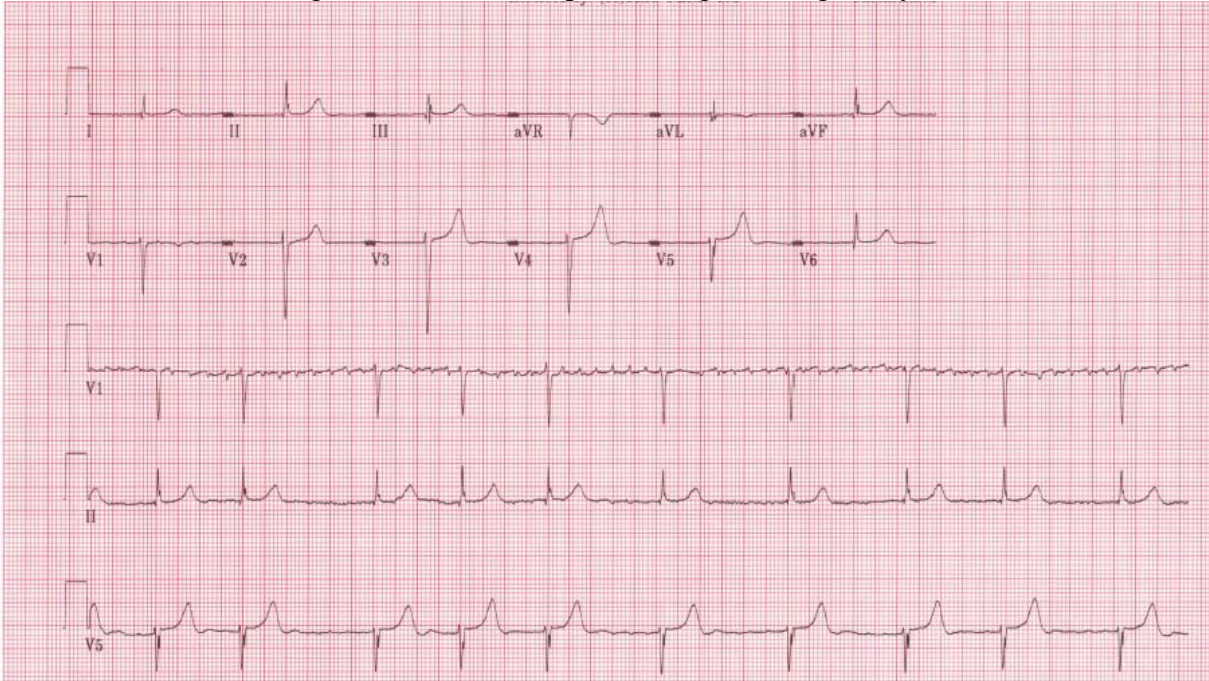


Figure 9 Ventricular tachycardia

Diagnosis key points: Wide complex tachycardia ( $HR \geq 110$ ) with QRS not preceded by P wave.  
The patient will be mostly restless

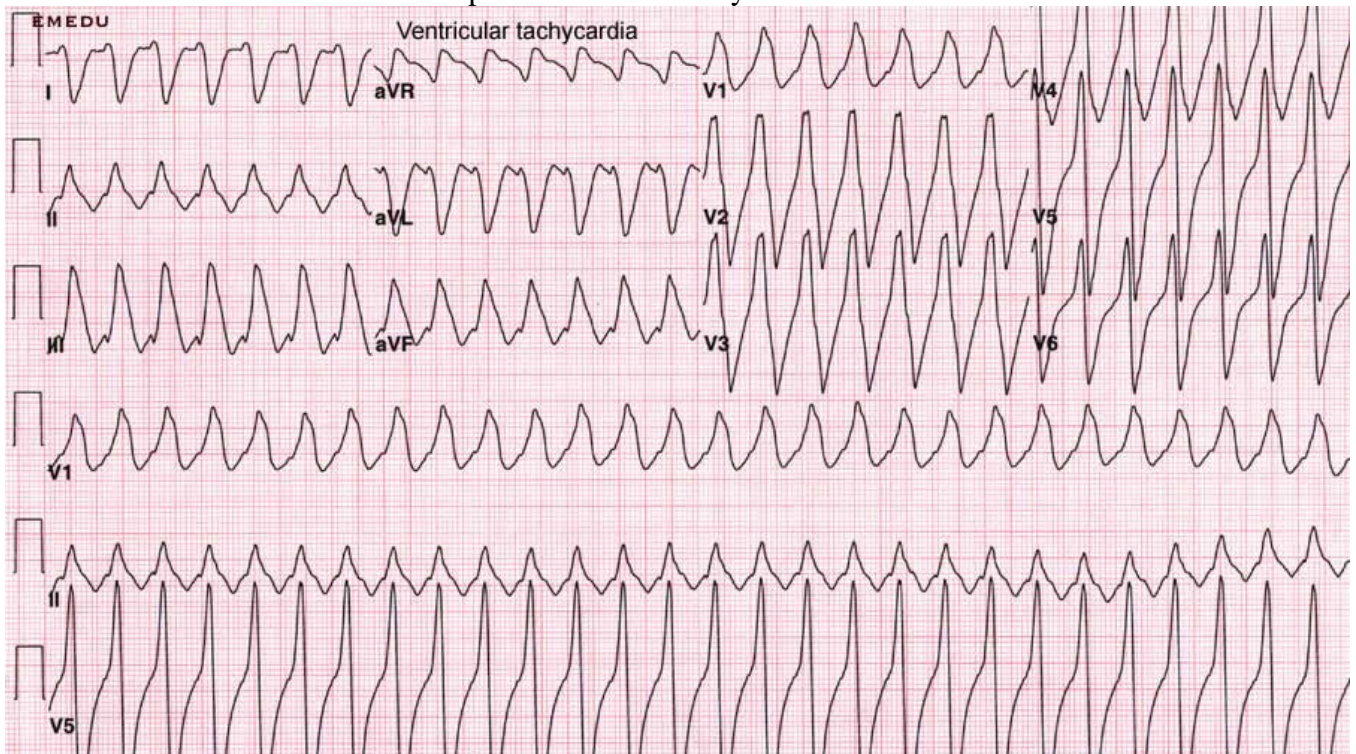


Figure 10. Acute inferior (upper panel) and acute anterior (lower panel) myocardial infarction  
 Diagnosis key points: Elevated ST segment in a group of adjacent leads with or without Q waves and with or without ST depression in other leads. Patients usually will have chest pain

