

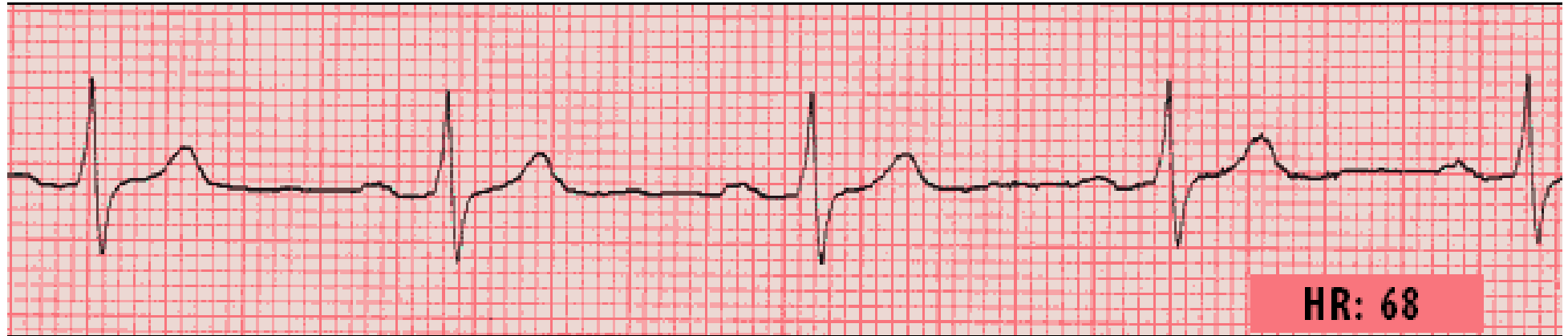
# ACLS RHYTHMS - 2015

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**Bayfront Health Dade City**



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# THIS RHYTHM IS: NORMAL SINUS RHYTHM



**MAIN IDENTIFICATION CHARACTERISTIC(S): PERFECTLY NORMAL IN EVERY WAY!**

**RATE** ----- **BETWEEN 60 - 100**  
**RHYTHM** ----- **REGULAR**  
**P-R INTERVAL** ----- **120 - 200 ms (.12 - .20)**  
**P: QRS RATIO** ----- **1:1**  
**QRS INTERVAL** ----- **NORMAL (LESS THAN 120 ms)**

**POTENTIAL PROBLEMS: NONE!**

# THIS RHYTHM IS: SINUS BRADYCARDIA



**MAIN IDENTIFICATION CHARACTERISTIC(S): HEART RATE LESS THAN 60**

**RATE** ----- **LESS THAN 60**  
**RHYTHM** ----- **REGULAR**  
**P-R INTERVAL** ----- **NORMAL (120 - 200 ms)**  
**P:QRS RATIO** ----- **1:1**  
**QRS INTERVAL** ----- **NORMAL (< 120 ms)**

## POTENTIAL PROBLEM(S):

- **HYPOTENSION / SHOCK**
- **MAY HAVE OTHER SERIOUS PROBLEMS (SUCH AS ACUTE MI)**

# THIS RHYTHM IS: SINUS BRADYCARDIA



## **WE MUST CONSIDER UNDERLYING CAUSES:**

- INCREASED VAGAL TONE** →
- BLOCKED SA NODAL ARTERY (INFERIOR WALL MI)** →
- ELECTROLYTE IMBAL. (K<sup>+</sup>)** →
- HYPOTHERMIA** →
- ORGANOPHOSPHATE POISONING** →
- ATHLETIC METABOLISM (excellent health!)** →

## **AND TREAT THEM:**

- ATROPINE**
- CARDIAC CATH - PTCA / STENT**
- THROMBOLYTICS**
- CORRECT ELECTROLYTES**
- WARM PATIENT**
- ATROPINE**
- COMPLIMENT PATIENT!**

# THIS RHYTHM IS: FIRST DEGREE HEART BLOCK



MAIN IDENTIFICATION CHARACTERISTIC(S): **P - R INTERVAL TOO LONG -  
(GREATER THAN 200 mSEC.)**

RATE -----	<b>NORMAL</b>
RHYTHM -----	<b>REGULAR</b>
P-R INTERVAL -----	<b>&gt; 200 mSEC.</b>
P: QRS RATIO -----	<b>1:1</b>
QRS INTERVAL -----	<b>NORMAL</b>

# THIS RHYTHM IS: FIRST DEGREE HEART BLOCK

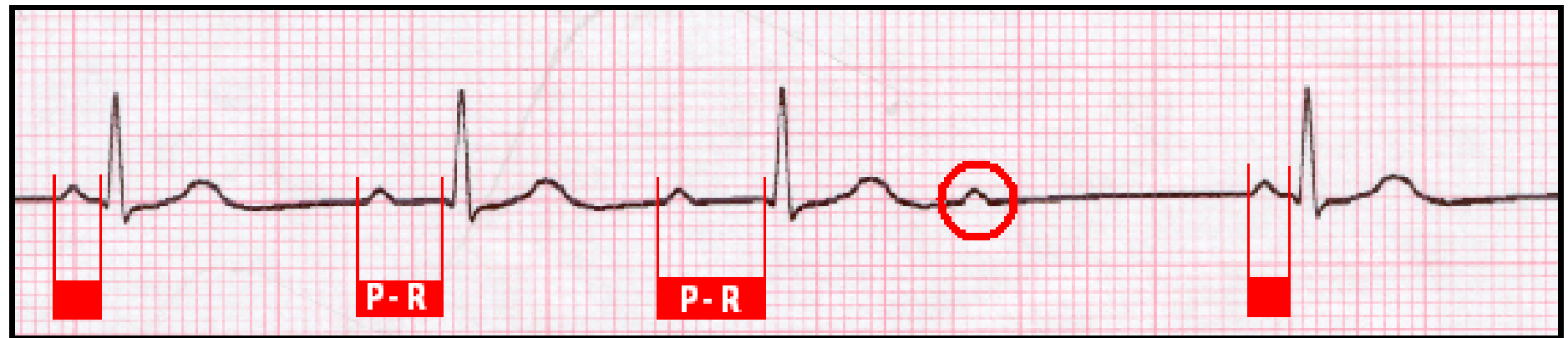


**MAIN IDENTIFICATION CHARACTERISTIC(S): P - R INTERVAL TOO LONG -  
(GREATER THAN 200 mSEC.)**

## POTENTIAL PROBLEMS:

- HR MAY BE BRADYCARDIC ( $< 60$ )
- MAY PROGRESS TO HIGHER GRADE HB ( $2^{\circ}$ ,  $3^{\circ}$ ) with SLOWER VENTRICULAR RATE

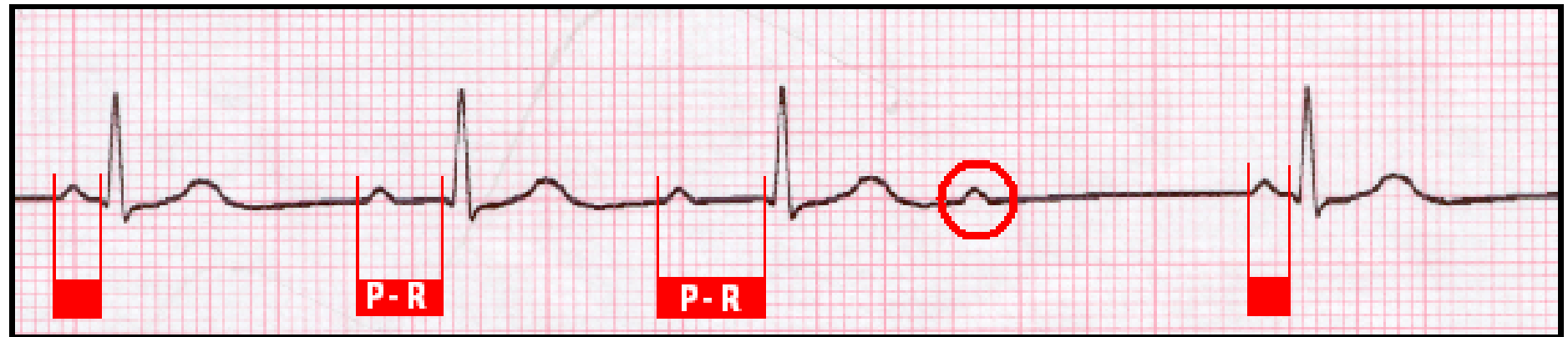
# THIS RHYTHM IS: 2<sup>nd</sup> ° TYPE I HB (Wenckebach)



**MAIN IDENTIFICATION CHARACTERISTIC(S): P - R INTERVAL GETS PROGRESSIVELY LONGER UNTIL IT DROPS A QRS – THEN CYCLE REPEATS**

<b>RATE</b> -----	<b>NORMAL or BRADYCARDIC</b>
<b>RHYTHM</b> -----	<b>REGULARLY IRREGULAR</b>
<b>P-R INTERVAL</b> -----	<b>VARIABLES (regularly irregular)</b>
<b>P:QRS RATIO</b> -----	<b>VARIABLES (usually 1:1 and 2:1)</b>
<b>QRS INTERVAL</b> -----	<b>NORMAL</b>

# THIS RHYTHM IS: 2<sup>nd</sup> ° TYPE I HB (Wenckebach)



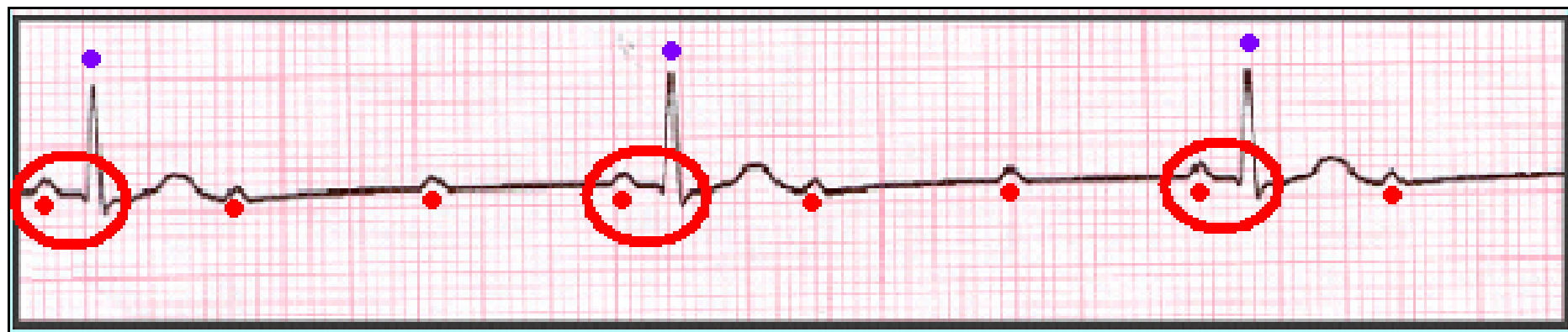
**MAIN IDENTIFICATION CHARACTERISTIC(S): P - R INTERVAL GETS PROGRESSIVELY LONGER UNTIL IT DROPS A QRS – THEN CYCLE REPEATS**

## POTENTIAL PROBLEMS:

- HR MAY BE BRADYCARDIC (< 60)
- MAY PROGRESS TO HIGHER GRADE HB ( 2<sup>o</sup> type II , 3<sup>o</sup> )  
with SLOWER VENTRICULAR RATE
- PT MAY BE SYMPTOMATIC (SHOCK) FROM  
↓ CARDIAC OUTPUT



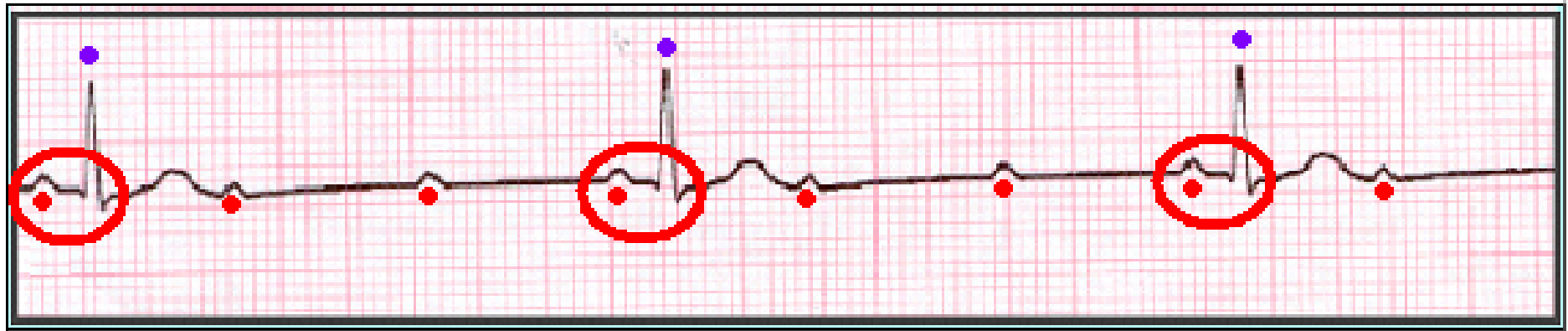
# THIS RHYTHM IS: 2<sup>nd</sup>° TYPE II HEART BLOCK



**MAIN IDENTIFICATION CHARACTERISTIC(S): MORE THAN ONE P WAVE FOR EACH QRS – BUT EVERY QRS HAS A NORMAL, CONSISTENT P - R INTERVAL**

**RATE** ----- **USUALLY BRADYCARDIC**  
**RHYTHM** ----- **USUALLY REGULAR (can be irregular)**  
**P-R INTERVAL** ----- **NORMAL and CONSISTENT**  
**P:QRS RATIO** ----- **≥ 2:1**  
**QRS INTERVAL** ----- **NORMAL**

# THIS RHYTHM IS: 2<sup>nd</sup>° TYPE II HEART BLOCK

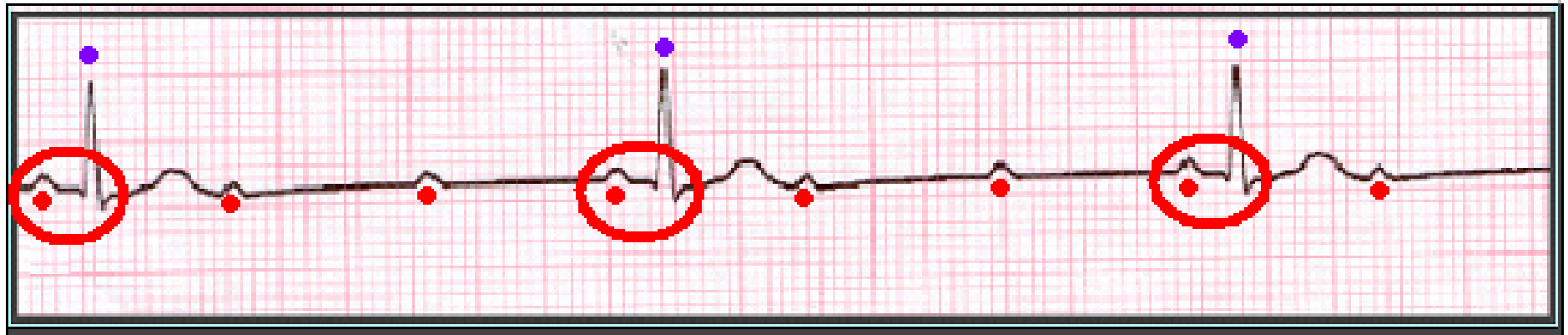


MAIN IDENTIFICATION CHARACTERISTIC(S): **MORE THAN ONE P WAVE FOR EACH QRS -- BUT EVERY QRS HAS A NORMAL, CONSISTENT P - R INTERVAL**

