Personal Quick Reference Sheets

(pages 333 to 346)

from: Rapid Interpretation of EKG's

by Dale Dubin, MD

COVER Publishing Co., P.O. Box 1092, Tampa, FL 33601, USA

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Rapid Interpretation of EKG's

Dr. Dubin’s classic, simplified methodology for understanding EKG’s

6th Ed.

Dale Dubin, MD

May humanity benefit from your knowledge,

Dale Dubin

Web Sites:

Physicians and medical students: www.theMDsite.com

Nurses and nurses in training: www.CardiacMonitors.com

Emergency medical personnel: www.EmergencyEKG.com
Dubin’s Method
for Reading EKG’s

1. RATE (pages 65-96)
   Say “300, 150, 100” …“75, 60, 50”
   • but for bradycardia:
     rate = cycles/6 sec. strip ∙ 10

2. RHYTHM (pages 97-202)
   Identify the basic rhythm, then scan tracing for prematurity,
   pauses, irregularity, and abnormal waves.
   • Check for: P before each QRS.
     QRS after each P.
   • Check: PR intervals (for AV Blocks).
     QRS interval (for BBB).
   • If Axis Deviation, rule out Hemiblock.

3. AXIS (pages 203-242)
   • QRS above or below baseline for Axis Quadrant
     (for Normal vs. R. or L. Axis Deviation).
     For Axis in degrees, find isoelectric QRS in a limb lead
     of Axis Quadrant using the “Axis in Degrees” chart.
   • Axis rotation in the horizontal plane: (chest leads)
     find “transitional” (isolectric) QRS.

4. HYPERTROPHY (pages 243-258)
   Check
   \[
   V_1 \begin{cases} 
   P \text{ wave for atrial hypertrophy.} \\
   R \text{ wave for Right Ventricular Hypertrophy.} \\
   S \text{ wave depth in } V_1 \\
   + R \text{ wave height in } V_6 \text{ for Left Ventricular Hypertrophy.}
   \end{cases}
   \]

5. INFARCTION (pages 259-308)
   Scan all leads for:
   • Q waves
   • Inverted T waves
   • ST segment elevation or depression
   Find the location of the pathology (in the Left ventricle),
   and then identify the occluded coronary artery.
Determine Rate by Observation (pages 78-88)

Bradycardia (slow rates) (pages 90-96)
- Cycles/6 second strip × 10 = Rate
- When there are 10 large squares between similar waves, the rate is 30/minute.

Sinus Rhythm: origin is the SA Node (“Sinus Node”),
normal sinus rate is 60 to 100/minute.
- Rate more than 100/min. = Sinus Tachycardia (page 68).
- Rate less than 60/min. = Sinus Bradycardia (page 67).

Determine any co-existing, independent (atrial/ventricular) rates:
- Dissociated Rhythms: (pages 155, 157, 186-189)
  A Sinus Rhythm (or atrial rhythms) may co-exist with an independent rhythm
  from an automaticity focus of a lower level. Determine rate of each.

Irregular Rhythms: (pages 107-111)
- With Irregular Rhythms (such as Atrial Fibrillation) always note the general
  (average) ventricular rate (QRS’s per 6-sec. strip × 10) or take the patient’s pulse.
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Rhythm (pages 97 to 111)

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★ Identify basic rhythm...
...then scan entire tracing for pauses, premature beats, irregularity, and abnormal waves.

★ Always:
• Check for: P before each QRS.
  QRS after each P.
• Check: PR intervals (for AV Blocks).
  QRS interval (for BBB).
• Has QRS vector shifted outside normal range? (to rule out Hemiblock).

Irregular Rhythms (pages 107-111)

Sinus Arrhythmia (page 100)
Irregular rhythm that varies with respiration.
All P waves are identical.
Considered normal.

Wandering Pacemaker (page 108)
Irregular rhythm. P waves change shape as pacemaker location varies.
Rate under 100/minute...

...but if the rate exceeds 100/minute, then it is called
Multifocal Atrial Tachycardia (page 109)

Atrial Fibrillation (pages 110, 164-166)
Irregular ventricular rhythm.
Erratic atrial spikes (no P waves) from multiple atrial automaticity foci. Atrial discharges may be difficult to see.
**Escape** (pages 112-121) – the heart’s response to a pause in pacing

- An unhealthy Sinus (SA) Node may fail to emit a pacing stimulus ("Sinus Block"); this pause may evoke an escape beat from an automaticity focus.
- But a sick Sinus (SA) Node may cease pacing ("Sinus Arrest"), causing an automaticity focus to "escape" to assume pacemaker status.

Then...

- the SA Node usually resumes pacing.