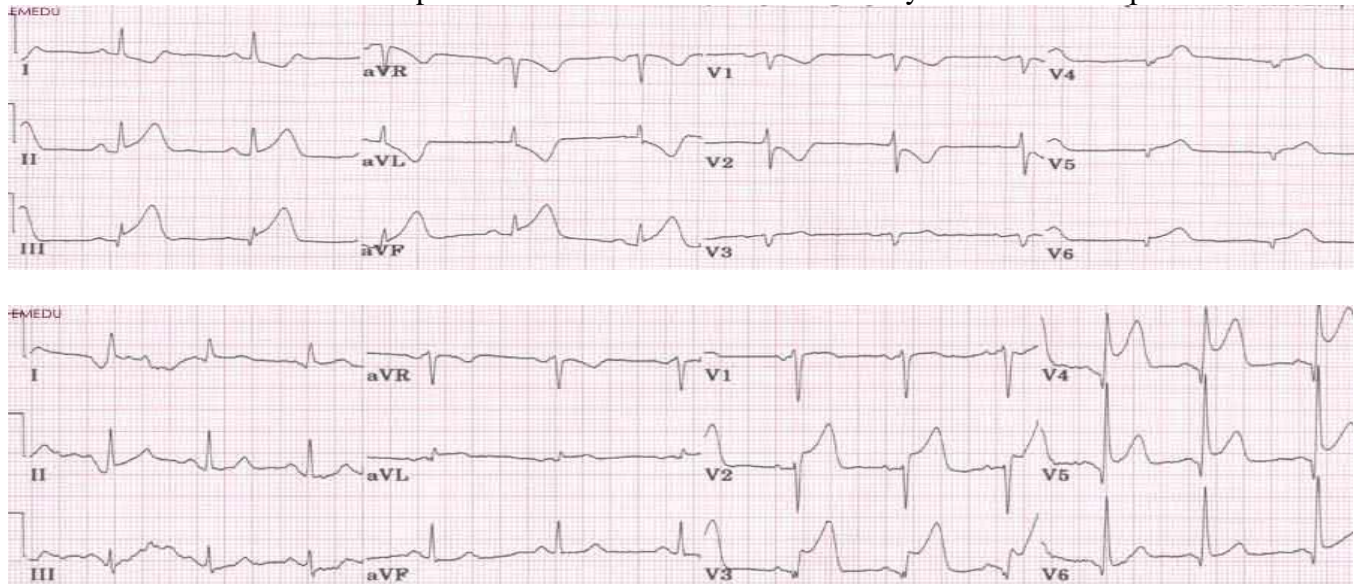


Figure 11. Wolf Parkinson White Syndrome  
 Diagnosis key points: Short PR interval (below 120 ms), slurred upstroke of the R wave (delta wave) with wide QRS complex (mostly above 110 ms)

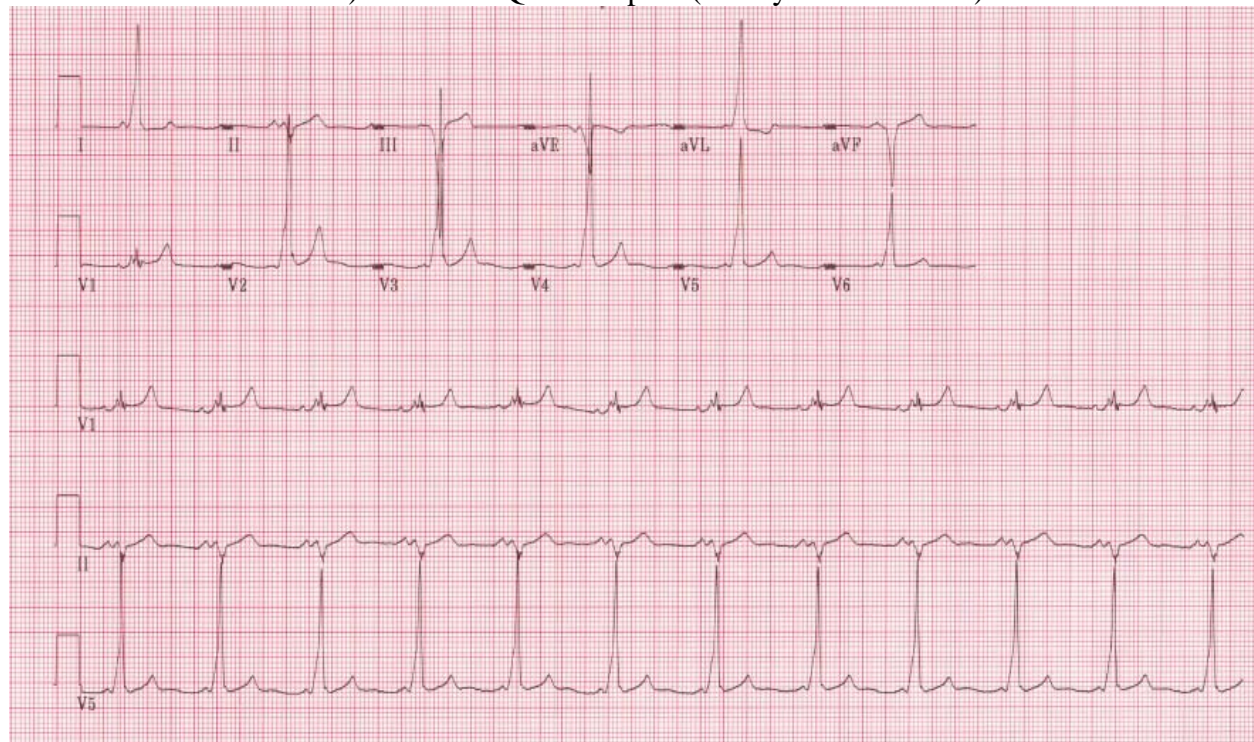


Figure 12 Third degree atrioventricular block.