## POTENTIAL PROBLEMS:

- PT MAY BE SYMPTOMATIC (SHOCK) FROM ↓ CARDIAC OUTPUT
- BLOCKAGE MAY ADVANCE TO VENTRICULAR STANDSTILL (ADAMS - STOKES SYNDROME) AND CARDIAC ARREST
- MAY PROGRESS TO COMPLETE (3<sup>rd</sup>°) HEART BLOCK

# THIS RHYTHM IS: 2<sup>nd</sup>° TYPE II HEART BLOCK



MAIN IDENTIFICATION CHARACTERISTIC(S): **MORE THAN ONE P WAVE FOR EACH QRS -- BUT EVERY QRS HAS A NORMAL, CONSISTENT P - R INTERVAL**

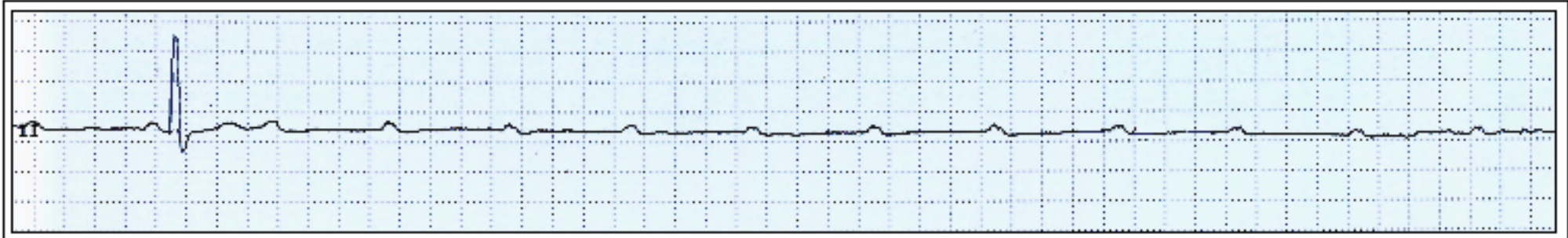


**ADAMS - STOKES SYNDROME** is essentially spontaneous **CARDIAC ARREST** -- characterized by episodes of **ASYSTOLE**, **VENTRICULAR STANDSTILL** and **V-FIB**. In this regard, 2<sup>nd</sup>° TYPE II HB can be more dangerous than 3<sup>rd</sup>° HB (at least 3<sup>rd</sup>° Heart Block has an **ESCAPE RHYTHM**)





## ADAMS - STOKES SYNDROME

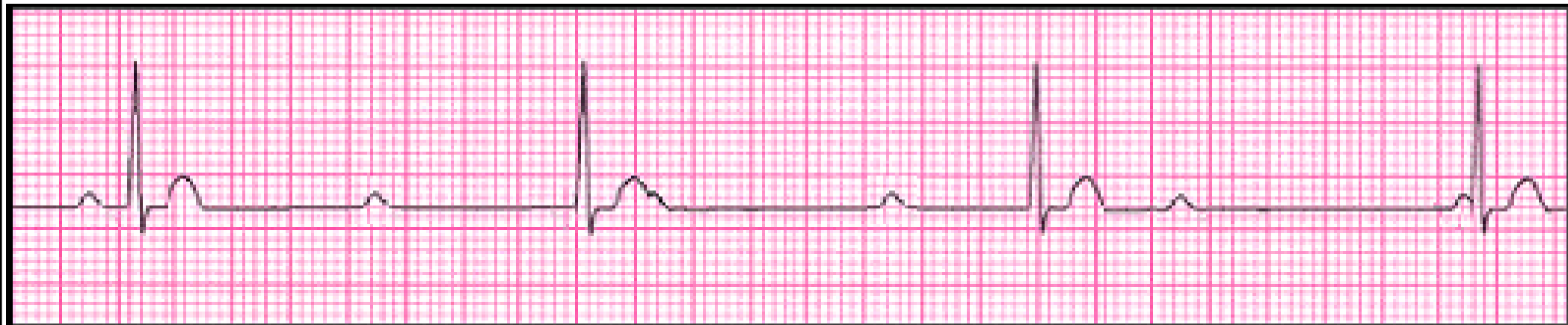


### CASE HISTORY:

**72 y/o male with history of SYNCOPES OF UNKNOWN ORIGIN. While undergoing Cardiac Catheterization ( Left Heart Cath ), pt went from NSR rate 76 - 80 to 2nd o TYPE II HEART BLOCK, which quickly deteriorated into VENTRICULAR STANDSTILL .**

**TX: CPR, Atropine, Transvenous Pacemaker, followed by Permanent Pacemaker Implantation. Patient experienced full recovery, was discharged.**

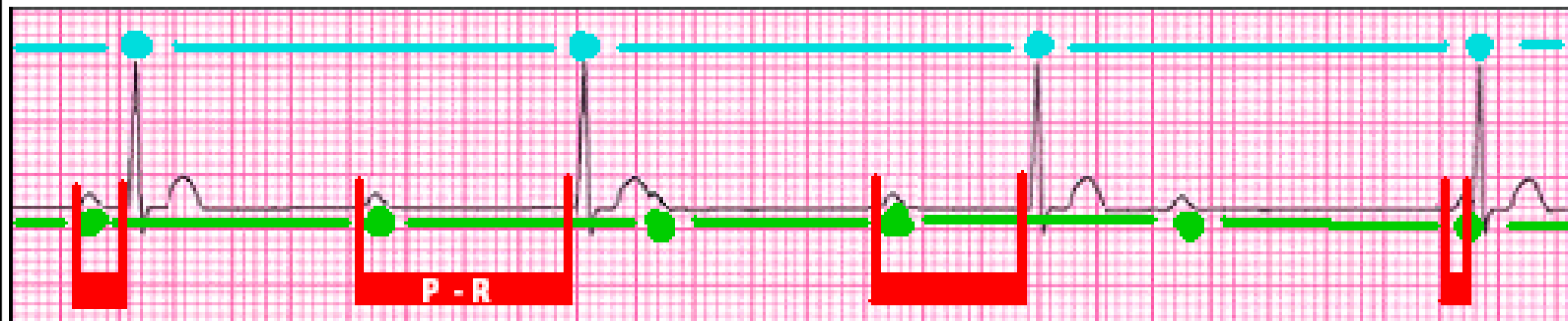
# THIS RHYTHM IS: 3rd<sup>o</sup> HB $\bar{c}$ JUNCTIONAL ESCAPE



**MAIN IDENTIFICATION CHARACTERISTIC(S): P - R INTERVAL INCOSISTENT, P - P INTERVALS REGULAR, R - R INTERVALS REGULAR -- NO RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES.**

RATE -----	<b>USUALLY BRADYCARDIC (40 -60 JUNCTIONAL RATE)</b>
RHYTHM -----	<b>REGULAR</b>
P-R INTERVAL ----	<b>INCONSISTENT (irregularly irregular)</b>
P:QRS RATIO ----	<b>VARIES - USUALLY &gt; 2:1</b>
QRS INTERVAL ----	<b>NORMAL (&lt; 120 ms) UNLESS PT HAS BUNDLE BRANCH BLOCK</b>

# THIS RHYTHM IS: 3rd<sup>o</sup> HB $\bar{c}$ JUNCTIONAL ESCAPE

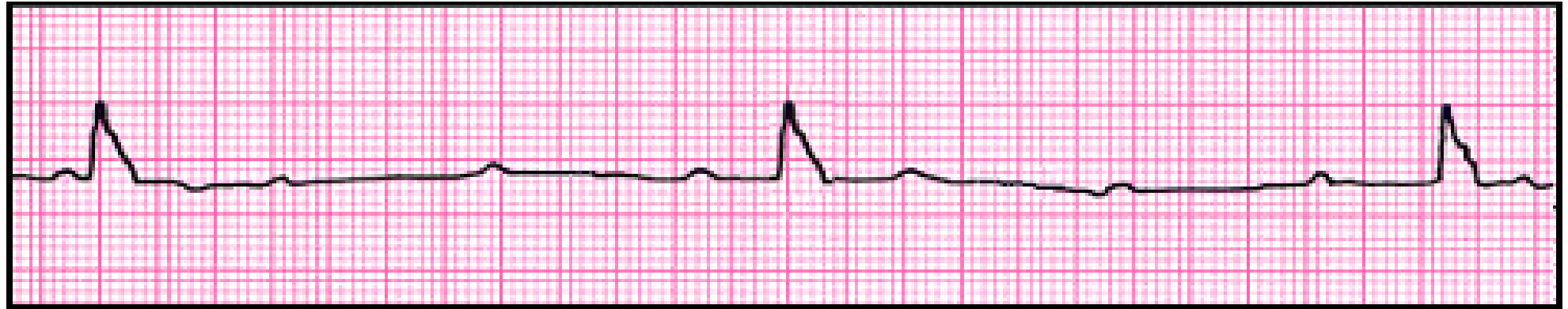


**MAIN IDENTIFICATION CHARACTERISTIC(S): P - R INTERVAL INCOSISTENT, P - P INTERVALS REGULAR, R - R INTERVALS REGULAR -- NO RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES.**

## POTENTIAL PROBLEMS:

**- HYPOTENSION and SHOCK due to ↓ HEART RATE and ↓ CARDIAC OUTPUT**

# THIS RHYTHM IS: 3rd<sup>o</sup> HB $\bar{c}$ IDIOVENTRICULAR ESCAPE



MAIN IDENTIFICATION CHARACTERISTIC(S): **P - R INTERVALS INCONSISTENT**  
**P - P INTERVALS REGULAR, R - R INTERVALS REGULAR. NO**  
**RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES. QRS**  
**COMPLEXES are WIDER THAN 120ms, AND OF SLOW VENTRICULAR**  
**RATE ( usually < 40 )**

RATE ----- **USUALLY BRADYCARDIC ( < 40 VENTRICULAR RATE )**

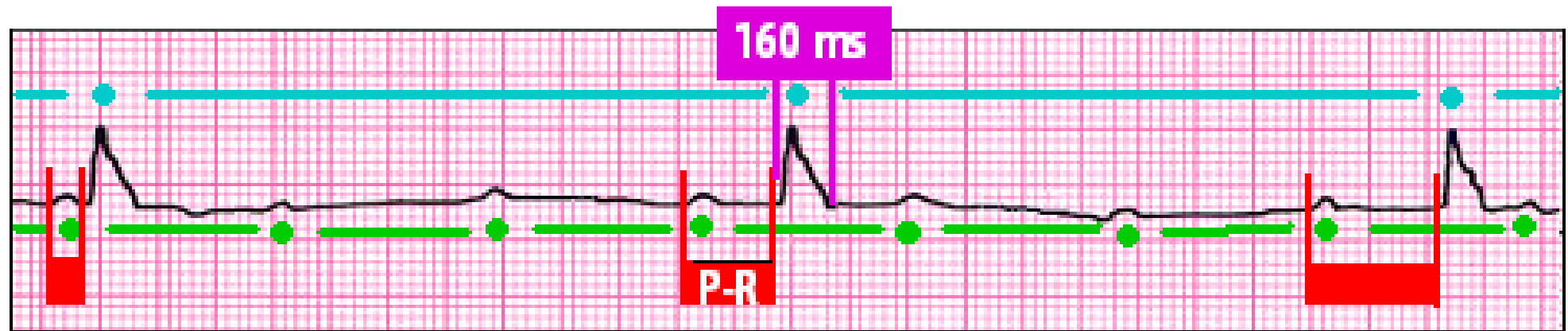
RHYTHM ----- **REGULAR**

P-R INTERVAL ---- **INCONSISTENT ( irregularly irregular )**

P: QRS RATIO ---- **VARIES - USUALLY > 2 : 1**

QRS INTERVAL ---- **WIDER THAN 120 ms**

# THIS RHYTHM IS: 3<sup>rd</sup>° HB $\bar{z}$ IDIOVENTRICULAR ESCAPE



MAIN IDENTIFICATION CHARACTERISTIC(S): **P - R INTERVALS INCONSISTENT**  
**P - P INTERVALS REGULAR, R - R INTERVALS REGULAR. NO**  
**RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES. QRS**  
**COMPLEXES are WIDER THAN 120ms, AND RATE (usually < 40)**

## POTENTIAL PROBLEMS:

**HYPOTENSION and SHOCK due to ↓ HEART RATE and**  
**↓ CARDIAC OUTPUT**



# CAUSES of HEART BLOCK

## THINK:

- **ISCHEMIA / INFARCTION**
  - AV NODE** INFERIOR WALL (RCA or CIRCUMFLEX LESIONS)
  - HIS / BUNDLE BRANCHES** ANTERIOR WALL (LAD LESIONS)
- **⊖ DROMOTROPIC MEDS** DIGITALIS / BETA & Ca<sup>++</sup> CH BLOCKERS
- **INFILTRATIVE DISEASE** AMYLOIDOSIS / HEMOCHROMATOSIS
- **INFLAMMATORY DISEASE** PERICARDITIS / MYOCARDITIS / RHEUMATIC DISORDERS
- **LEV'S DISEASE** LENEGRE'S SYNDROME
- **AORTIC / MITRAL ANNULAR CALCIFICATION**

# " CLASSIC " INFERIOR WALL M.I. with 3<sup>o</sup> HEART BLOCK

81 yr  
Female Caucasian  
Room:ER  
Loc:3 Option:11

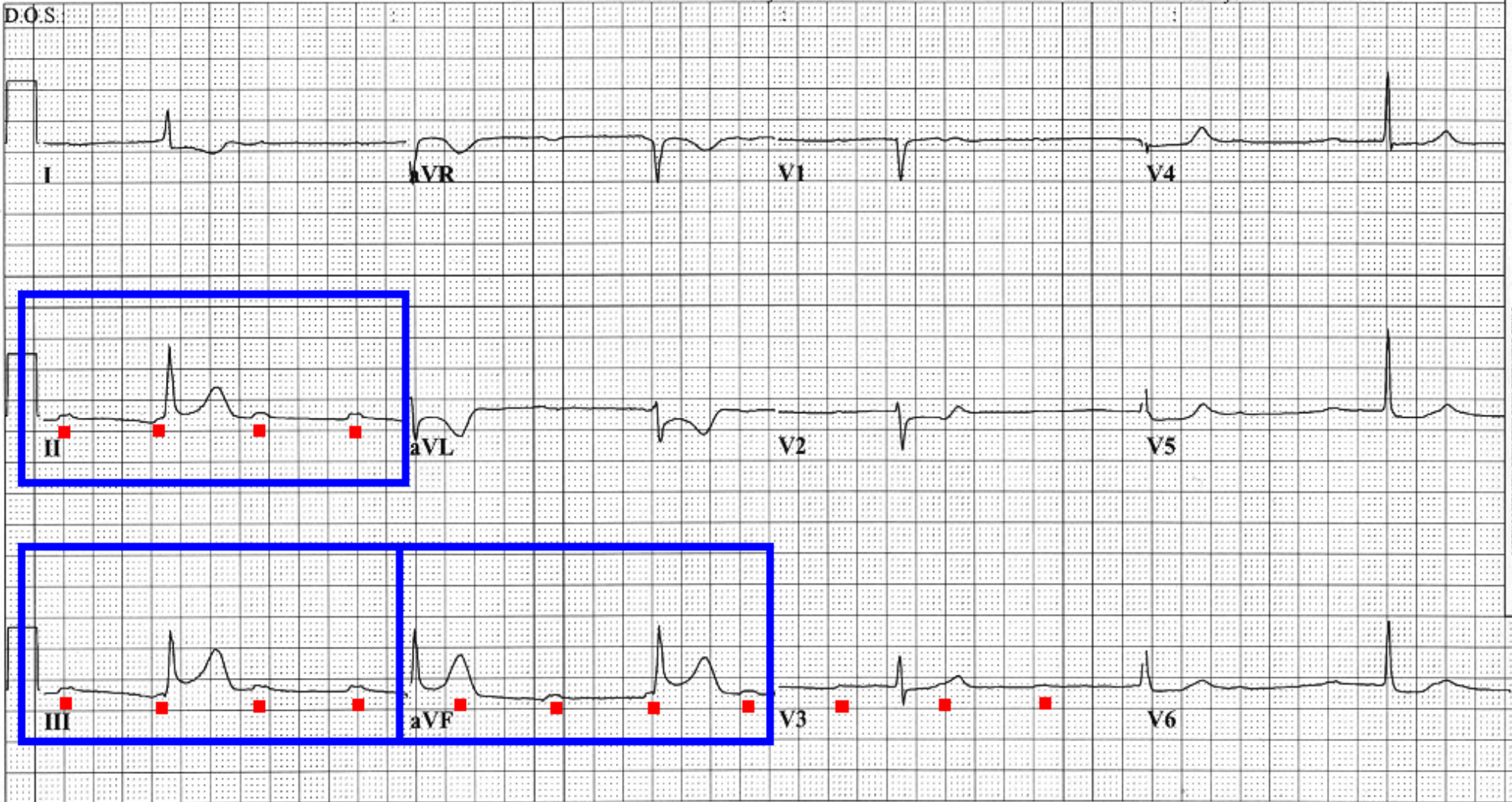
Vent. rate 36 BPM  
PR interval 846 ms  
QRS duration 88 ms  
QT/QTc 574/443 ms  
P-R-T axes \* 78 99