**Premature Beats** (pages 122-145) – from an irritable automaticity focus

- An irritable automaticity focus may suddenly discharge, producing a:

  - Premature Atrial Beat (pages 124-130)
  - Premature Junctional Beat (pages 131-133)
  - Premature Ventricular Contraction (pages 134-135)

PVC’s may be: multiple, multifocal, in runs, or coupled with normal cycles.
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**Rhythm** continued (pages 146 to 172)

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**Tachyarrhythmias** (pages 146-172), “focus” = automaticity focus

<table>
<thead>
<tr>
<th>Rates:</th>
<th>150</th>
<th>250</th>
<th>350</th>
<th>450</th>
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<tbody>
<tr>
<td>Paroxysmal Tachycardia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flutter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibrillation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Paroxysmal (sudden) Tachycardia

**Paroxysmal Atrial Tachycardia**

An irritable atrial focus discharging at 150-250/min. produces a normal wave sequence, if P' waves are visible. (page 149)

- **P.A.T. with block**
  
  Same as P.A.T. but only every second (or more) P' wave produces a QRS. (page 150)

**Paroxysmal Junctional Tachycardia**

AV Junctional focus produces a rapid sequence of QRS-T cycles at 150-250/min. QRS may be slightly widened. (pages 151-153)

**Paroxysmal Ventricular Tachycardia**

Ventricular focus produces a rapid (150-250/min.) sequence of (PVC-like) wide ventricular complexes. (pages 154-158)

### Flutter

**Flutter**...rate: 250-350/min.

**Atrial Flutter**

A continuous (“saw tooth”) rapid sequence of atrial complexes from a single rapid-firing atrial focus. Many flutter waves needed to produce a ventricular response. (pages 159, 160)

**Ventricular Flutter** (pages 161, 162) also see “Torsades de Pointes” (pages 158, 345)

A rapid series of smooth sine waves from a single rapid-firing ventricular focus; usually in a short burst leading to Ventricular Fibrillation.

### Fibrillation

**Fibrillation**...erratic (multifocal) rapid discharges at 350 to 450/min. (pages 167-170)

**Atrial Fibrillation** (pages 110, 164-166)

Multiple atrial foci rapidly discharging produce a jagged baseline of tiny spikes. Ventricular (QRS) response is irregular.

**Ventricular Fibrillation** (pages 167-170)

Multiple ventricular foci rapidly discharging produce a totally erratic ventricular rhythm without identifiable waves. Needs immediate treatment.
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**Rhythm: (“heart”) blocks** (pages 173 to 202)

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### Sinus (SA) Block

(page 174)

An unhealthy Sinus (SA) Node misses one or more cycles (sinus pause)...

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### AV Block

(pages 176-189)

Blocks that delay or prevent atrial impulses from reaching the ventricles.

#### 1° AV Block

…prolonged PR interval (pages 176-178).

- PR interval is prolonged to greater than .2 sec (one large square).

#### 2° AV Block

…some P waves without QRS response (page 179-185)

- Wenckebach ...PR gradually lengthens with each cycle until the last P wave in the series does not produce a QRS.
- Mobitz ...some P waves don’t produce a QRS response. If “intermittent,” an occasional QRS is dropped.
- More advanced Mobitz block may produce a 3:1 (AV) pattern or even higher AV ratio (page 181).

#### 2:1 AV Block

…may be Mobitz or Wenckebach.

- PR length and QRS width or vagal maneuvers help differentiate.

#### 3° (“complete”) AV Block

…no P wave produces a QRS response (pages 186-190)

- 3° Block: P waves—SA Node origin.
- QRS’s—if narrow, and if the ventricular rate is 40 to 60 per min., then origin is a Junctional focus.
- 3° Block: P waves—SA Node origin.
- QRS’s—if PVC-like, and if the ventricular rate is 20 to 40 per min., then origin is a Ventricular focus.

---

### Bundle Branch Block

…find R,R’ in right or left chest leads (pages 191-202)

- **Right BBB** (pages 194-196)
- **Left BBB** (pages 194-197)

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### Hemiblock

…block of Anterior or Posterior fascicle of the Left Bundle Branch.

- **Anterior Hemiblock** (pages 297-299)
- **Posterior Hemiblock** (pages 300-302)
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**Axis** (pages 203 to 242)

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**General Determination of Electrical Axis** (pages 203-231)

Is QRS positive (верху) or negative (внизу) in leads I and AVF?

**Is Axis Normal?** (page 227)

**QRS in lead I** (pages 215-222)

...if the QRS is Positive (mainly above baseline), then the Vector points to positive (patient's left) side.