Diagnosis key points: Slow heart rate (around 40 beats per minute) with no relation between the P wave and the QRS

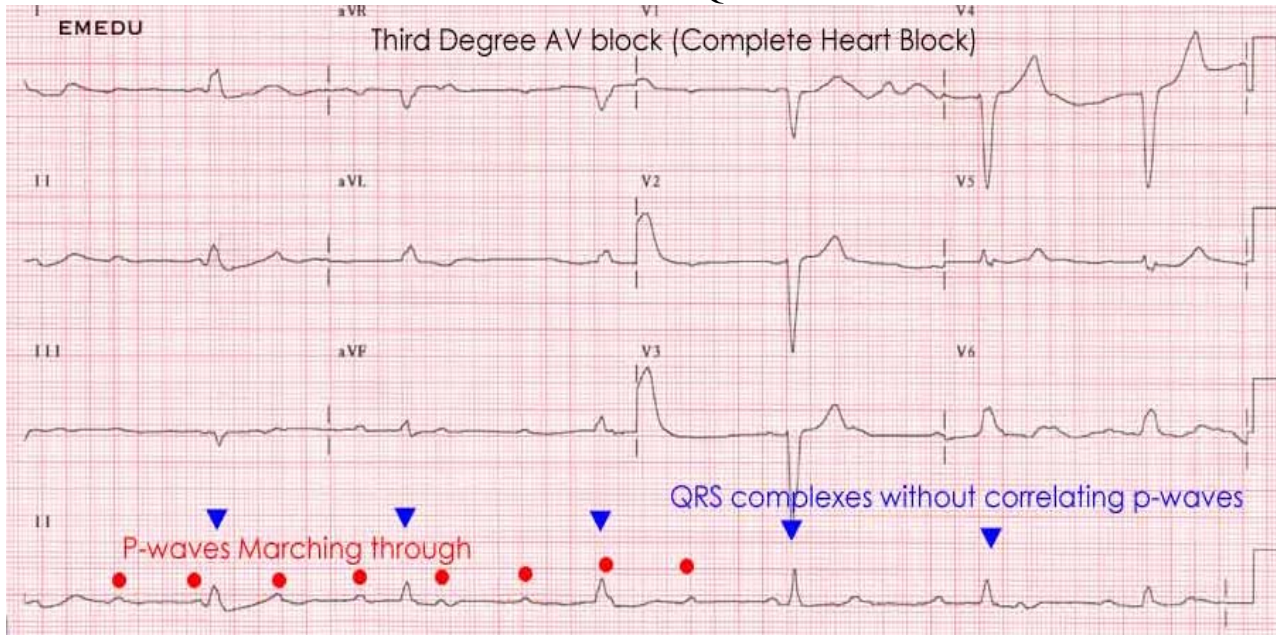


Figure 13. Complete left bundle branch block

Diagnosis key points: Wide QRS complexes (> 120 ms)

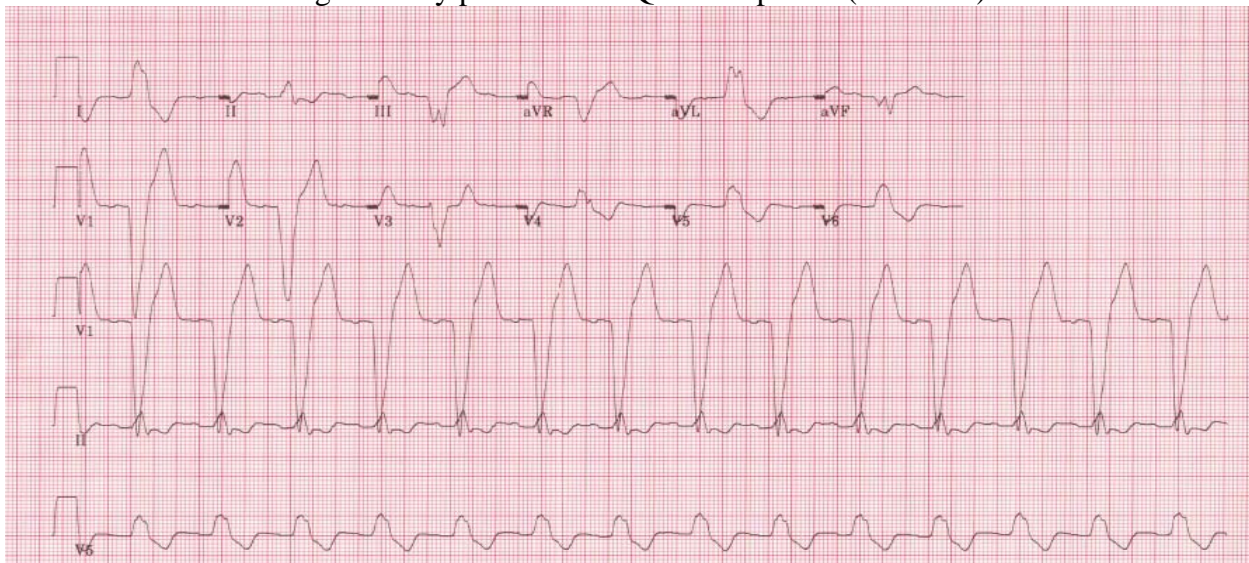
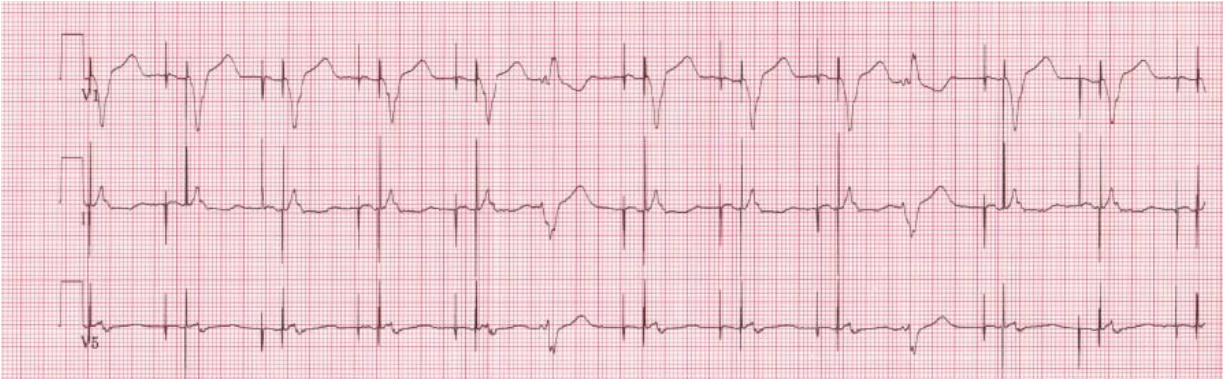