Marked sinus bradycardia with 1st degree A-V block → **COMPUTER LIED !!**  
ST elevation consider inferior injury or acute infarct  
\*\*\*\*\* ACUTE MI \*\*\*\*\*  
Abnormal ECG  
No previous ECGs available

Technician: **EKG CLASS # WR03416454**

Referred by:

Confirmed By:



# — THE CONCERNS OF ACLS —

IS THE

**VENTRICULAR RATE:**



**T O O                      S L O W**

- **SYMPTOMATIC BRADYCARDIAS**
- **HEART BLOCKS with SLOW VENTRICULAR RATES**  
( patient symptomatic )



**Tx:**

- ✓ **ABC s**
- ✓ **GENERAL SUPPORTIVE CARE**
- ✓ **BRADYCARDIA ALGORITHM**

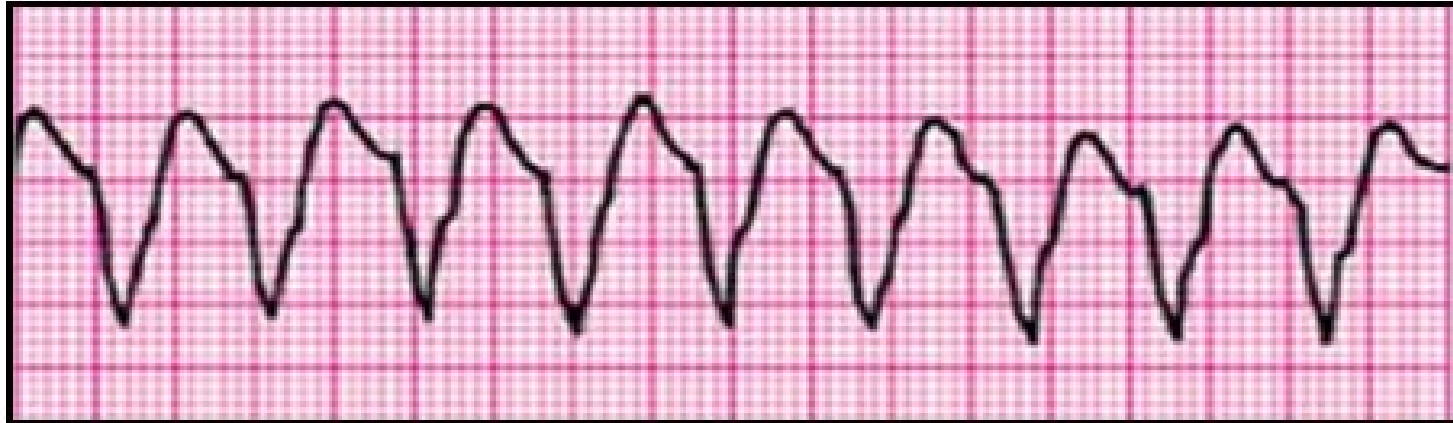
# **SYMPTOMATIC BRADYCARDIA**

- **ABC s + GENERAL SUPPORTIVE CARE**
- **ATROPINE 0.5 mg. IV**
  - MAY REPEAT 0.5 mg. DOSES IF NEEDED
  - MAXIMUM 3.0 mg.
- **TRANSCUTANEOUS PACEMAKER**
  - PREFERRED PRIMARY Tx FOR HIGH GRADE A-V BLOCK

# **SYMPTOMATIC BRADYCARDIA**

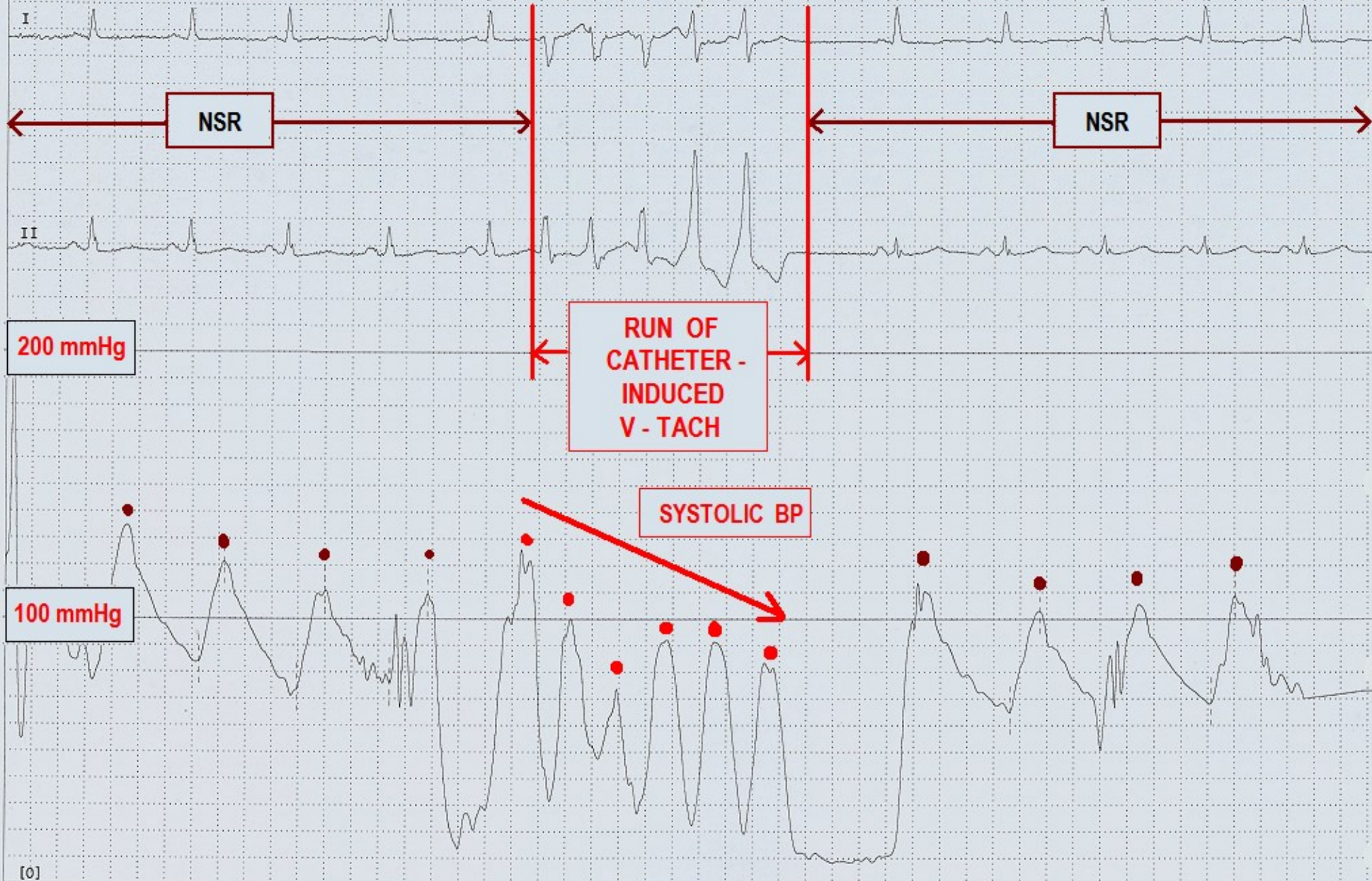
- **DOPAMINE gtt.**  
2 - 10 mcg / kg. / min. INFUSION RATE  
IF PACING NOT AVAILABLE or EFFECTIVE
- **EPINEPHRINE gtt.**  
2 - 10 mcg / min INFUSION RATE  
IF PACING NOT AVAILABLE or EFFECTIVE
- **TRANSVENOUS PACEMAKER**

# THIS RHYTHM IS: MONOMORPHIC V-TACH



**MAIN IDENTIFICATION CHARACTERISTIC(S): WIDE QRS COMPLEXES ( $> 120$  ms )  
HR USUALLY BETWEEN 150 - 200 ; ALL QRS COMPLEXES APPEAR SAME IN  
SHAPE and DEFLECTION ; IF P WAVES SEEN, DISASSOCIATED w/ QRS**

<b>RATE</b> -----	<b><math>&gt; 100</math> (usually 150 - 200 )</b>
<b>RHYTHM</b> -----	<b>REGULAR</b>
<b>P-R INTERVAL</b> -----	<b>N / A</b>
<b>P: QRS RATIO</b> -----	<b>N / A</b>
<b>QRS INTERVAL</b> -----	<b><math>&gt; 120</math> ms</b>





# **WIDE COMPLEX TACHYCARDIA**

( QRS > 120 ms )

**MONOPHASIC**

**ABC s**

**NO PULSE**

**GO TO  
V - FIB  
ALGORITHM !**

**PULSE - UNSTABLE**

- IMMEDIATE SYNC. CARDIOVERSION:
  - 100 j biphasic
  - consider sedation
- INCREASE joules
- MEDS:
  - PROCAINAMIDE
  - AMIODARONE

**PULSE - STABLE**

- O2, IV-IO, EKG
- MEDS:
  - ADENOSINE 6-12 (only if REGULAR)
  - PROCAINAMIDE (20-50mg/min)
  - AMIODARONE (150 over 10min + 1mg/ min INFUSION)

# THIS RHYTHM IS: POLYMORPHIC V-TACH



**MAIN IDENTIFICATION CHARACTERISTIC(S): WIDE QRS COMPLEXES, MULTIPLE SHAPES AND FORMS, POSITIVE AND NEGATIVE DEFLECTIONS, APPEARS TO ROTATE BETWEEN NEGATIVE AND POSITIVE (TWISTING OF POINTS)**

<b>RATE</b> -----	<b>200 - 300</b>
<b>RHYTHM</b> -----	<b>VARIES</b>
<b>P-R INTERVAL</b> -----	<b>N/A</b>
<b>P: QRS RATIO</b> -----	<b>N/A</b>
<b>QRS INTERVAL</b> -----	<b>VARIES</b>

# THIS RHYTHM IS: POLYMORPHIC V - TACH



**MAIN IDENTIFICATION CHARACTERISTIC(S): WIDE QRS COMPLEXES, MULTIPLE SHAPES AND FORMS, POSITIVE AND NEGATIVE DEFLECTIONS, APPEARS TO ROTATE BETWEEN NEGATIVE AND POSITIVE (TWISTING OF POINTS)**

**RATE ----- 200 - 300**

**RHYTHM ----- VARIES**

**P-R INTERVAL ----- N/A**

**P:QRS RATIO ----- N/A**

**QRS INTERVAL ----- VARIES**

**THE MOST COMMON FORM OF POLYMORPHIC VT is TORDSADES de POINTES (TdP) as seen above. TdP is most commonly caused by: PROLONGED QT INTERVAL and/or HYPOMAGNESEMIA**

**Most patients in TdP are in cardiac arrest. Those with a pulse are usually hemodynamically unstable with imminent cardiac arrest.**

# **WIDE COMPLEX TACHYCARDIA**

## **TORSADES de POINTES**

( QRS > 120 ms )

### **ABC s**

#### **NO PULSE**

**GO TO  
V - FIB  
ALGORITHM !**

#### **PULSE - UNSTABLE**

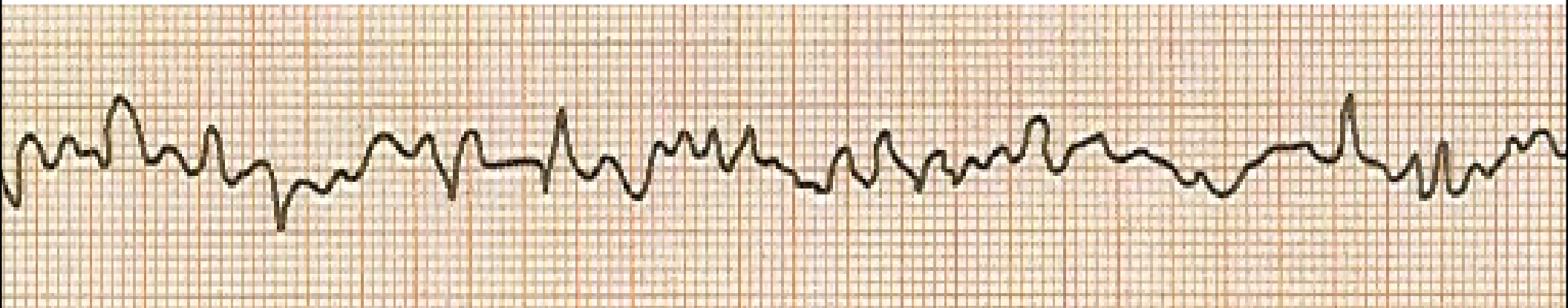
- **IMMEDIATE  
DEFIBRILLATION**

#### **PULSE - STABLE**

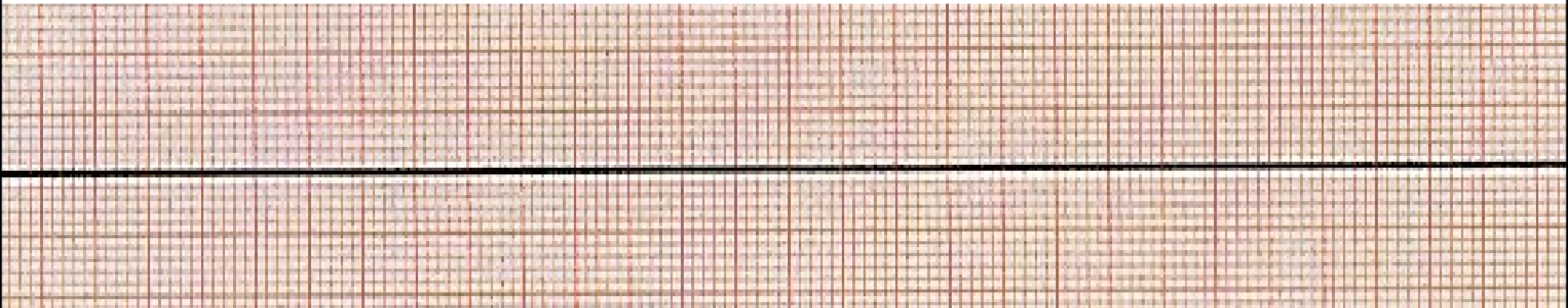
- **O2 / IV / EKG**
- **MAGNESIUM  
1 - 2 gm OVER  
5 - 60 min, THEN  
INFUSION**