**Normal:**

QRs upright in I and AVF

“two thumbs-up” sign

**QRS in lead AVF** (pages 223-226)

...if the QRS is mainly Positive, then the Vector must point downward to positive half of the sphere.

---

**Axis in Degrees** (pages 233, 234) *(Frontal Plane)*

After locating Axis Quadrant, find limb lead where QRS is most isoelectric:

**Extreme Right Axis Deviation**

<table>
<thead>
<tr>
<th>lead</th>
<th>Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>$-90^\circ$</td>
</tr>
<tr>
<td>AVL</td>
<td>$-120^\circ$</td>
</tr>
<tr>
<td>III</td>
<td>$-150^\circ$</td>
</tr>
<tr>
<td>AVF</td>
<td>$-180^\circ$</td>
</tr>
</tbody>
</table>

**Right Axis Deviation**

<table>
<thead>
<tr>
<th>lead</th>
<th>Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVF</td>
<td>$+180^\circ$</td>
</tr>
<tr>
<td>II</td>
<td>$+150^\circ$</td>
</tr>
<tr>
<td>AVR</td>
<td>$+120^\circ$</td>
</tr>
<tr>
<td>I</td>
<td>$+90^\circ$</td>
</tr>
</tbody>
</table>

**Left Axis Deviation**

<table>
<thead>
<tr>
<th>lead</th>
<th>Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>$-90^\circ$</td>
</tr>
<tr>
<td>AVR</td>
<td>$-60^\circ$</td>
</tr>
<tr>
<td>II</td>
<td>$-30^\circ$</td>
</tr>
<tr>
<td>AVF</td>
<td>$0^\circ$</td>
</tr>
</tbody>
</table>

**Normal Range**

<table>
<thead>
<tr>
<th>lead</th>
<th>Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVF</td>
<td>$0^\circ$</td>
</tr>
<tr>
<td>III</td>
<td>$+30^\circ$</td>
</tr>
<tr>
<td>AVL</td>
<td>$+60^\circ$</td>
</tr>
<tr>
<td>I</td>
<td>$+90^\circ$</td>
</tr>
</tbody>
</table>

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**Axis Rotation (left/right) in the Horizontal Plane** (pages 236-242)

Find transitional (isoelectric) QRS in a chest lead.
Hypertrophy (pages 243 to 258)

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**Atrial Hypertrophy** (pages 245-249)

**Right Atrial Hypertrophy** (page 248)

- large, diphasic P wave with tall initial component.

**Left Atrial Hypertrophy** (page 249)

- large, diphasic P wave with wide terminal component.

**Ventricular Hypertrophy** (pages 250-258)

**Right Ventricular Hypertrophy** (pages 250-252)

- R wave greater than S in V1, but R wave gets progressively smaller from V1 - V6.
- S wave persists in V5 and V6.
- R.A.D. with slightly widened QRS.
- Rightward rotation in the horizontal plane.

**Left Ventricular Hypertrophy** (pages 253-257)

\[
\text{S wave in V1 (in mm.)} + \text{R wave in V5 (in mm.)} \]
\[
\text{Sum in mm. is more than 35 mm. with L.V.H.}
\]

- L.A.D. with slightly widened QRS.
- Leftward rotation in the horizontal plane.

Inverted T wave:

- slants downward gradually,
- but up rapidly.
**Infarction** (pages 259 to 308)

**Q wave = Necrosis** (significant Q’s only) (pages 272-284)
- Significant Q wave is one millimeter (one small square) wide, which is .04 sec. in duration…
  … or is a Q wave 1/3 the amplitude (or more) of the QRS complex.
- Note those leads (omit AVR) where significant Q’s are present
  … see next page to determine infarct location, and to identify the coronary vessel involved.
- Old infarcts: significant Q waves (like infarct damage) remain for a lifetime. To determine if an infarct is acute, see below.

**ST (segment) elevation = (acute) Injury** (pages 266-271) (also Depression)
- Signifies an acute process, ST segment returns to baseline with time.
- ST elevation associated with significant Q waves indicates an acute (or recent) infarct.
- A tiny “non-Q wave infarction” appears as significant ST segment elevation without associated Q’s. Locate by identifying leads in which ST elevation occurs (next page).
- ST depression (persistent) may represent “subendocardial infarction,” which involves a small, shallow area just beneath the endocardium lining the left ventricle. This is also a variety of “non-Q wave infarction.” Locate in the same manner as for infarction location (next page).

**T wave inversion = Ischemia** (pages 264, 265)
- Inverted T wave (of ischemia) is symmetrical (left half and right half are mirror images). Normally T wave is upright when QRS is upright, and vice versa.
- Usually in the same leads that demonstrate signs of acute infarction (Q waves and ST elevation).
- Isolated (non-infarction) ischemia may also be located; note those leads where T wave inversion occurs, then identify which coronary vessel is narrowed (next page).