Figure 14. Cardiac pacemaker

Diagnosis key points: Presence of sharp signals (spikes) before either the P wave, QRS complex or both



## 2.6 Reading Center Technical Details

The ECG reading center (EPICARE) will program each clinic electrocardiograph prior shipment to the clinics. The ECG set-up enables correct transmission of the ECGs to EPICARE as well as ensuring standardized data entry for all clinics. Set-up of the machines is ONLY allowed to be done at EPICARE or with assistance of one of the EPICARE staff if it has to be done at the clinic. It may be necessary to re-program the machine after the start of the study if a malfunction occurs, or the battery has been allowed to become dead. The machine set-up and programming instruction are mention in appendix 4. PROGRAMMING WITHOUT ASSISTANCE FROM EPICARE PERSONNEL IS NOT ALLOWED

## 3. COMMUNICATIONS SETUP FOR TRANSMISSION

As previously mentioned, EPICARE will set up the machines in a way that enables the clinics to send the ECGs via a modem and a phone lines. Adding 9 (or other number) to get an outside line and/or adding an access code for long distance will be taken into consideration. [NOTE: Contact EPICARE any time with questions and/or comments]

### 3.1 Before Transmitting ECGs to EPICARE

Ensure that all previously transmitted ECGs are deleted only after confirmation of receipt by checking the EPICARE website. Check to ensure that all IDs are valid. You can correct any variable from your participant data information by doing the following: While holding the “Shift” key down, press the Store/Retrieve key, move the cursor to the ID in question, highlight “Change” and then proceed to make corrections as needed

### 3.2 Transmitting ECGs to EPICARE

Secure the modem cable into the 9-pin connector found on the right side of the MAC1200 and the 25-pin connector found on the rear of the modem. Plug one end of the phone cable into the connector marked “LINE” on the rear of the modem and the other end into any “analog” (fax) phone line. Start at the 12-lead screen. While holding the “Shift” key down, press the “Store/Retrieve” key. Press the down arrow 3 times and then hold the shift key and the down arrow together to get to the desired ECG to be transmitted. The screen will show black squares

on the right and left sides of the ECG selected for transmission. To skip an ECG press the down arrow without using the shift key. Repeat this procedure until all ECGs that are to be transmitted have been selected. Once selections are made, press the “Enter” key. This will return you to the top of the screen. Use the right arrow to highlight “Send” and press the “Enter” key. Another screen will appear which states “to start Transmission, press Enter”. Once transmission is complete, press the “Start/Stop” key, located on the far bottom right of the keyboard, to return to the 12-lead screen. Confirmation of receipt of transmitted ECGs could be made by logging into the EPICARE website using a user name and password specific to each clinic. More information on the path, username and password will be given to each clinic

#### 4. DIRECTORY MANAGEMENT

Keep your directory correct and current by doing the following:

**BEFORE TRANSMISSION:** Delete all unwanted ECGs like those with flat lines, poor quality or duplicates. Correct any errors in patient data entry like ID numbers, or HEARTSQUARE measurements

**AFTER TRANSMISSION:** After confirmation of receipt, it is recommended not to delete the ECGs for at least 24 hours to allow system backup at EPICARE. Keep a log of the ECG acquisition date of the ECG, name of the technician performed the ECG and the status of the ECG (sent, confirmed, deleted) (Appendix 5)

#### 5. QUALITY CONTROL ISSUES AND PROCEDURES

##### 5.1 Certification/Recertification Procedures

All ECG technicians must go through the certification process before they are allowed to acquire study ECGs. Each technician must acquire three (3) good quality grade ECGs. The 3 ECGs should be performed on 3 different volunteers or on one volunteer provided that there is at least 30 minutes between each ECG. Each ECG technician, who meets the certification requirement, will receive a certificate. Recertification process (required annually) is the same as the certification process. The participant data entry should be done according to the instructions in table 5.3 after pressing the “pat info key” on the MAC 1200 keyboard

Table 3. Entry into the MAC1200 for certification of technicians ONLY

Category	Entry
New patient	YES
Last name	Enter technician’s last name
First name	Enter technician’s first name
Date of birth	Enter volunteer’s birth date (MM/DD/YY)
Participant ID	Enter 999-9999-9 (Press “Shift” key to enter numbers)
Secondary ID	Enter 999-9999-9 (Press Shift key to enter numbers)
Pacemaker	YES or NO
Gender	M or F (Note: Do not choose)
Height	E Measurement of HeartSquare (e.g., if E=16.0, enter 160)
Weight	V6 Measurement of HeartSquare (e.g., if V6=12.0, enter 120)
Race	Choose “Other” and choose defined race codes
Referring physician	No action required. Pre-programmed data
Technician	Choose “Other” and select technician’s last name
Location	Unit location ID (same as clinic No.)

## 5.2 Quality Grades

The ECG reading center (EPICARE) evaluates and ranks the ECG quality through an automated system with visual confirmation of the results if needed. There are 5 grades from 1 to 5. The best grade is 1 and the worst is 5. Generally, grades 1 and 2 are difficult to separate visually and they are considered good. Grades 3 and 4 are given to ECGs that have correctable problems i.e. the ECG problems could be adjusted for on reading them. Grade 5 ECG are given for the ECGs that there have major problems which make it impossible to read them

## 5.3 Common ECG Problems

**EXCESSIVE BASELINE DRIFT (Figure 15):** This occurs if the participant is moving around or there is tension on the lead wires. Ask the participant to lie still for a few seconds. Drift in excess of 1 mm between baseline points (QRS onset) of any two successive complexes is a sign of significant drift.

**EXCESSIVE MUSCLE NOISE (Figure 16):** The Participant is either tense due to lack of body support or may be cold. Use a wide bed and blanket to cover the participant.