***DO NOT give PROCAINAMIDE, AMIODARONE, or SOTALOL  
to patients with TORSADES or POLYMORPHIC VT !!!***

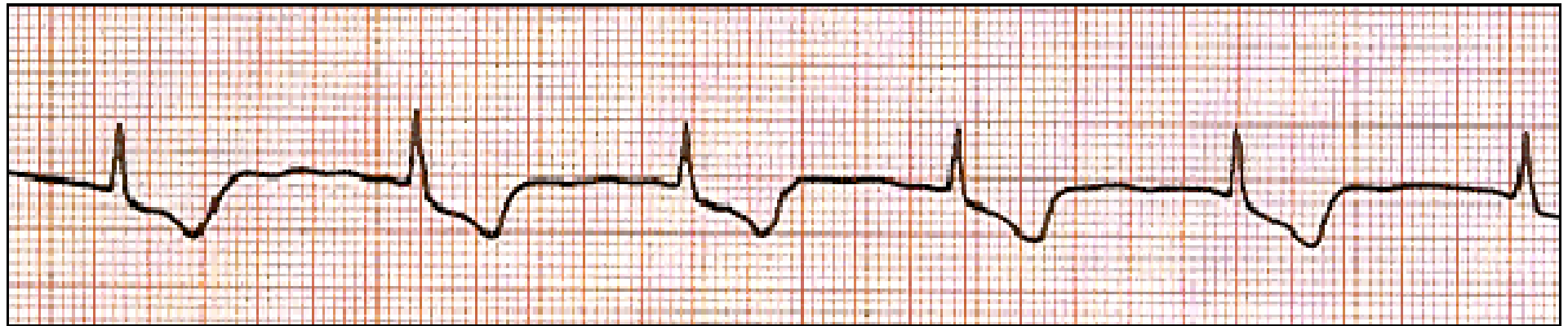
# Ventricular Fibrillation



# Ventricular Asystole



# THIS RHYTHM IS: JUNCTIONAL RHYTHM



**MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ABSENT, or LOCATED JUST AFTER QRS (in S-Tseg) or JUST BEFORE QRS (short P-R). WHEN P wave**

**seen, it is INVERTED (upside-down).**

**- HR USUALLY 40 -60**

**RATE ----- 40 -60**

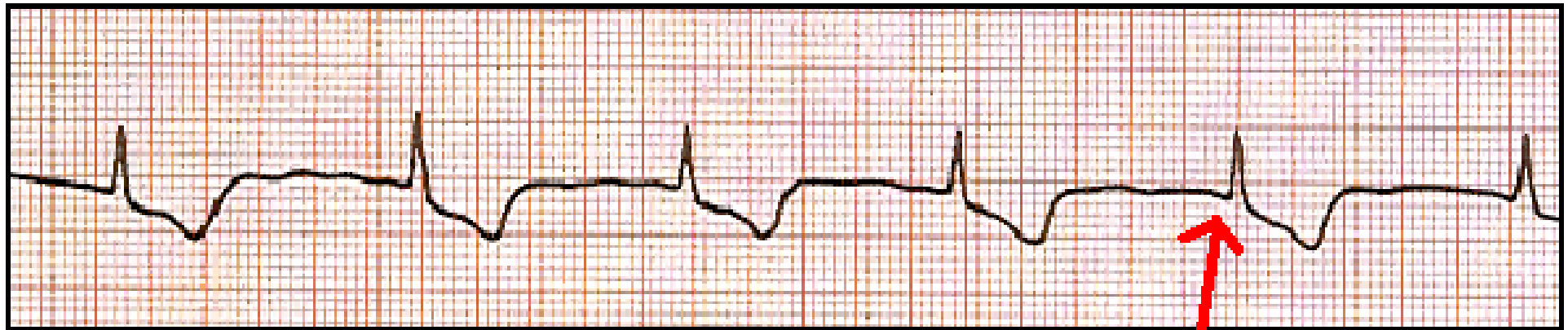
**RHYTHM ----- REGULAR**

**P-R INTERVAL ----- ABSENT or SHORT**

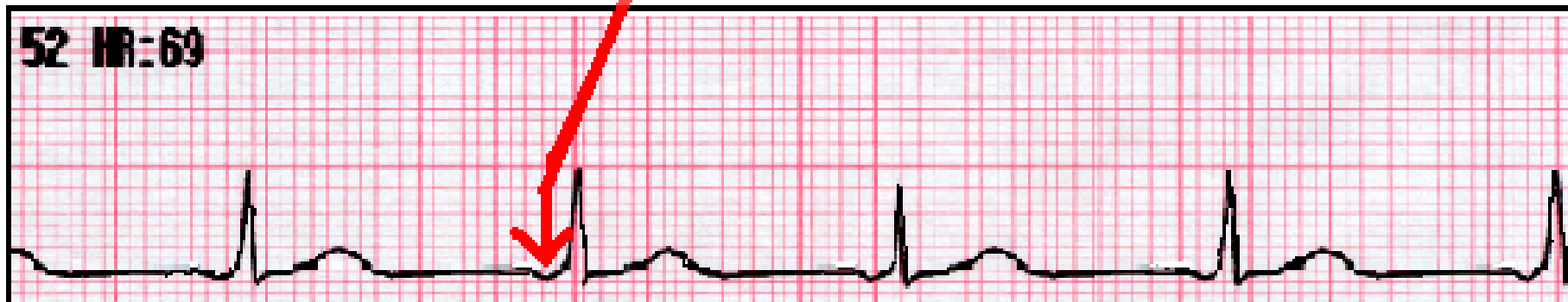
**P: QRS RATIO ----- 1:1**

**QRS INTERVAL ----- NORMAL**

# THIS RHYTHM IS: JUNCTIONAL RHYTHM

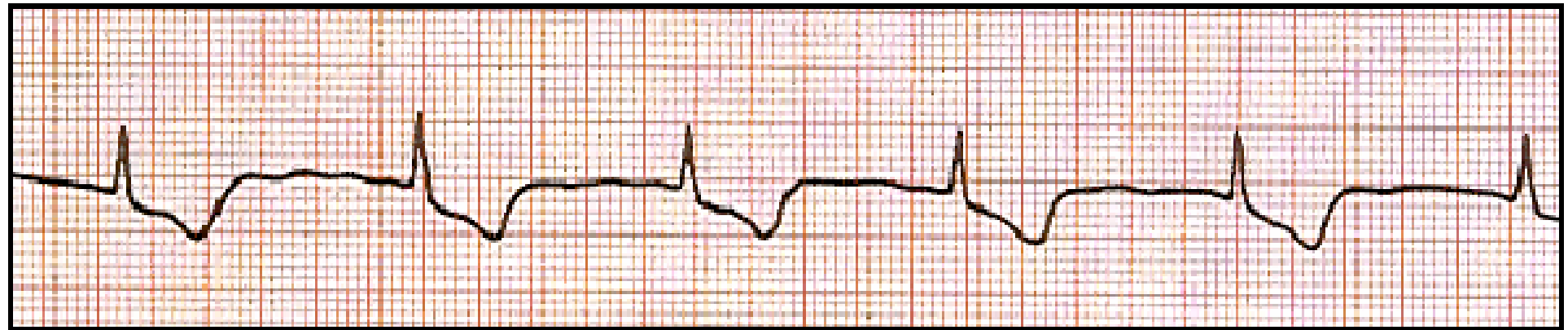


MAIN IDENTIFICATION CHARACTERISTIC(S): **P WAVES ABSENT**, or **LOCATED JUST AFTER QRS (in S-Tseg) or JUST BEFORE QRS (short P-R)**. WHEN P wave seen, it is **INVERTED (upside-down)**.  
- HR USUALLY 40 -60





# THIS RHYTHM IS: JUNCTIONAL RHYTHM

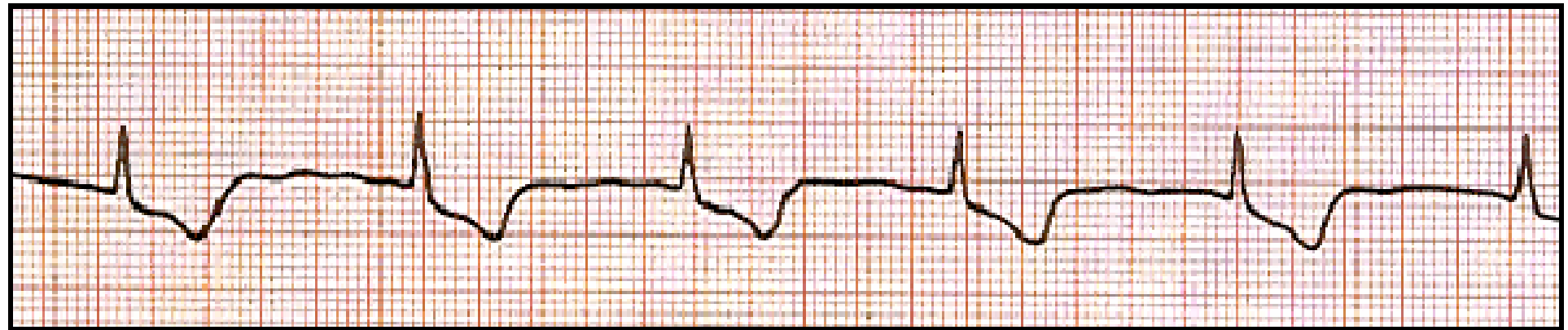


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- HR USUALLY 40 -60

## POTENTIAL PROBLEM(S):

- HR can be TOO FAST or TOO SLOW !! ( ↓ CARDIAC OUTPUT )
- COULD BE INDICATOR OF MORE SERIOUS UNDERLYING CONDITIONS:
  - M.I.
  - ELECTRICAL SYSTEM DISTURBANCES

# THIS RHYTHM IS: JUNCTIONAL RHYTHM

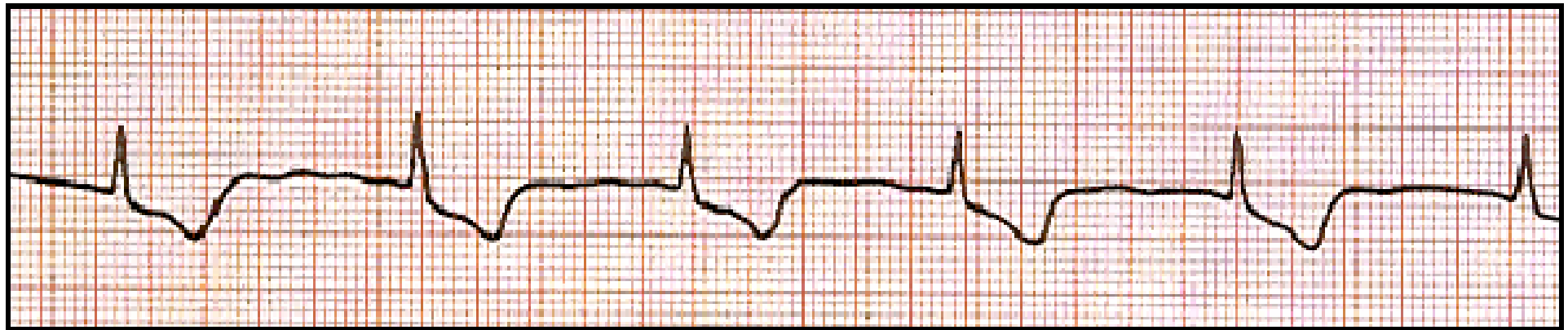


**MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ABSENT, or LOCATED JUST AFTER QRS (in S-Tseg) or JUST BEFORE QRS (short P-R). WHEN P wave seen, it is INVERTED (upside-down).**  
- HR USUALLY 40 -60

## TREATMENT / INTERVENTION:

- CORRECT HEART RATE, if pt. symptomatic and HR too SLOW or FAST. (atropine, pacemaker - cardioversion, etc)
- FURTHER DIAGNOSTIC STUDIES to determine why SINUS NODE not working !!!

# THIS RHYTHM IS: JUNCTIONAL RHYTHM



HEART RATE TOO SLOW . . . .

**WE MUST CONSIDER  
UNDERLYING CAUSES:**

INCREASED VAGAL TONE →

BLOCKED SA NODAL ARTERY →  
(ACUTE INFERIOR MI ?)

ELECTROLYTE IMBAL. (K<sup>+</sup>) →

**AND TREAT THEM:**

ATROPINE

CARDIAC CATH - PTCA / STENT  
THROMBOLYTICS

CORRECT ELECTROLYTES

# THIS RHYTHM IS: JUNCTIONAL RHYTHM



HEART RATE TOO FAST . . . .

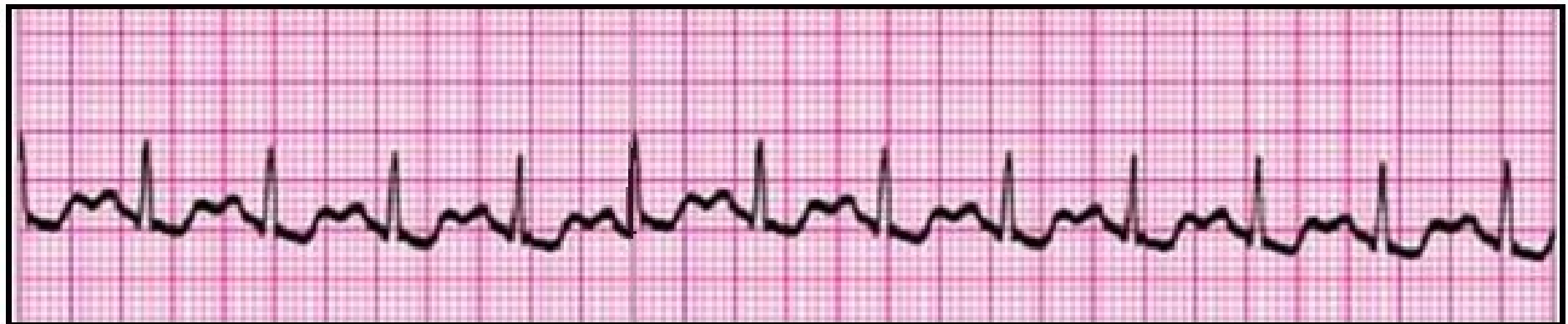
WE MUST CONSIDER  
UNDERLYING CAUSES:

- AV NODAL RE-ENTRANT TACHYCARDIA (AVNRT) (Pt. has DUAL AV NODES)
- WPW ORTHODROMIC TACHYCARDIA

AND TREAT THEM:

- "CHEMICAL" CARADIOVERSION
- SYNCHRONIZED CARADIOVERSION
- ABLATION of "SLOW PATHWAY" (AVNRT) or ACCESSORY BYPASS TRACT (WPW) in EP LAB

