For ADULT patients only. EKG Frequency should be set to 0.05-100 or 150 Hz. Ideally filters should be off if possible.

CHAMBER ENLARGEMENT

Left Atrial Enlargement
1. P-terminal force in V1 (depth x duration of terminal neg deflection) > 0.04 mm-sec
2. Notched P > 0.12 secs (II)
3. P-wave LAD (+15 to –90)

Right Atrial Enlargement
1. Tall (>2.5mm) peaked P in lead II, III, F, nl duration
2. P axis > 75
3. V1 or V2 P > 1.5 mm high

Biatral Enlargement
1. Large diphasic P in V1 > 1.5 up and 1 down
2. Tall peaked P V1-3, & wide notched P in limb leads or V5-6
3. Increase in amplitude (>2.5) and duration (>0.12) in limb leads.

Left Ventricular Hypertrophy
Quick: S in V1 + R in V6 > 35mm
Romhilt & Estes (5 pts or greater = LVH)
1) Amplitude ______________________5
Any of the following:
  a. largest R or S in limbs>20
  b. S in V1 or V2 > 30
  c. R in V5 or V6 > 30
2) Strain pattern (V5-6 ST depressions) without digitalis____________________3
  with digitalis ______________________1
3) Left atrial involvement (terminal neg in V1 P-wave
   > 1mm down, 0.04 wide)_______________3
4) LAD (<-30) _________________________2
5) QRS < 0.09 _________________________1
6) Intrinsocoid deflection V5-6 > 0.05sec________________1

Right Ventricular Hypertrophy
1) RAD > +110
2) R > S in V1
3) R in V1 > 7mm
4) S in V1 < 2mm
5) QR in V1
6) RSR' in V1, R' > 10 mm
7) ST dep/T inversions V1-3

Combined Ventricular Hypertrophy
1) ECG meets either LVH or RVH criteria
2) LVH in precordial, but QRS > +90
3) R > Q in aVR, S > R in V5, T-inversion V1

PULMONARY EMBOLISM
1) S1Q3T3 pattern
2) RAD
3) RBBB, transient
4) T-wave inversions, V1-V3
5) Sinus tachycardia
6) Inverted Ts in inferior leads

12LeadEKG.net Worksheet (Marriott’s Criteria)

1. Rate (< 60 = Brady, > 100 = Tachy)
2. Rhythm (Regular / irreg-Reg irreg. / irreg irreg)
3. Axis (< -30 = LAD, > 110 = RAD)
4. P Waves and Intervals: PR (120-200 ms)
5. QRS (50-100 ms)
6. QTc (390-440 ms)
7. Hypertrophy: (RA, LA, RV, LV)
8. Blocks (SA blocks, AVHB, RBBB, LBBB, LAFB, LPFB)
9. Ischemia (T inversions, ST depression)
10. Injury (ST elevation)(reciprocal changes)
11. Infarct (significant Q or Q equivalents)
12. Other (WPW/LGL, high or low Mg/K/Ca, hypothermia, Wellen’s, Brugada’s, S1Q3T3)

LOCATIONS CRITERIA

Left Bundle Branch Block
1) QRS > 0.12 sec
2) Broad, monophasic R in V1, V5, V6, usually notched or slurred
3) No Q in I, V5, V6
4) Delayed Onset of Intrinsocoid Deflection (R peak time) in V5 and V6
5) ST depressions laterally

Right Bundle Branch Block
1) QRS > 0.11 secs
2) rSR', rSR' in V1
3) Delayed OID > 0.05 secs
4) Wide S in I, V5-6

Left Anterior Fascicular Block
1) LAD (> -30)
2) r>Q in I, aVL, RS in II, III, aVF
3) QRS <= 110 or 20 m > baseline

Left Posterior Fascicular Block
1) RAD > +90
2) Deep S in I
3) Q in III
4) QRS <=(120)

Bifascicular Block (RBBB + LAFB)
1) QRS > 0.11 secs
2) RSR' in V1, with broad, slurred R
3) Wide, slurred S in I, V5-6
4) First half of QRS has LAD
5) Initial r in inferior leads

BLOCKS

Myocardial Infarction In LBBB
1) Q waves in I, V5 or V6
2) R-wave progression reversed V1-4
3) Primary ST/T wave changes
4) See Sgarbossa’s Criteria on separate page

DIFFERENTIALS, ETC

RAD
Normal young adults, COPD without cor pulmonale
Lateral MI, LPFB
R > S in V1
Normal young adults (1% of cases)
Posterior infarct “Q” equivalent
Displacement of heart / CCW Rotation
RBBB, RVH, WPW

R’s in V5-6
LAFB (or LPFB)
COPD
Anterior MI scar

RSR’ in V1
Incomplete RBBB or RBBB
Normal variant
Posterior MI, Epsilon waves
Pectus abnormalities

Long QT = Risk of TDP/VT/Vf
LQTS genetic
Jervell-Lange-Nielson syndrome
Romano-Ward syndrome
LQTS Acquired
Hypomagnesemia quinidine/procaine/
sotalol/amiodarone tricyclics/
phenothiazines/pentamidine/
imidazoles,CNS hemorrhage / MI

MI Vessels
LAD: anterior, anteroseptal
RCA: inferior, 50% inf/post & post, inf/RV
(prox RCA)
LCX: antero/post/inferolateral, high lateral, 50% of inf/post & post

Evolution of Changes in Q-Wave MI
1 – Tall, broad T waves (hyperacute)
2 – ST elevation
3 – Q waves develop
4 – decreased ST elev., T waves invert

Limb Lead Reversal vs. Dextrocardia
Both: Lead I = neg QRS and inv T-waves
Dextro: Precordium has reverse progression of R-waves
LLR: Precordium is normal

Hyperkalemia
1) Peaked T-waves
2) Flat or absent P-waves
3) PR prolongation
Brady/tachyarrhythmias/sine wave

Hypokalemia: U increased amplitude
Hypercalcemia: Short QT

Hypocalcemia: Long QT

Hypothermia: Osbourne Wave (J-wave), a “hump” between QRS and T-wave

Pears
1 – Persistent ST elevation in pt with prior MI = ventricular aneurysm
2 – widespread PR dep, ST elevations /T-wave inversions = penticarditis
3 – Negative P, QRS and T in I is probably limb-lead reversal (see above)
4 – Short PR, delta-wave = WPW
5 - Short PR normal QRS = LGL