**BASELINE DRIFT DUE TO TANGLED WIRES (Figure 17):** Ensure that the wires are not pulling. Be sure to establish a good electrode connection. Lay a towel across the wires, if necessary. Adjusting the angle of the clip at the electrode often helps. You may need to tape down the chest leads; use only hypoallergenic medical tape to prevent allergic reactions. Use a U loop (not a cross loop) with the electrode wires, i.e., the wire should not cross but remain open like a U; never cross over wires

**LOOSE ELECTRODE CONNECTION (Figure 18):** Loose electrodes connection may cause wavy baseline in some ECG leads. Check each electrode to ensure that it is secure.

**SIXTY HZ NOISE (Figure 19):** Periodic 60 HZ noise is sometimes visible in the record. This may be caused by AC interference from a nearby machine. Make a visual check of this before recording the ECG. Unplug any unnecessary surrounding electric equipment *Note:* Jewelry does not cause 60 HZ noise.

**MISSING LEADS AND LEAD REVERSAL (Figures 20, 21, and 22):** To minimize the chances of having lead reversal and missing leads, always make sure that there are no flat lines in the ECG recording and/or mainly positive QRS in aVR lead. Also, always have a second look at the connections before recording

## 5.4 Other Issues

Each clinic has to keep list of phone numbers of the ECG reading center (EPICARE) contact persons, laminated sheet for the participant data entry format, GE operation manual for the MAC 1200 and GE contact numbers to order supplies