# THIS RHYTHM IS: SINUS TACHYCARDIA



**MAIN IDENTIFICATION CHARACTERISTIC(S): SINUS RHYTHM, RATE HIGHER THAN 100. (ACLS guidelines: heart rate 100 - 150 )**

**RATE** ----- **100 - 150 ( can be > 150 )**

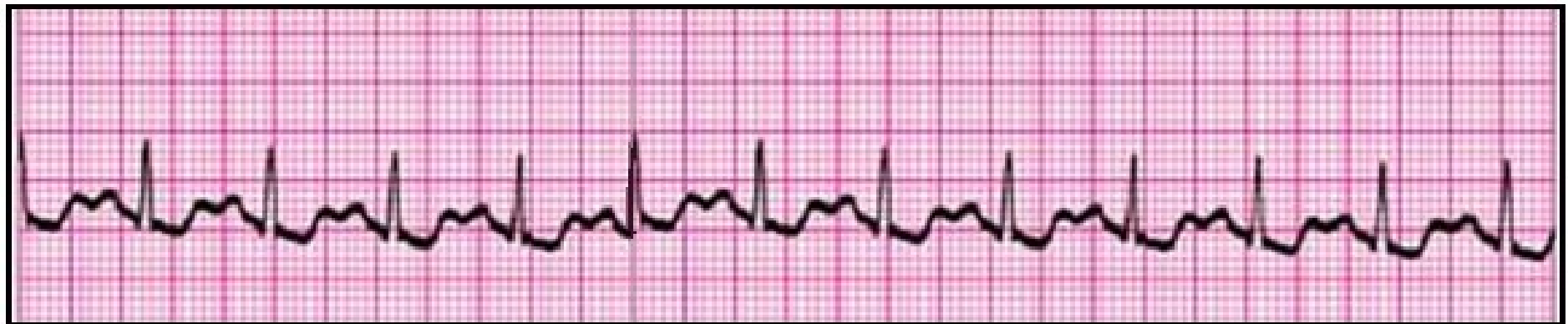
**RHYTHM** ----- **REGULAR**

**P-R INTERVAL** ----- **NORMAL ( 120 - 200 ms )**

**P: QRS RATIO** ----- **1 : 1**

**QRS INTERVAL** ----- **NORMAL (< 120 ms ), ( unless Bundle Branch Block present )**

# THIS RHYTHM IS: SINUS TACHYCARDIA

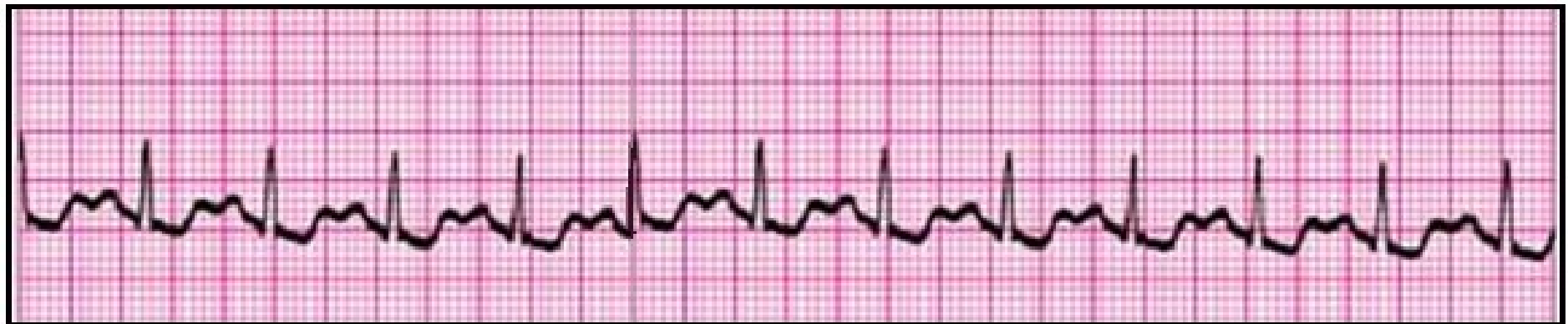


**MAIN IDENTIFICATION CHARACTERISTIC(S): SINUS RHYTHM, RATE HIGHER THAN 100. (ACLS guidelines: heart rate 100 - 150 )**

## POTENTIAL PROBLEMS :

- Usually none, unless pt. has severe underlying disease, such as a LOW EF ( < 40 % ).
- **IN MOST CASES, the patient's UNDERLYING PROBLEM is the key issue . . . .**

# THIS RHYTHM IS: SINUS TACHYCARDIA



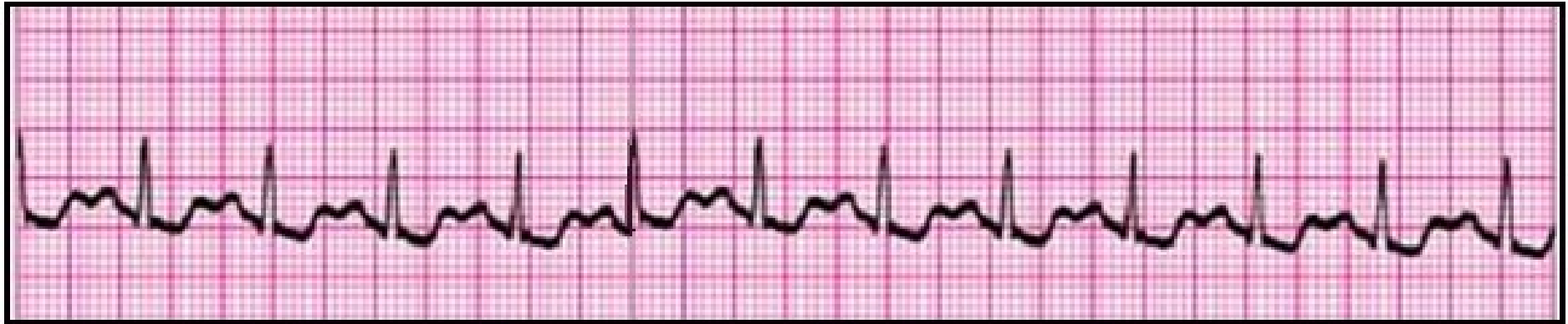
**MAIN IDENTIFICATION CHARACTERISTIC(S): SINUS RHYTHM, RATE HIGHER THAN 100. (ACLS guidelines: heart rate 100 - 150 )**

## TREATMENT / INTERVENTIONS :



**IN MOST CASES, YOU TREAT THE UNDERLYING CAUSE!**

# THIS RHYTHM IS: SINUS TACHYCARDIA



**WE MUST CONSIDER  
UNDERLYING CAUSES:**

**AND TREAT THEM:**

**ANXIETY / FEAR**



**CALM PATIENT**

**HYPOVOLEMIA**

**DEHYDRATION**



**FLUIDS**

**BLOOD LOSS**



**STOP BLEEDING**

**MEDICATION EFFECTS**



**CONSIDER MEDICAL Tx**

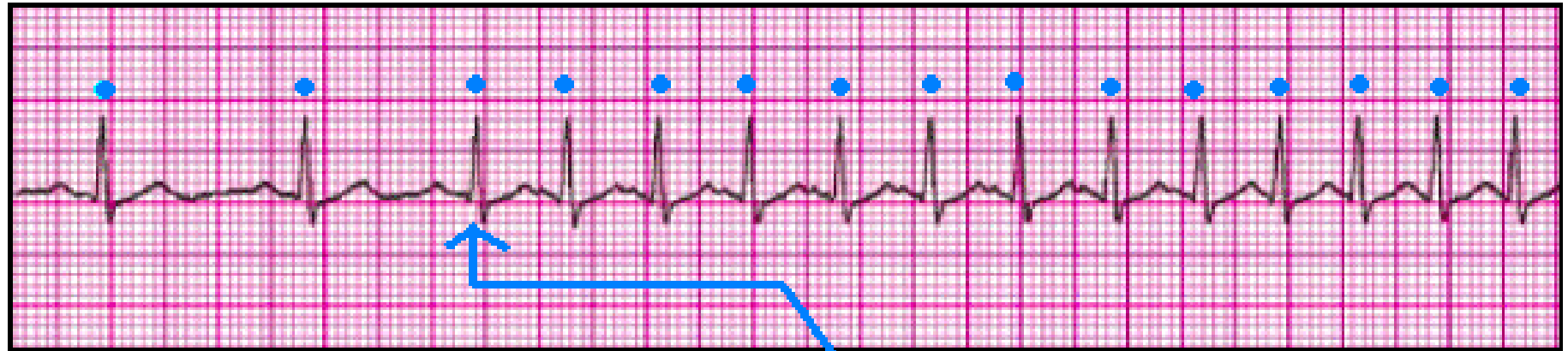
**OTHER ILLNESS**



**IDENTIFY & Tx DISORDER**



## RHYTHM CLUES . . . .

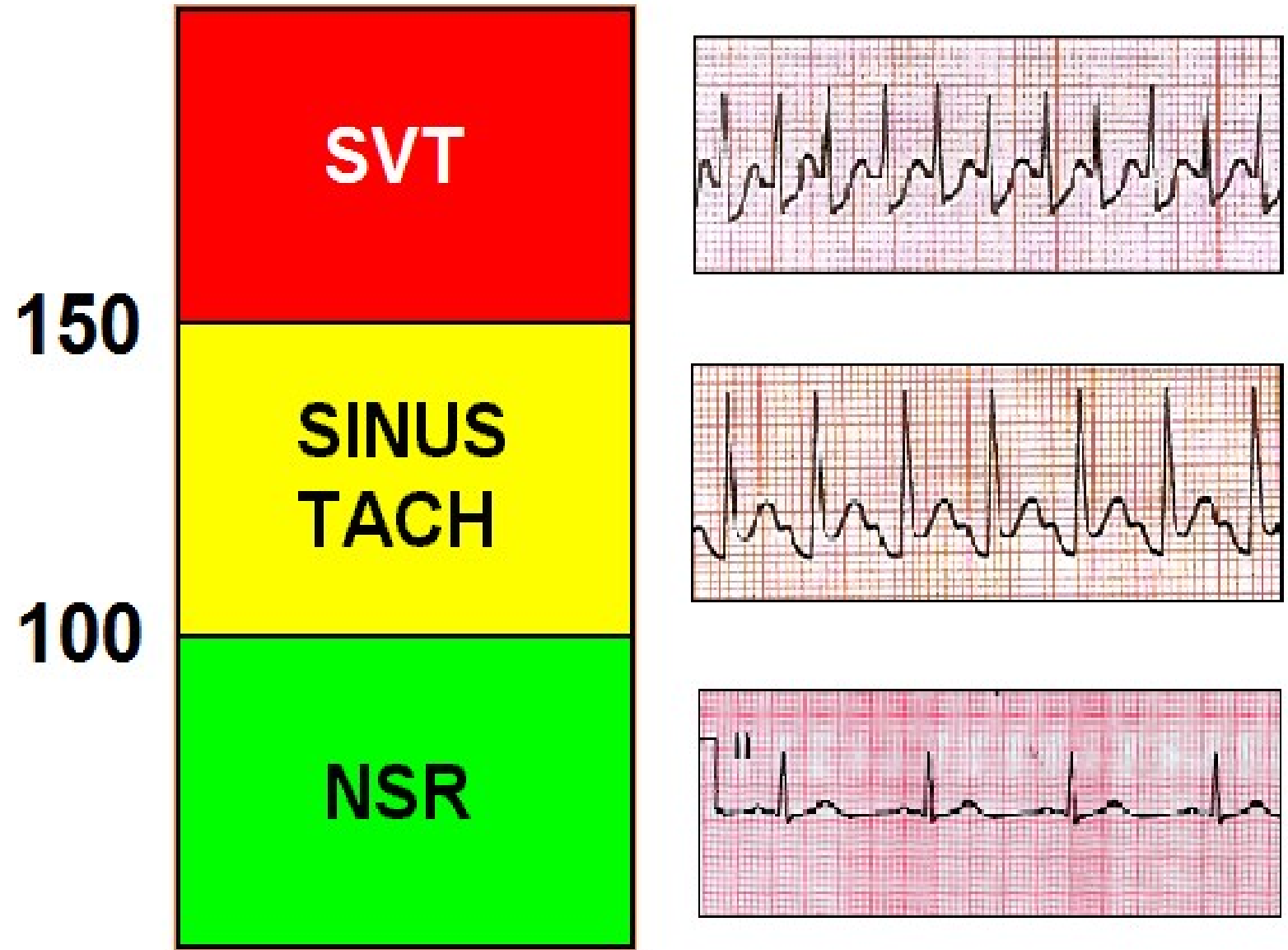


**SUPRAVENTRICULAR TACHYCARDIA**

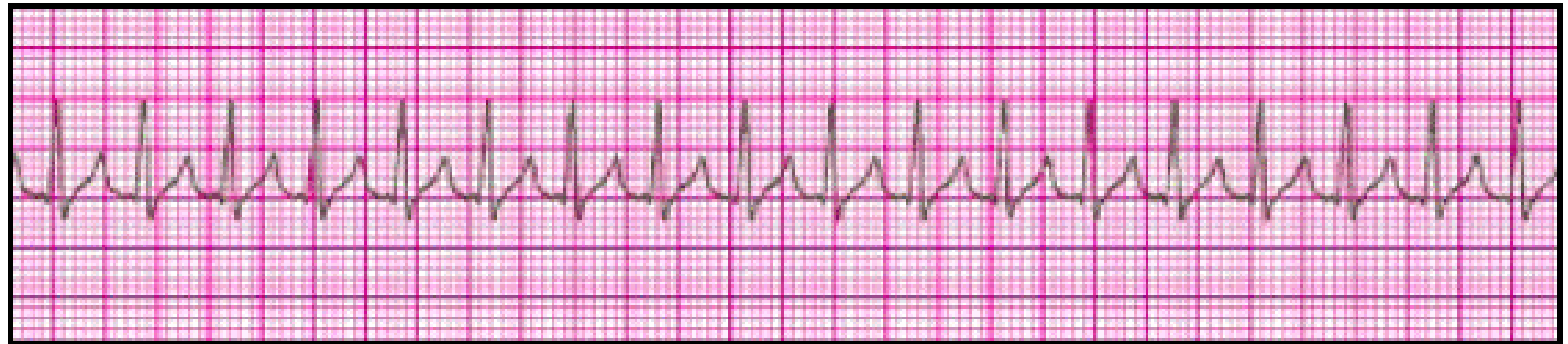
**SVT is usually PAROXYSMAL -- ie: has a SUDDEN ONSET.**

**SINUS TACHYCARDIA usually has a "ramp - up" and "ramp - down" period -- a gradual change in HEART RATE.**

# ACLS TACHYCARDIA GUIDELINES



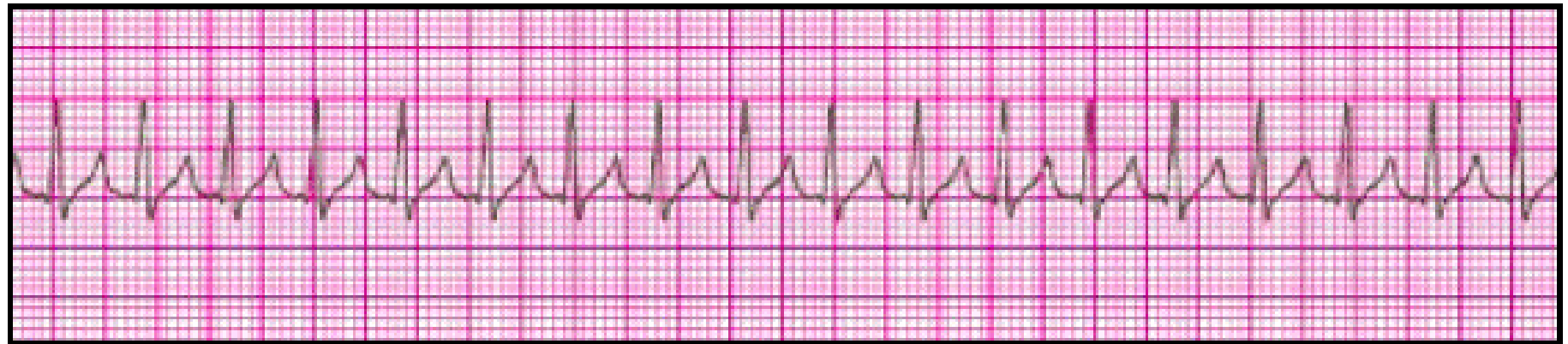
# THIS RHYTHM IS: SUPRAVENTRICULAR TACHYCARDIA (SVT)



**MAIN IDENTIFICATION CHARACTERISTIC(S): HEART RATE TOO FAST, USUALLY > 150. P WAVES MAY BE "BURIED" IN THE PRECEDING T WAVES. Pt USUALLY C/O "SUDDEN ONSET of HEART RACING," or "PALPITATIONS."**

<b>RATE</b> -----	<b>TACHYCARDIC (usually &gt; 150)</b>
<b>RHYTHM</b> -----	<b>REGULAR</b>
<b>P-R INTERVAL</b> -----	<b>NORMAL or ABNORMAL. MAY BE IMPOSSIBLE TO SEE DUE TO P WAVE BURIED IN T WAVES</b>
<b>P:QRS RATIO</b> -----	<b>1:1</b>
<b>QRS INTERVAL</b> -----	<b>NORMAL</b>

# THIS RHYTHM IS: SUPRAVENTRICULAR TACHYCARDIA (SVT)



**MAIN IDENTIFICATION CHARACTERISTIC(S): HEART RATE TOO FAST, USUALLY > 150. P WAVES MAY BE "BURIED" IN THE PRECEDING T WAVES. Pt USUALLY C/O "SUDDEN ONSET of HEART RACING," or "PALPITATIONS."**

## POTENTIAL PROBLEMS:

- HEART MAY BE BEATING TOO FAST TO ALLOW ADEQUATE TIME FOR VENTRICULAR FILLING, RESULTING IN ↓ CARDIAC OUTPUT AND POSSIBLE HYPOTENSION AND SHOCK.
- MYOCARDIAL ISCHEMIA (and therefore CHEST PAIN ) IN PATIENTS WITH SIGNIFICANT UNDERLYING HEART DISEASE.