NOTE: Always obtain patient’s previous EKG’s for comparison!
Infarction Location — and — Coronary Vessel Involvement (pages 259 to 308)

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Coronary Artery Anatomy (page 291)

Infarction Location/Coronary Vessel Involvement (pages 278-294)

**Posterior**
- large R with ST depression in V₁ & V₂
- mirror test or reversed transillumination test (Right Coronary Artery) (pages 282-286)

**Lateral**
- Q’s in lateral leads I and AVL (Circumflex Coronary Artery) (pages 280, 292)

**Inferior**
- (diaphragmatic) Q’s in inferior leads II, III, and AVF (R. or L. Coronary Artery) (pages 281, 294)

**Anterior**
- Q’s in V₁, V₂, V₃, and V₄ (Anterior Descending Coronary Artery) (pages 278, 292)
Pulmonary Embolism (pages 312, 313)
- S\(_1\), Q\(_3\), R\(_3\) – wide S in I, large Q and inverted T in III.
- acute Right BBB (transient, often incomplete)
- R.A.D. and clockwise rotation
- inverted T waves V\(_1\) → V\(_4\) and ST depression in II.

Artificial Pacemakers (pages 321-326)
Modern artificial pacemakers have sensing capabilities and also provide a regular pacing stimulus. This electrical stimulus records on EKG as a tiny vertical spike that appears just before the “captured” cardiac response.

Demand Pacemakers (page 301)
- are “triggered” (activated) when the patient’s own rhythm ceases or slows markedly.
- are “inhibited” (cease pacing) if the patient’s own rhythm resumes at a reasonable rate.
- will “reset” pacing (at same rate) to synchronize with a premature beat.

Pacemaker Impulse (delivery modes)
| Ventricular Pacemaker (page 323) (electrode in Right Ventricle) | (Asynchronous) Epicardial Pacemaker
|---|---|
| Ventricular impulse not linked to atrial activity. | Atrial Synchronous Pacemaker (page 323)
| P wave sensed, then after a brief delay, ventricular impulse is delivered. | Dual Chamber (AV sequential) Pacemaker (page 323)
| External Non-invasive Pacemaker (page 326) |
**Electrolytes**

**Potassium** (pages 314, 315)

- Increased $K^+$ (page 314) (hyperkalemia)

- Decreased $K^+$ (pages 315) (hypokalemia)

**Calcium** (page 316)

- Hyper $Ca^{++}$
  - short QT

- Hypo $Ca^{++}$
  - prolonged QT

**Digitalis** (pages 317-319)

- EKG appearance with digitalis (“digitalis effect”)
  - remember Salvador Dali.
  - T waves depressed or inverted.
  - QT interval shortened.

- Digitalis Excess $\rightarrow$ Digitalis Toxicity (irritable foci firing rapidly)
  - SA Block
  - P.A.T. with Block
  - AV Blocks
  - AV Dissociation
  - Atrial Fibrillation
  - Junctional or Ventricular Tachycardia
  - multiple P.V.C.’s
  - Ventricular Fibrillation

**Quinidine** (page 320)

- EKG appearance with quinidine (page 320)

- Excess quinidine or other medications that block potassium channels (or even low serum potassium) may initiate… (page 158)

**Quinidine Effects**

- Torsades de Pointes
**Dubin’s Quickie Conversion**—for—
**Patient’s Weight from Pounds to Kilograms**

Patient wt. in kg. = Half of patient’s wt. (in lb.) minus 1/10 of that value.

Examples:
- 180 lb. patient (becomes 90 minus 9) is 81 kg
- 160 lb. patient (becomes 80 minus 8) is 72 kg
- 140 lb. patient (becomes 70 minus 7) is 63 kg.

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**Modified Leads**—for—
**Cardiac Monitoring**

Locations are approximate. Some minor adjustment of electrode positions may be necessary to obtain the best tracing. Identify the specific lead on each strip placed in the patient’s record.

<table>
<thead>
<tr>
<th>Sensor Electrode</th>
<th>Identification</th>
<th>Color (inconsistent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ R (or RA)</td>
<td>red</td>
<td></td>
</tr>
<tr>
<td>– L (or LA)</td>
<td>white</td>
<td></td>
</tr>
<tr>
<td>G (or RL)</td>
<td>variable</td>
<td></td>
</tr>
</tbody>
</table>

* Ground, Neutral or Reference

**Modified Lead I**

**Modified Lead II**

**Conventional Lead**

To make this $MCI_1$ move the electrode to same (mirror) position on the patient’s left chest.