Figure 15 Excessive baseline drift due to sudden movement of the participant

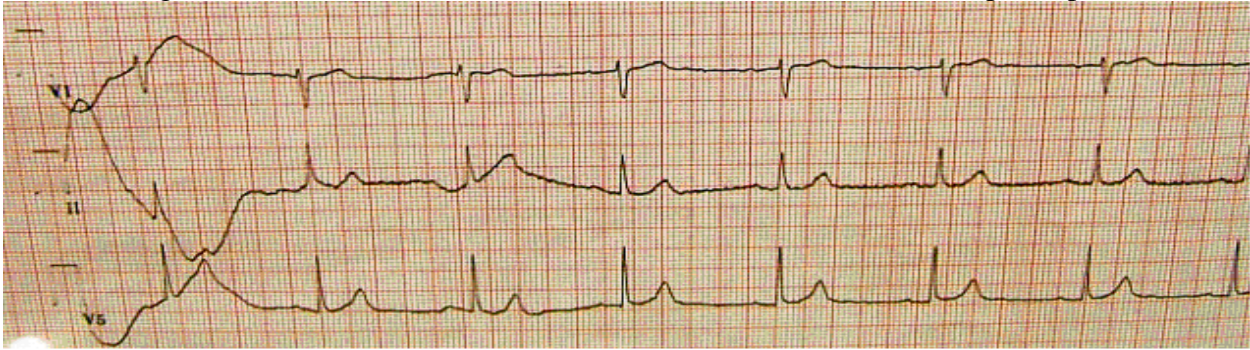


Figure 16 Excessive muscle noise

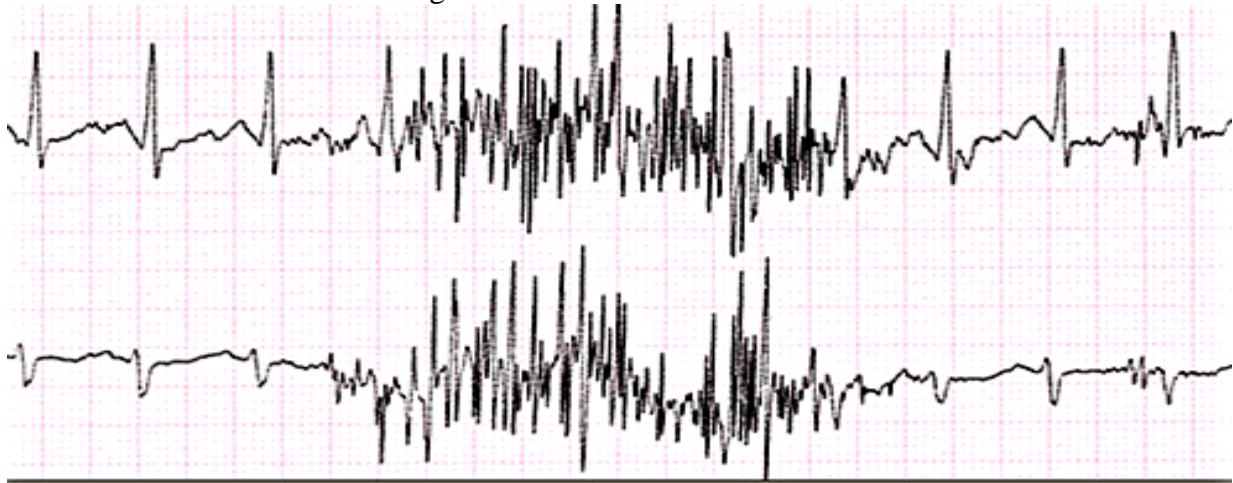


Figure 17 Baseline drift due to tangled wires

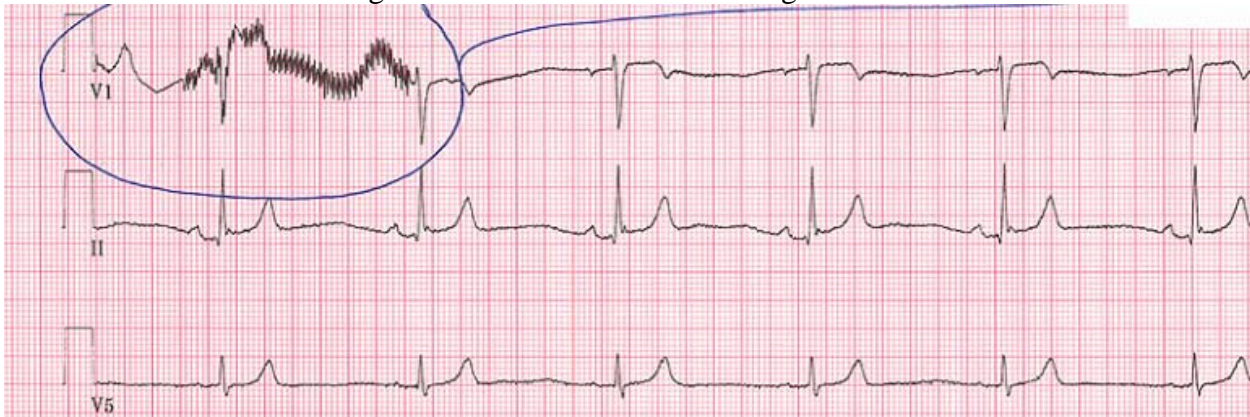




Figure 18 Wavy V1 baseline due to loose electrode

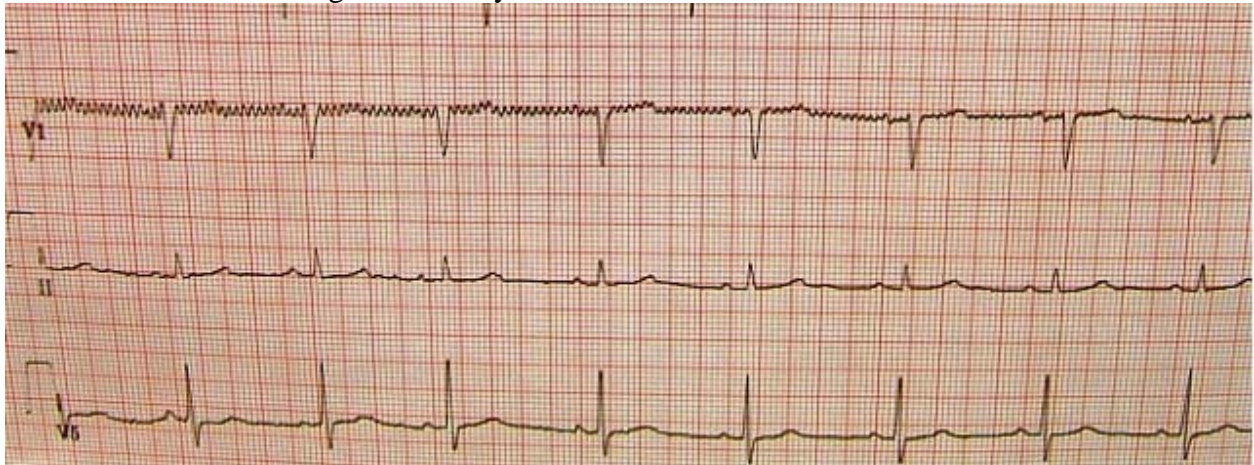


Figure 19 Sixty Hz electrical interference



Figure 20 Flat line due to missing V1 lead

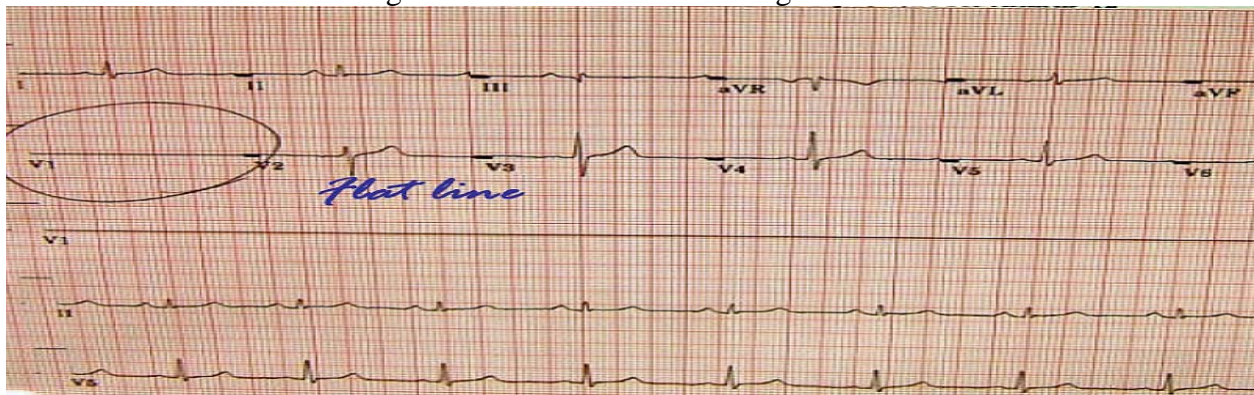


Figure 21 Lead reversal denoted by positive aVR (upper panel)  
compared to the normal (lower panel)