# THIS RHYTHM IS: SUPRAVENTRICULAR TACHYCARDIA (SVT)



**MAIN IDENTIFICATION CHARACTERISTIC(S): HEART RATE TOO FAST, USUALLY > 150. P WAVES MAY BE "BURIED" IN THE PRECEDING T WAVES. Pt USUALLY C/O "SUDDEN ONSET of HEART RACING," or "PALPITATIONS."**

## TREATMENT / INTERVENTIONS:



**BASED ON WHETHER PATIENT IS**

**STABLE or UNSTABLE: . . .**

# **SVT - UNSTABLE PATIENT** ( NARROW QRS )

## **ABC s + GENERAL SUPPORTIVE CARE**

( OXYGEN, ECG / VS / SAO2 MONITORING, IV ACCESS )

## **IMMEDIATE SYNCHRONIZED CARADIOVERSION**

- CONSIDER SEDATION

—— ADENOSINE - IF IT DOES NOT DELAY CARADIOVERSION !

- SYNCHRONIZED CARADIOVERSION

REGULAR RHYTHM:

50 - 100 j biphasic

IRREGULAR RHYTHM:

100 - 200 j biphasic

----- monophasic = 200 j -----

# **SVT - STABLE PATIENT** (NARROW QRS)

## **ABCs + GENERAL SUPPORTIVE CARE**

### **REGULAR RHYTHM**

- VAGAL MANEUVERS
- ADENOSINE 6 mg / 12 mg

### **IRREGULAR RHYTHM**

POSSIBLE ATRIAL FIB or  
MULTIFOCAL ATRIAL TACH

- BETA BLOCKERS ( eg. DILTIAZEM, CARDIZEM )
- TREAT UNDERLYING CAUSE ( THE Hs and Ts )
- " EXPERT CONSULTATION "

MONITOR PATIENT -- IF PATIENT BECOMES UNSTABLE, GO TO "UNSTABLE" ALGORITHM

## THE " H's " and the " T's "

- HYPOVOLEMIA
- HYPOXIA
- HYDROGEN ION ( Ph )
- HYPOGLYCEMIA
- HYPOTHERMIA
  
- TOXINS
- TAMPONADE ( CARDIAC )
- TENSION PNEUMOTHORAX
- THROMBOSIS ( CORONARY or PULMONARY )
- TRAUMA



# THIS RHYTHM IS: ATRIAL FIBRILLATION



MAIN IDENTIFICATION CHARACTERISTIC(S): **IRREGULARLY IRREGULAR R-R INTERVALS, NO DISCERNABLE P WAVES, FIBRILLATORY BASE-LINE.**

RATE	—————	BRADY, NORMAL, or TACHY
RHYTHM	—————	<b>IRREGULARLY IRREGULAR</b>
P-R INTERVAL	————	<b>NOT DISCERNABLE</b>
P:QRS RATIO	————	<b>NOT DISCERNABLE</b>
QRS INTERVAL	————	NORMAL, (unless BBB present )

# THIS RHYTHM IS: ATRIAL FIBRILLATION



MAIN IDENTIFICATION CHARACTERISTIC(S): **IRREGULARLY IRREGULAR R - R INTERVALS, NO DISCERNABLE P WAVES, FIBRILLATORY BASE-LINE.**

## POTENTIAL PROBLEMS :

- VENTRICULAR RATE CAN BECOME TOO SLOW or TOO FAST
- WITHOUT THE " ATRIAL KICK," CARDIAC OUTPUT DROPS 10 -20%
- THROMBUS FORMATION MAY OCCUR IN THE LEFT ATRIAL APPENDAGE, PUTTING PATIENT AT HIGH RISK FOR CVA

# THIS RHYTHM IS: ATRIAL FIBRILLATION



**MAIN IDENTIFICATION CHARACTERISTIC(S):** **IRREGULARLY IRREGULAR R - R INTERVALS, NO DISCERNABLE P WAVES, FIBRILLATORY BASE-LINE.**

## TREATMENT / INTERVENTIONS:

**- NEED FOR EMERGENCY INTERVENTION FOR A-FIB IS BASED ON PATIENT'S VENTRICULAR RATE:**

**☞ TOO SLOW - SYMPTOMATIC BRADYCARDIA ALGORITHM**

**☞ TOO FAST - TACHYCARDIA ALGORITHM**

- **SYMPTOMATIC BRADYCARDIAS**
- **HEART BLOCKS with SLOW VENTRICULAR RATES**  
( patient symptomatic )



**Tx:**

- ✓ **ABC s**
- ✓ **GENERAL SUPPORTIVE CARE**
- ✓ **BRADYCARDIA ALGORITHM**

55 yr  
Male Caucasian  
Loc:3 Option:23

Vent. rate	178	BPM
PR interval	*	ms
QRS duration	90	ms
QT/QTc	264/454	ms
P-R-T axes	* -19	46

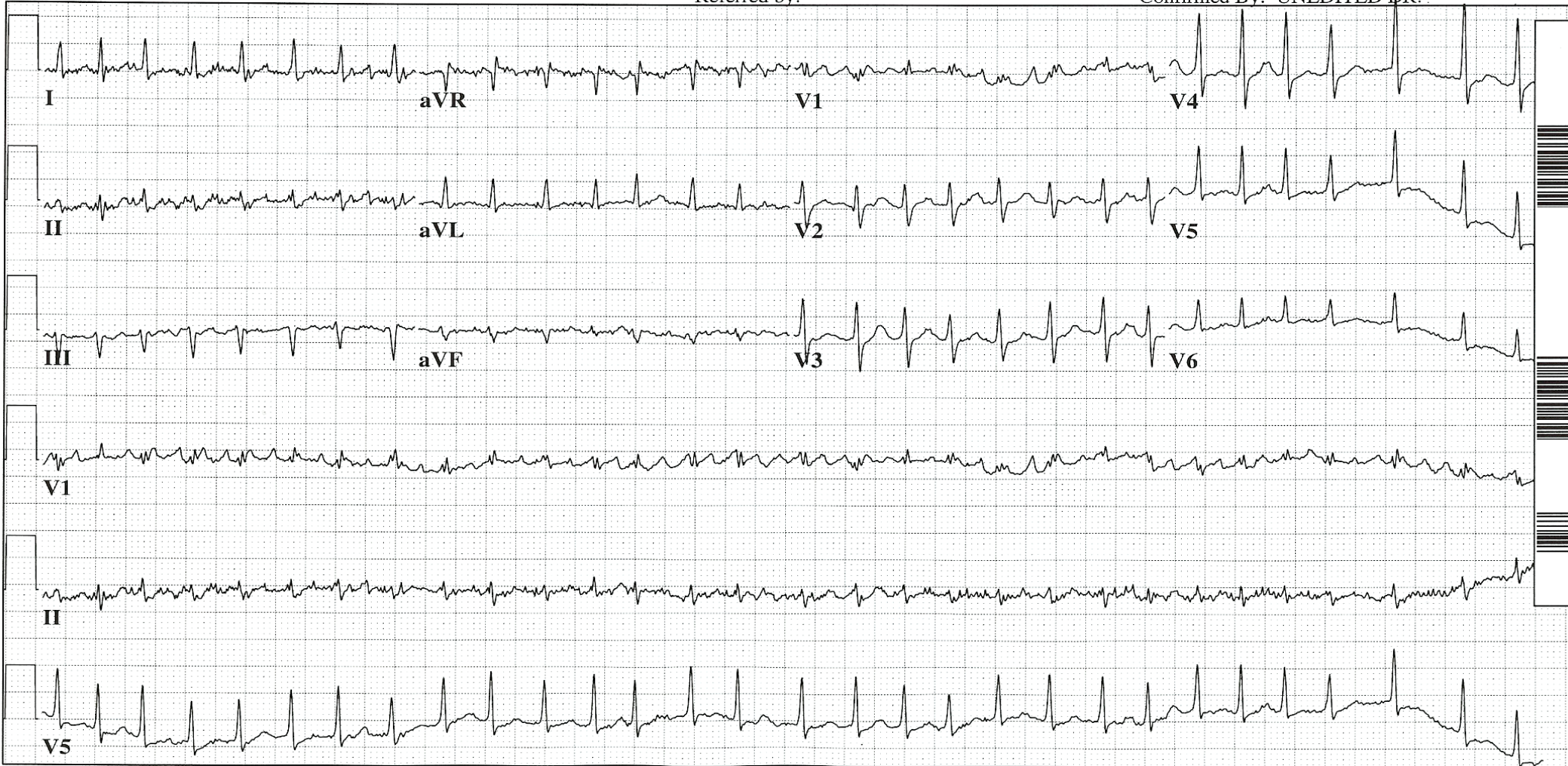
\*\*UNEDITED COPY - REPORT IS COMPUTER GENERATED ONLY, WITHOUT PHYSICIAN INTERPRETATION

**Atrial fibrillation with rapid ventricular response**  
 with premature ventricular or aberrantly conducted complexes  
 Nonspecific ST abnormality , probably digitalis effect  
 Abnormal ECG  
 When compared with ECG of 30-JUL-1998 15:14,  
 Atrial fibrillation has replaced Sinus rhythm  
 Vent. rate has increased BY 109 BPM ...

Technician:

Referred by:

Confirmed By: UNEDITED DR.



# ATRIAL FIBRILLATION

## *CRITICAL CONSIDERATION . . . .*

COULD PATIENT HAVE BEEN  
IN A - FIB FOR AT LEAST  
48 HOURS ? \_\_\_\_\_



**YES**

IS PATIENT ON  
ANTICOAGULANTS ? \_\_\_\_\_



**NO**



**THEN RULE OUT EMBOLI IN ATRIUM  
WITH EITHER A STAT ECHO or T.E.E.  
BEFORE CONVERTING TO SINUS  
RHYTHM !**

# **SVT - STABLE PATIENT** (NARROW QRS)

## **ABCs + GENERAL SUPPORTIVE CARE**

### **REGULAR RHYTHM**

- VAGAL MANEUVERS
- ADENOSINE 6 mg / 12 mg

### **IRREGULAR RHYTHM**

POSSIBLE ATRIAL FIB or  
MULTIFOCAL ATRIAL TACH

- BETA BLOCKERS ( eg. DILTIAZEM, CARDIZEM )
- TREAT UNDERLYING CAUSE ( THE Hs and Ts )
- " EXPERT CONSULTATION "

MONITOR PATIENT -- IF PATIENT BECOMES UNSTABLE, GO TO "UNSTABLE" ALGORITHM

# **SVT - UNSTABLE PATIENT** ( NARROW QRS )

## **ABC s + GENERAL SUPPORTIVE CARE**

( OXYGEN, ECG / VS / SAO2 MONITORING, IV ACCESS )

## **IMMEDIATE SYNCHRONIZED CARディオVERSION**

- CONSIDER SEDATION

—— ADENOSINE - IF IT DOES NOT DELAY CARディオVERSION !

- SYNCHRONIZED CARディオVERSION

REGULAR RHYTHM:

50 - 100 j biphasic

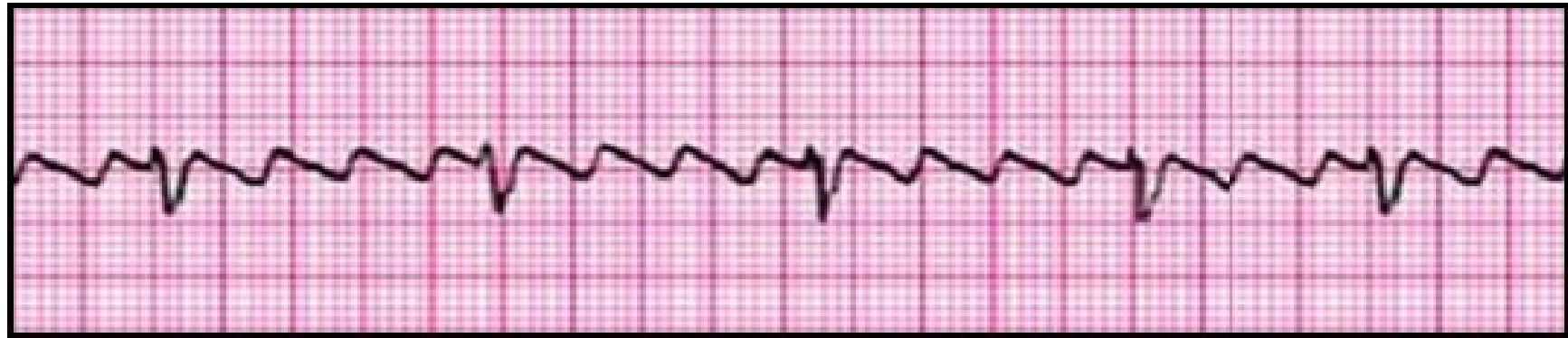
IRREGULAR RHYTHM:

100 - 200 j biphasic

----- monophasic = 200 j -----



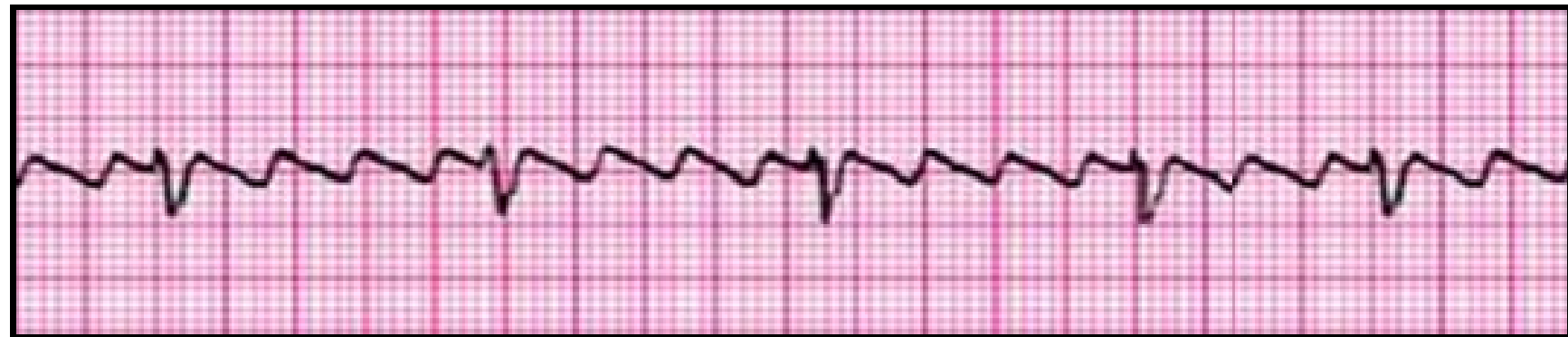
# THIS RHYTHM IS: ATRIAL FLUTTER



MAIN IDENTIFICATION CHARACTERISTIC(S): **RAPID RATE "SAW-TOOTHED" FLUTTER WAVES (F-WAVES)**

RATE ----- **ATRIAL : 200 - 300, VENT: BRADY, NORMAL or TACHY**  
RHYTHM ----- **REGULAR or IRREGULAR**  
P-R INTERVAL ----- **USUALLY NORMAL, CONSISTENT**  
P: QRS RATIO ----- **VARIES (usually 3:1, 4:1, or 5:1)**  
QRS INTERVAL ----- **NORMAL (unless BBB present)**

# THIS RHYTHM IS: ATRIAL FLUTTER



MAIN IDENTIFICATION CHARACTERISTIC(S): **RAPID RATE "SAW-TOOTHED" FLUTTER WAVES (F-WAVES)**

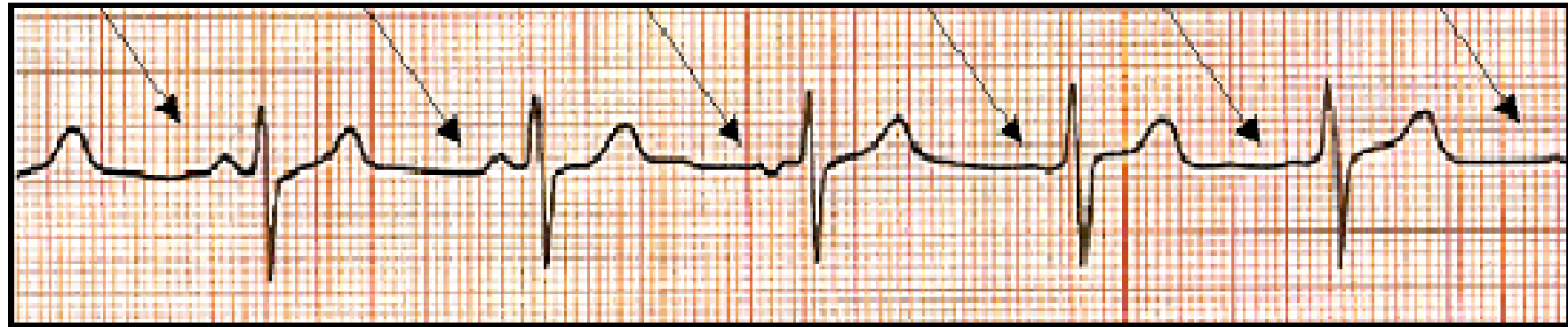
## POTENTIAL PROBLEM(S):

- **VENTRICULAR RATE CAN BE TOO RAPID or TOO SLOW**
- **A-FLUTTER OFTEN IS INTERMITTENT WITH A-FIB -- A-FIB PRECAUTIONS APPLY (THROMBUS RISKS)**

## TREATMENT / INTERVENTIONS:

- ☞ **TOO SLOW - SYMPTOMATIC BRADYCARDIA ALGORITHM**
- ☞ **TOO FAST - TACHYCARDIA ALGORITHM**

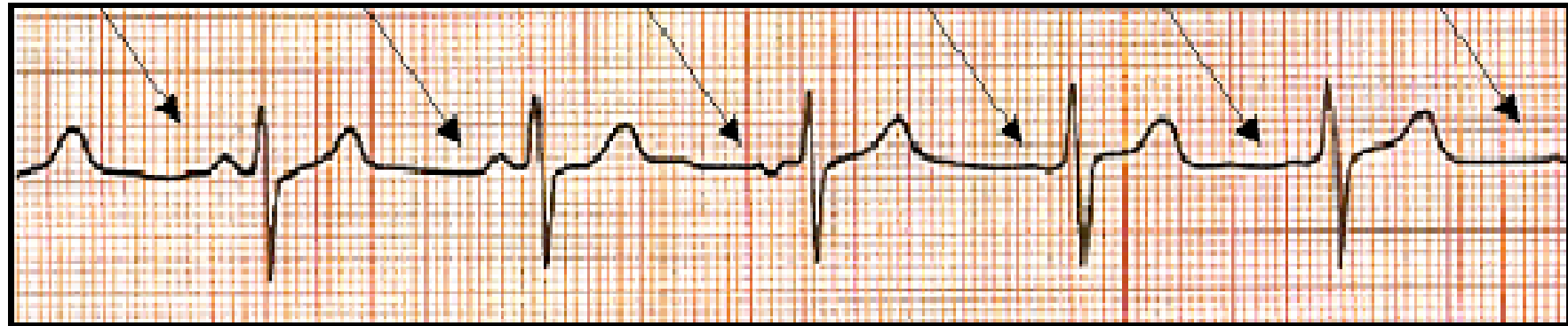
# THIS RHYTHM IS: WANDERING ATRIAL PACEMAKER



**MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ARE OF DIFFERENT SIZES, DEFLECTIONS, and P - R INTERVALS SLIGHTLY VARY**

RATE	NORMAL
RHYTHM	NORMAL
P-R INTERVAL	<b>SLIGHT VARIATION</b>
P: QRS RATIO	1:1
QRS INTERVAL	NORMAL (unless BBB)

## **THIS RHYTHM IS: WANDERING ATRIAL PACEMAKER**



**MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ARE OF DIFFERENT SIZES, DEFLECTIONS, and P - R INTERVALS SLIGHTLY VARY**

### **POTENTIAL PROBLEM(S):**

- **USUALLY NONE.**
- **THIS RHYTHM IS SEEN MOST FREQUENTLY IN HEALTHY YOUNG CHILDREN**

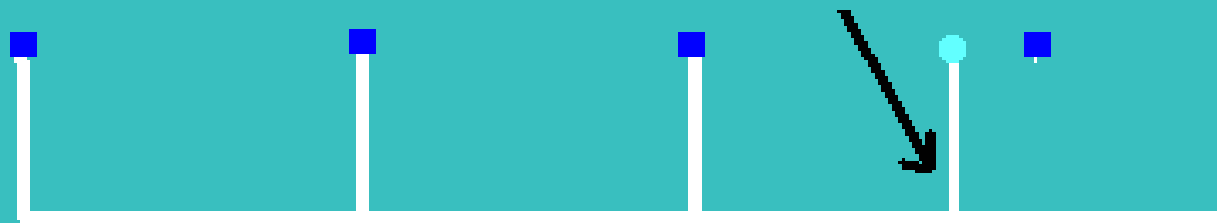
# ECTOPY

- ATRIAL
- JUNCTIONAL
- VENTRICULAR

# CLASSIFICATIONS OF ECTOPY

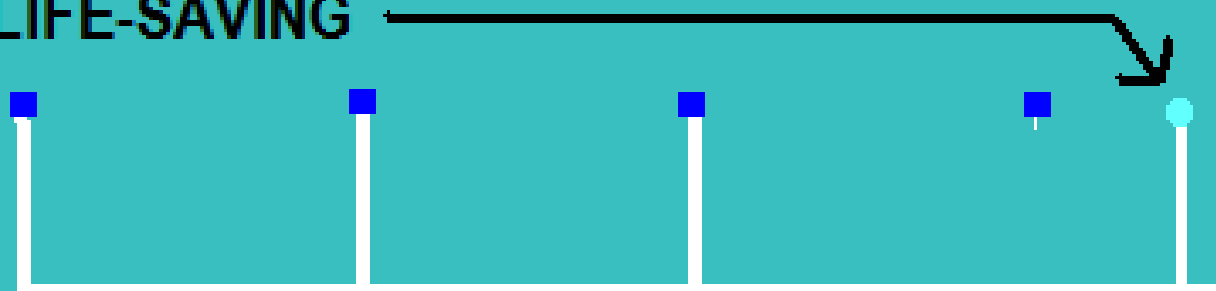
## 1. PREMATURE

THE ECTOPIC BEAT COMES BEFORE THE NEXT REGULARLY EXPECTED BEAT (IT'S EARLY!)



## 2. END-DIASTOLIC, ESCAPE, or COMPENSATORY

THE ECTOPIC BEAT COMES AFTER A REGULAR BEAT FAILS TO HAPPEN. END-DIASTOLIC BEATS MAY BE LIFE-SAVING



# CAUSES OF ECTOPY


---

## 1. PREMATURE

- HYPOXIA
- IRRITABILITY
- CHANGES IN SYMPATHETIC / PARASYMPATHETIC TONE
- DAMAGE TO MYOCARDIUM CAUSING CHANGES IN AUTOMATICITY (such as from MI / NECROSIS, etc. ).
- MEDICATIONS / SUBSTANCES
- ELECTROLYTES

## 2. END-DIASTOLIC, ESCAPE, or COMPENSATORY

- FAILURE OF SA NODE
- FAILURE OF AV NODE



WHEN THESE FAIL TO PRODUCE OR PROPOGATE AN IMPULSE, ESCAPE FOCI MAY TAKE OVER PACING THE HEART BY PRODUCING END-DIASTOLIC BEATS

# SIMPLY STATED,

1. PREMATURE BEATS ----

**BAD**



IN SOME CASES WE MUST ELIMINATE  
PREMATURE BEATS TO PROTECT THE  
PATIENT

2. END-DIASTOLIC or ESCAPE BEATS ----

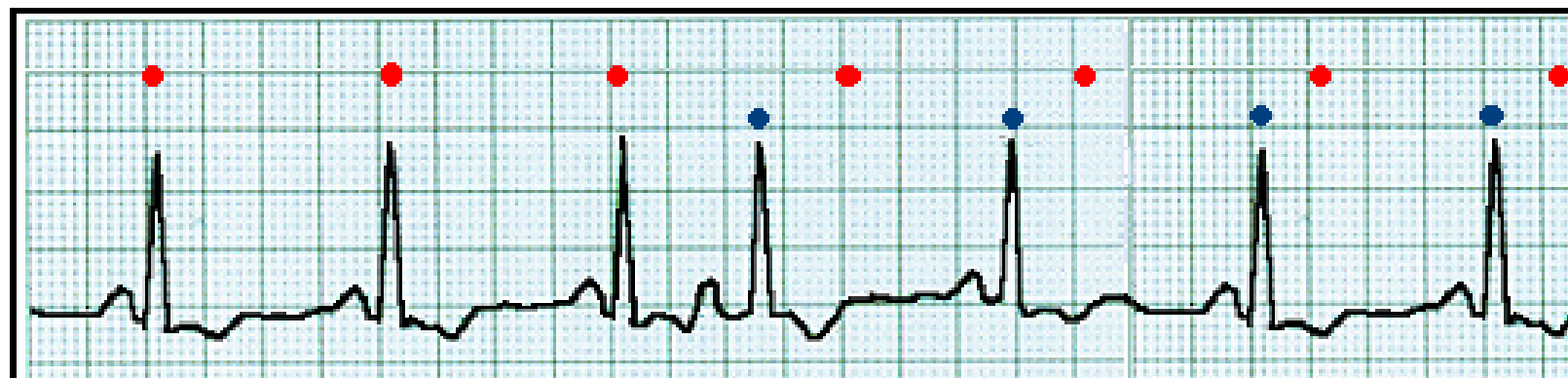
**GOOD**



ELIMINATION OF END-DIASTOLIC  
BEATS COULD BE DEADLY



# THIS RHYTHM IS: NSR with PAC



**MAIN IDENTIFICATION CHARACTERISTIC(S):** **PREMATURE COMPLEX,**  
**NORMAL QRS; P-WAVE DIFFERENT THAN OTHERS; P-R INTERVAL**  
**FREQUENTLY LONGER or SHORTER THAN NORMAL; NO COMPENSATORY PAUSE**

**RATE** ————— **NORMAL**

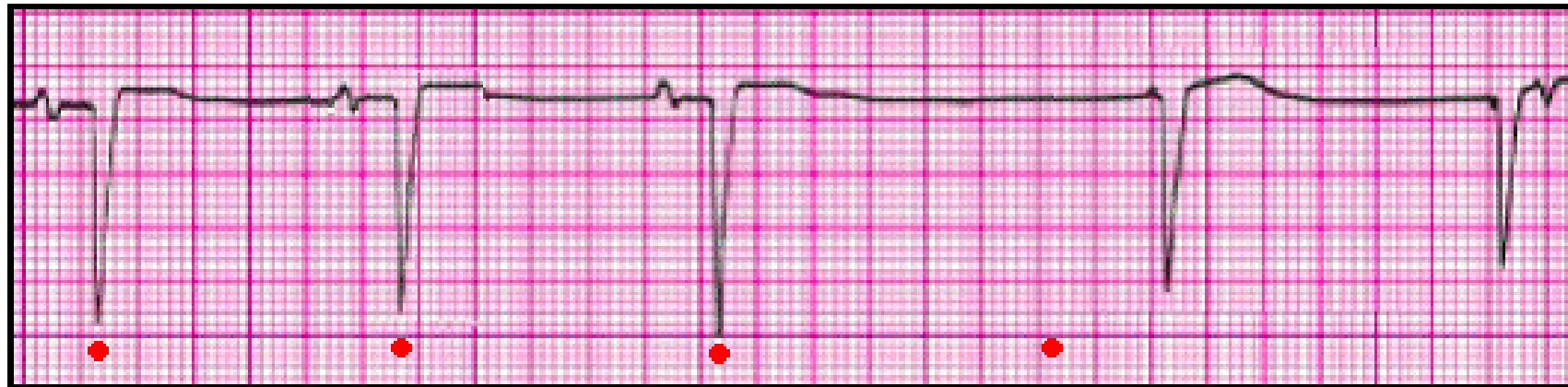
**RHYTHM** ————— **IRREGULAR**

**P-R INTERVAL** ——— **NORMAL (except PAC may be LONGER or SHORTER )**

**P: QRS RATIO** ——— **1 : 1**

**QRS INTERVAL** ——— **NORMAL ( unless BBB present )**

# THIS RHYTHM IS: NSR with JUNCTIONAL ESCAPE BEAT



**MAIN IDENTIFICATION CHARACTERISTIC(S): BEAT OCCURS LATER THAN NEXT EXPECTED BEAT; QRS IS NORMAL; P WAVE ABSENT or JUST IN FRONT OF or JUST AFTER QRS and is USUALLY INVERTED.**

**RATE** ----- **NORMAL**

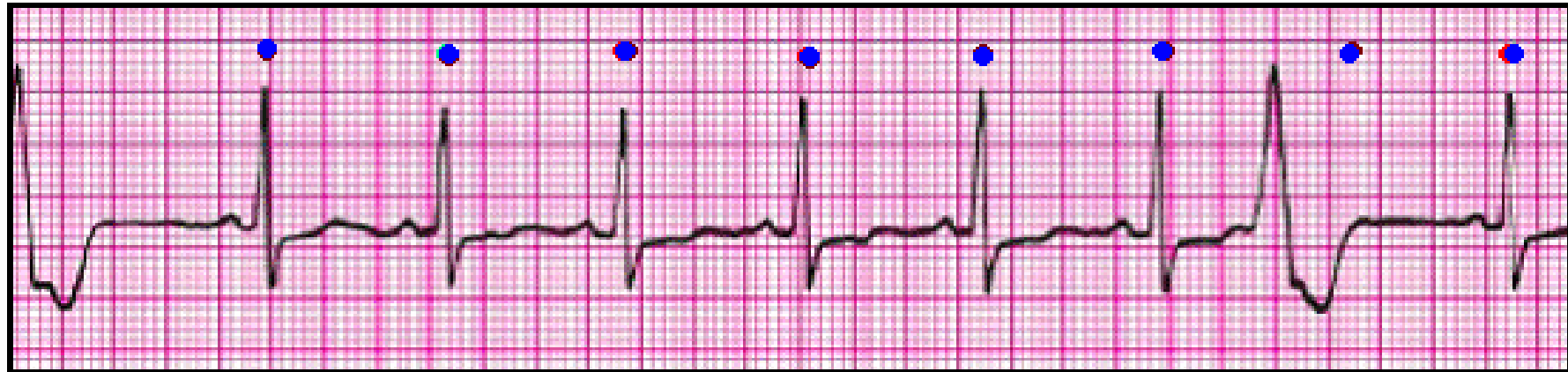
**RHYTHM** ----- **IRREGULAR (because of ESCAPE BEAT)**