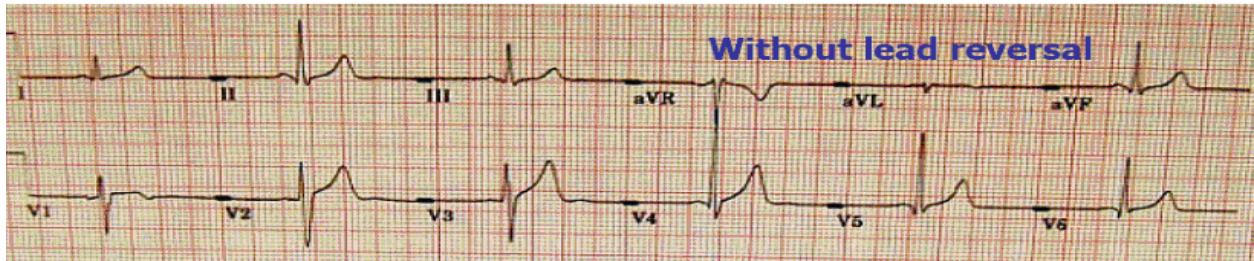
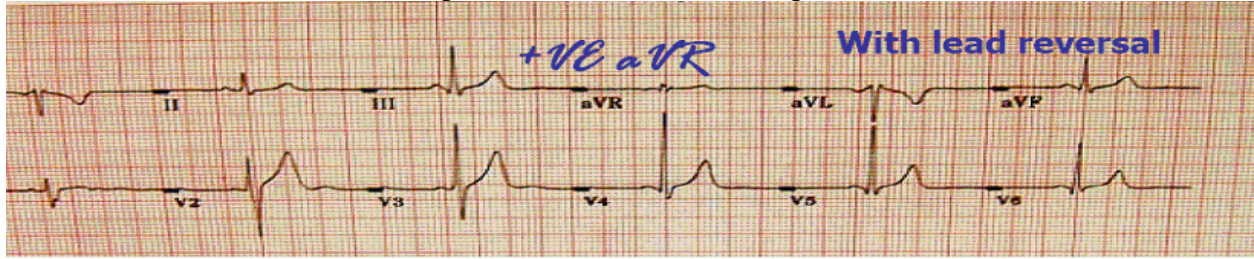
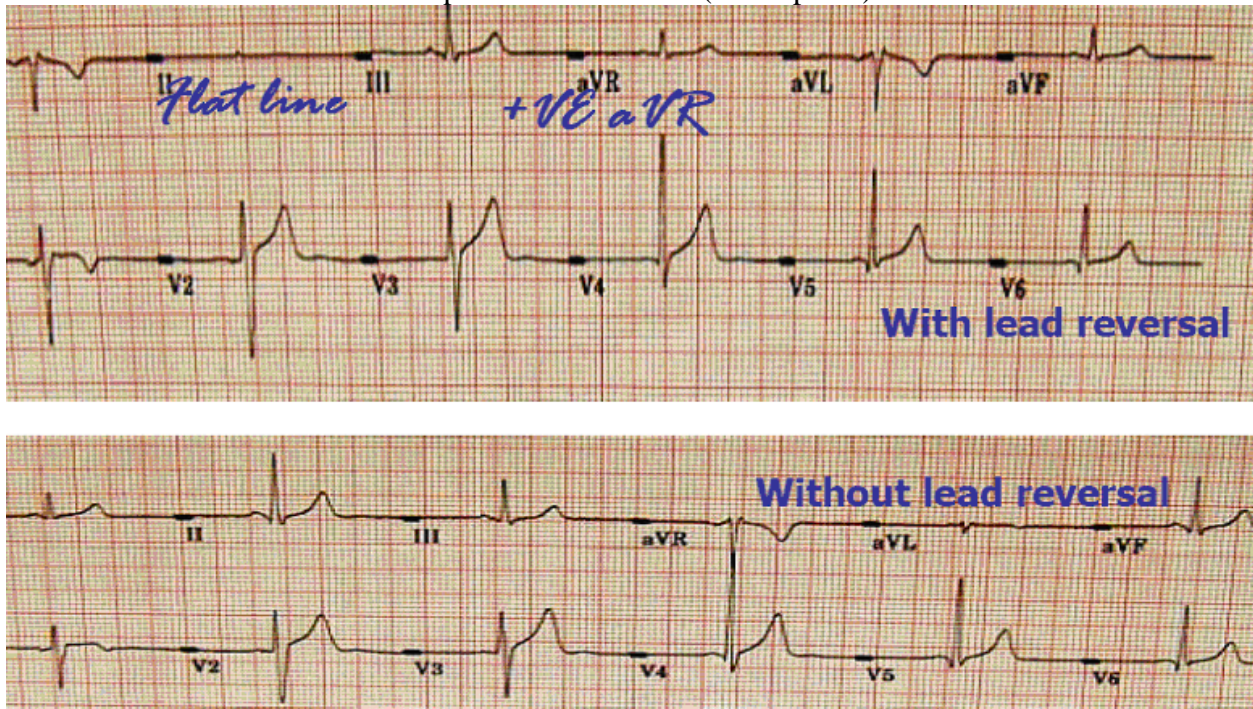


Figure 22 Lead reversal denoted by flat line in one of the limb leads (upper panel) compared to the normal (lower panel)



## APPENDICES

### Appendix 1 EPICARE Contact List

Susan Hensley, Computer ECG Technician  
(336) 716-9616 ([shensley@wfubmc.edu](mailto:shensley@wfubmc.edu))

Lisa Billings, Computer ECG Technician  
(336) 716-0387 ([lbilling@wfubmc.edu](mailto:lbilling@wfubmc.edu))

Elsayed Soliman, MD, MS, Research Associate  
(336) 716-8632 ([esoliman@wfubmc.edu](mailto:esoliman@wfubmc.edu))

**Ronald J. Prineas, MD, PhD, Professor/ EPICARE Director**  
(336) 716-7441 ([rprineas@wfubmc.edu](mailto:rprineas@wfubmc.edu))

EPICARE Fax: (336) 716-0834

## Appendix 2 HCHS/SOL Quick Reference Guide

### Entry of New Participant Data Prior Recording

CATEGORY LISTED ON MAC1200	ENTRY TO MACHINE BY THE ECG TECHNICIAN
NEW PATIENT	Yes
LAST NAME	Enter the 1 <sup>st</sup> letter of the participant's last name plus last 2 digits of birth year (e.g., H-60)
FIRST NAME	Enter the visit number (000 for baseline.) DO NOT ENTER FIRST NAME
PARTICIPANT ID	Enter the 8-digit number assigned by the HCHS/SOL Coordinating Center
SECONDARY ID	Enter same as participant ID
PACEMAKER	Select YES or NO
GENDER	Select male or female
HEIGHT	Enter E measurement of HeartSquare (e.g., if E=16.0, enter 160) DO NOT ENTER HEIGHT
WEIGHT	Enter V6 measurement of HeartSquare (e.g., if V6=12.0, enter 120) DO NOT ENTER WEIGHT
RACE	Choose "Other" and highlight defined race codes (defined on the MAC1200)
REFERRING PHYSICIAN	No action, the data will be pre-programmed. Press Enter.
TECHNICIAN	Choose "Other" and highlight technician's last name. Make sure that the technician's name matches the technician performing the ECG
LOCATION	Clinic site name has been pre-programmed. Press Enter

## Appendix 3 Transmission of HCHS/SOL ECGS to EPICARE

### Before transmitting ECGs to EPICARE

1. Ensure that all previously transmitted ECGs are deleted only after confirmation of receipt by checking the EPICARE website.
2. Check to ensure that all IDs are valid.
3. You can correct any variable from your participant data information by doing the following:
  - a. While holding the “Shift” key down, press the Store/Retrieve key,
  - b. Move the cursor to the ID in question,
  - c. Highlight “Change”
  - d. Proceed to correct information

### Transmitting ECGs to EPICARE

1. Plug one end of the phone cable into the connector marked “LINE” on the rear of the modem and the other end into any “analog” (fax) phone line.
2. Start at the 12-lead screen.
3. While holding the “Shift” key down, press the “Store/Retrieve” key.
4. Use the arrow keys to get cursor to the send option below the ECG to be transmitted, then press the “Enter” key. To skip an ECG press the down arrow without using the shift key. Repeat this procedure until all ECGs that are to be transmitted have been selected
5. Press the enter key to start the transmission
6. Once transmission is complete, press the “Start/Stop” key, located on the far bottom right of the keyboard, to return to the 12-lead screen.
7. Confirmation of receipt of transmitted ECGs could be made by logging into the EPICARE website using a user name and password specific to each clinic.

## Appendix 4 MAC 1200 Programming and Setup

In order to setup a MAC1200 for the HCHS/SOL study, turn the ECG machine ON. After the self-test completes, the ECG machine will be at the 12-lead screen (3 flat lines). Press the Setup key. Press “Enter” to select either 12-lead setup, system setup, communication setup, participant data setup, or code setup. To make a selection, use the four arrow keys to highlight any selection and press “Enter”.

### Appendix 4.1 12-Lead Setup

The lead setup should be conducted as in table (5.B.1). When finished, press the STOP key

Appendix 4 Table 1

CATEGORY	SELECTION
Report sequence	[STANDARD]
Rhythm leads	[II]
Gain	[10]
Report format	[4x2.5R1]
Detailed results	[NO]
Muscle filter	[NO]
Muscle filter frequency	[40 Hz]
AC filter	[YES]
Manual copy to	[HOST]
No. of copies	[1]
Delete ECG after transmission	[NO]
Auto save ECG	[YES]
Use screening criteria	[NO]
Suppress normal statements	[NO]
Suppress abnormal statements	[NO]
Interpretation	[YES]
Print interpretation	[YES]
Override function	[YES]

## Appendix 4.2 System Setup

After completing the 12-lead setup and pressing “STOP” key, press the down arrow key to highlight “System Setup”, and press ENTER. The system setup should be conducted as in table 2. When finished, press the STOP key

Appendix 4 Table 2

CATEGORY	SELECTION
Ordering physician	Name of the clinic study coordinator
Referring physician	HCHS/SOL then clinic #. Press ENTER; then Stop key.
Technician	Choose OTHERS, press ENTER. Press ENTER until the cursor is under the LAST NAME; type the technician’s LAST NAME then press ENTER. Type the technician’s FIRST NAME then press ENTER. Press the Stop key.
Institution name	The name of the university holding the clinic
Cart number	1, 2, 3 or 4 depending on the clinic
Site number	ENTER (130). This is EPICARE’s Study Number for HCHS/SOL
Location number	[1]
Date (mm/dd/yyyy)	ENTER the correct date using the mm/dd/yyyy format.
Time (hh:mm)	ENTER the correct time in the hh:mm format.
Lead fail beep	[NO]
High hr beep	[NO]
Lead labels	[AAMI]
Pace enhancement	[NO]
Baseline roll filter	[0.08]
Date	[MM/DD/YYYY]
Time	[24]
Units	[Cm, Kg]
Mains	[60 Hz]
LCD light off after	[5 MINS]
Low battery beep	[0 sec]
Default mode	[12 LEAD]
Language	[ENGLISH]
Enable password	[NO]
Test data	[NO]
Restore defaults	[NO]
Print setup lists	[NO]



### Appendix 4.3 Communication Setup

After completing the system setup and pressing “STOP” key, press the down arrow key to highlight “Communication Setup”, and press ENTER. The communication setup should be conducted as in table.3. When finished, press the STOP key

Appendix 4 Table 3

CATEGORY	SELECTION
Baud rate (pc)	[9600]
Protocol	[CSI]
Modem	MultiTech 56k
Dial mode	TONE
Phone no.	13367131102, 13367131103, 13367131104, or 13367131105 If an access code is required to dial a long distance number, enter the access code and the transmission telephone number at EPICARE, the same way you would dial a long distance number from your institution (using your access code), as follows: If the access Code is needed AFTER entering the transmission number, enter 13367131102,,,123456789 where 123456789 is the access code. If the access code is needed BEFORE entering the transmission number, enter 123456789,,,13367131102 where 123456789 is the access code Note: Access codes are separated from the EPICARE transmission telephone number by three commas. This allows the MAC1200 to pause before another telephone number is entered.
Outside line	If you need an outside line to obtain dial tone, please enter that digit. If not, leave it blank

#### Appendix 4.4 Participant Data Setup

After completing the communication setup and pressing “STOP” key, press the down arrow key to highlight “Patient Data Setup”, and press ENTER. The patient data setup should be conducted as in table (5.D.4). When finished, press the STOP key

Table (5.D.4)

CATEGORY	SELECTION
New patient	[YES]
Pacemaker	[YES]
Gender	[YES]
Height	[YES]
Weight	[YES]
Race	[YES]
Systolic BP	[NO]
Diastolic BP	[NO]
Ordering physician	[YES]
Referring physician	[YES]
Technician	[YES]
Phone no.	[NO]
Medication	[NO]
Comments	[NO]
Id required	[YES]
Patient id length	[10]
Secondary id	[YES]
Secondary id required	[YES]
Last name (required)	[YES]
First name (required)	[YES]
Location #	[NO]
Room #	[NO]
Order number	[NO]
Extra questions	[Leave Blank]

#### Appendix 4.5 Code Setup

This option requires NO action. If this is the last option remaining, press the STOP key. Press the STOP key once again to exit the setup menu.

**Appendix 5 ECG Directory Log**

<b>HCHS/SOL MAC1200 ECG DIRECTORY LOG</b>									
<b>PID</b>	<b>Acrostatic</b>	<b>Date Of ECG</b>	<b>CHANGES</b>			<b>WEBSITE CONF.</b>		<b>ECG DELETION</b>	
			<b>Change</b>	<b>Date</b>	<b>Tech.</b>	<b>Date</b>	<b>Tech.</b>	<b>Date</b>	<b>Tech.</b>