**P-R INTERVAL** ----- **NORMAL for NSR/ ABSENT or SHORT for ESCAPE BEAT**

**P:QRS RATIO** ----- **1:1 for NSR / 0:1 or 1:1 for ESCAPE BEAT**

**QRS INTERVAL** ----- **NORMAL (unless BBB present)**

# THIS RHYTHM IS: NSR with UNIFOCAL PVCs



**MAIN IDENTIFICATION CHARACTERISTIC(S):** ECTOPIC BEATS ARE PREMATURE, AND WIDE ( $> 120$  ms); COMPLEXES MAY BE OF ANY SHAPE or DEFLECTION, BUT ALL HAVE SAME APPEARANCE; THERE IS A COMPENSATORY PAUSE

RATE	—————	NORMAL
RHYTHM	—————	IRREGULAR (due to PVCs)
P-R INTERVAL	————	NSR BEATS - NORMAL (120 - 200 ms)    PVCs - N/A
P: QRS RATIO	————	NSR BEATS - 1 : 1    PVCs - N/A
QRS INTERVAL	————	NSR BEATS $< 120$ ms    PVCs $> 120$ ms

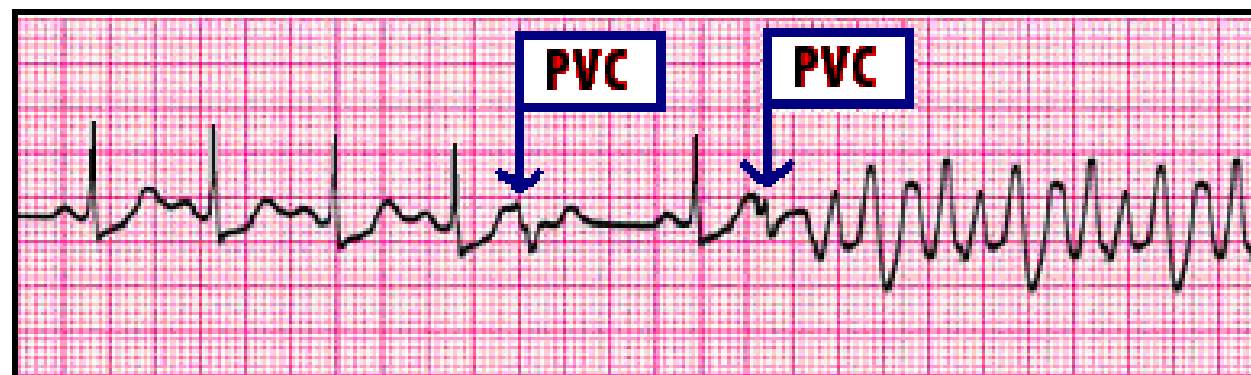
# THIS RHYTHM IS: NSR with MULTIFOCAL PVCs



**MAIN IDENTIFICATION CHARACTERISTIC(S): ECTOPIC BEATS ARE PREMATURE AND WIDE ( $> 120$  ms); THEY VARY IN SHAPE and DEFLECTION; THERE IS A COMPENSATORY PAUSE**

RATE	NORMAL
RHYTHM	<b>IRREGULAR (due to PVCs)</b>
P-R INTERVAL	NSR BEATS - NORMAL (120 - 200 ms) <b>PVCs - N/A</b>
P:QRS RATIO	NSR BEATS - 1:1 <b>PVCs - N/A</b>
QRS INTERVAL	NSR BEATS $< 120$ ms <b>PVCs <math>&gt; 120</math> ms</b>

# THIS RHYTHM IS: NSR with **R on T** PHENOMENON

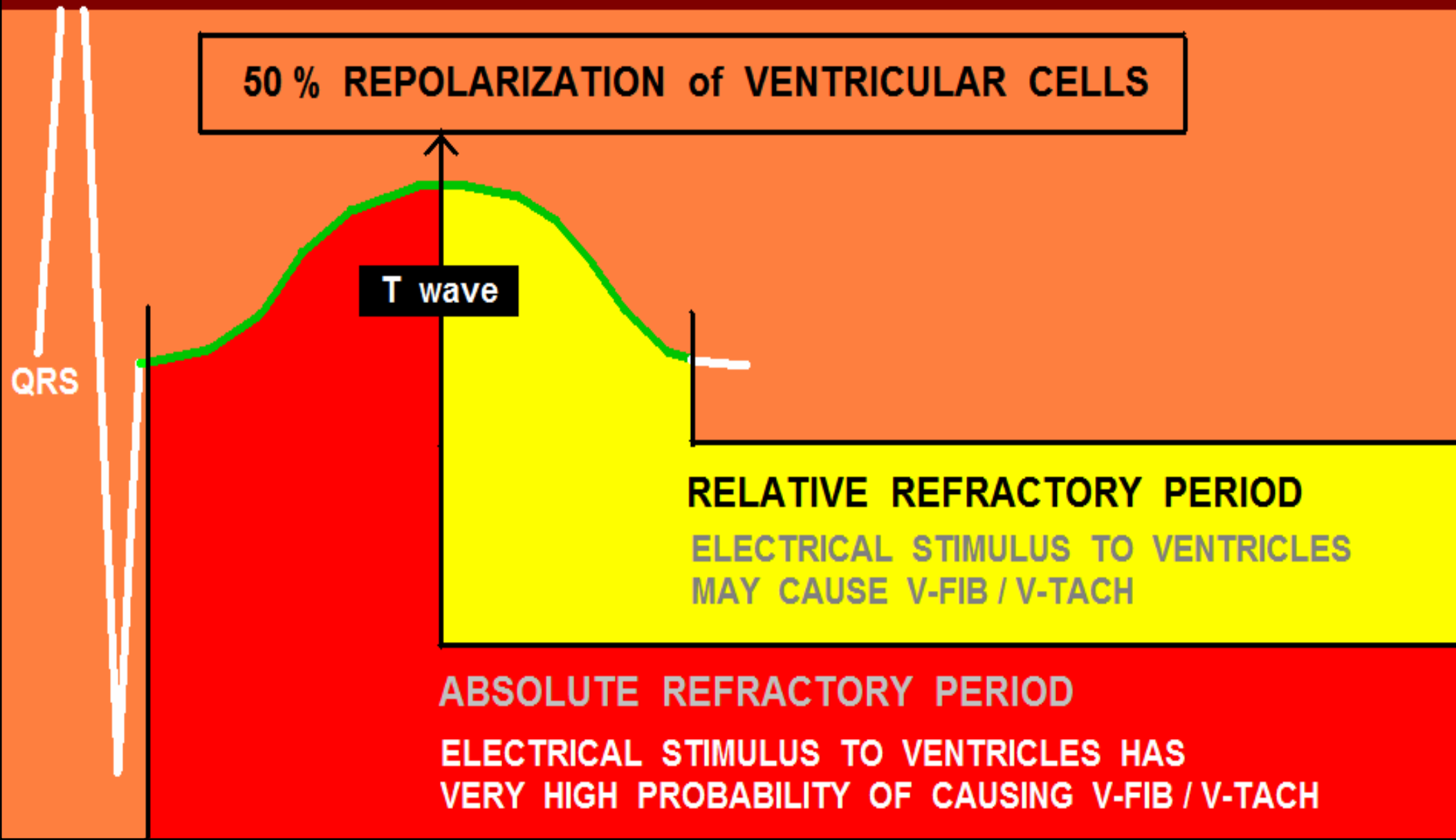


**MAIN IDENTIFICATION CHARACTERISTIC(S): ECTOPIC BEATS ARE WIDE (> 120 ms); ALL APPEAR TO HAVE SAME SHAPE and DEFLECTION; THERE IS A COMPENSATORY PAUSE**

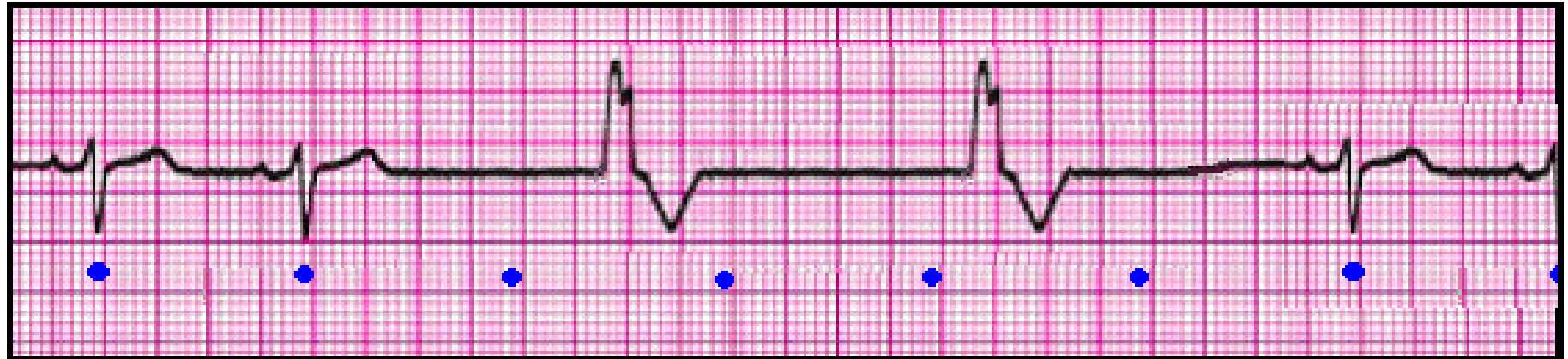
## POTENTIAL PROBLEMS (S):

- THE UNDERLYING REASON PVCs ARE PRESENT COULD BE A CRITICAL ISSUE . . .
- PVCs MAY HAVE A WEAKER PULSE, or NO PULSE
- PVCs DURING REFRACTORY PERIOD COULD CAUSE V-FIB
- PVCs COUPLED TOGETHER COULD PRECIPITATE V-TACH

# CARDIAC ANATOMY and PHYSIOLOGY "101"



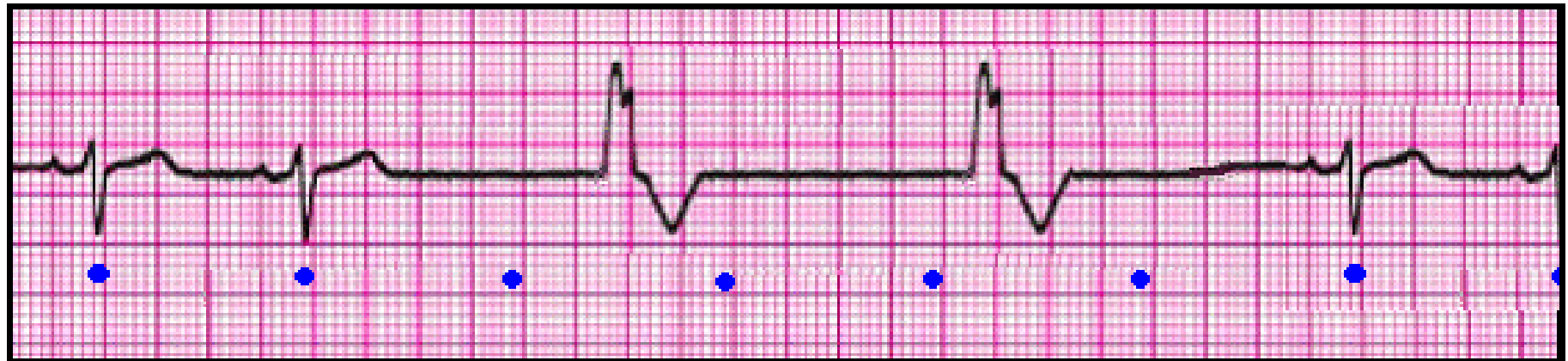
# THIS RHYTHM IS: SINUS ARREST w/ VENT. ESCAPE



**MAIN IDENTIFICATION CHARACTERISTIC(S): END DIASTOLIC (ESCAPE) BEAT(S); COMPLEXES WIDER THAN 120 ms ; MAY BE UNIFOCAL or MULTIFOCAL; MAY or MAY NOT HAVE GOOD PULSE w/ COMPLEXES**

<b>RATE</b> -----	<b>USUALLY &lt; 40</b>
<b>RHYTHM</b> -----	<b>VENT. ESCAPE: USUALLY REGULAR</b>
<b>P-R INTERVAL</b> -----	<b>VENT. ESCAPE: N / A</b>
<b>P: QRS RATIO</b> -----	<b>VENT. ESCAPE: N / A</b>
<b>QRS INTERVAL</b> -----	<b>VENT. ESCAPE: &gt; 20 ms</b>

## THIS RHYTHM IS: SINUS ARREST w/ VENT. ESCAPE



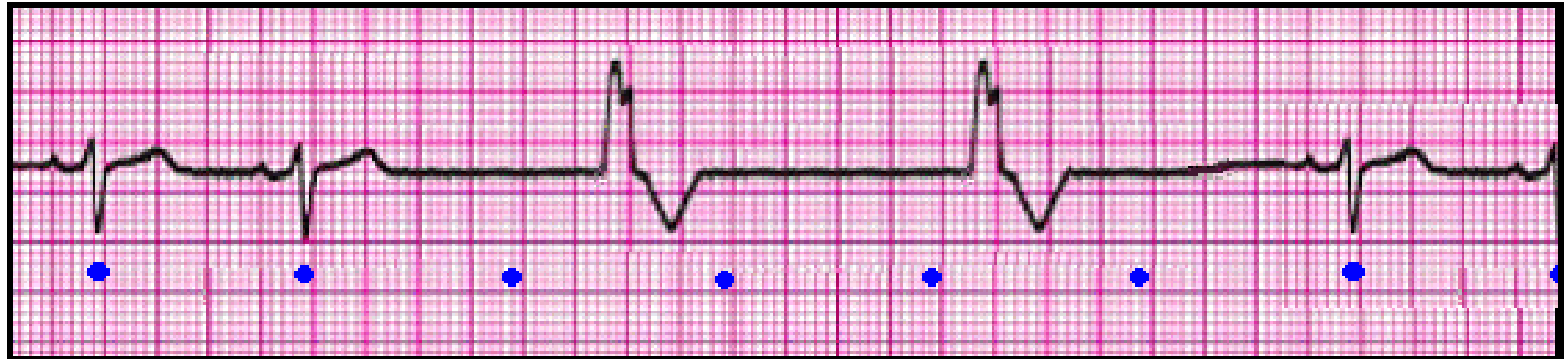
**MAIN IDENTIFICATION CHARACTERISTIC(S):** END DIASTOLIC (ESCAPE) BEAT(S); COMPLEXES WIDER THAN 120 ms ; MAY BE UNIFOCAL or MULTIFOCAL; MAY or MAY NOT HAVE GOOD PULSE w/ COMPLEXES

### PRESENTING PROBLEM(S):

- PROBLEM IS WITH UNDERLYING REASON WHY SINUS NODE and AV NODE HAVING PERIODS OF ARREST.
- THE VENTRICULAR ESCAPE COMPLEXES MAY BE VERY SLOW, BUT MAY BE ONLY THING KEEPING PATIENT PERFUSED DURING PERIODS OF SINUS/AV ARREST.



## THIS RHYTHM IS: SINUS ARREST w/ VENT. ESCAPE



### TREATMENT / INTERVENTION (S):

- EMERGENT TREATMENT IS TRANSCUTANEOUS PACING.
- TREAT UNDERLYING CAUSE OF SINUS / AV ARREST
- **DO NOT** ATTEMPT TO SUPPRESS VENTRICULAR ESCAPE BEATS WITHOUT HAVING BACK-UP TRANSCUTANEOUS / TRANSVENOUS PACING ATTACHED TO PATIENT !!!

# THIS RHYTHM IS: NSR w/ COUPLET and RUN of V-TACH

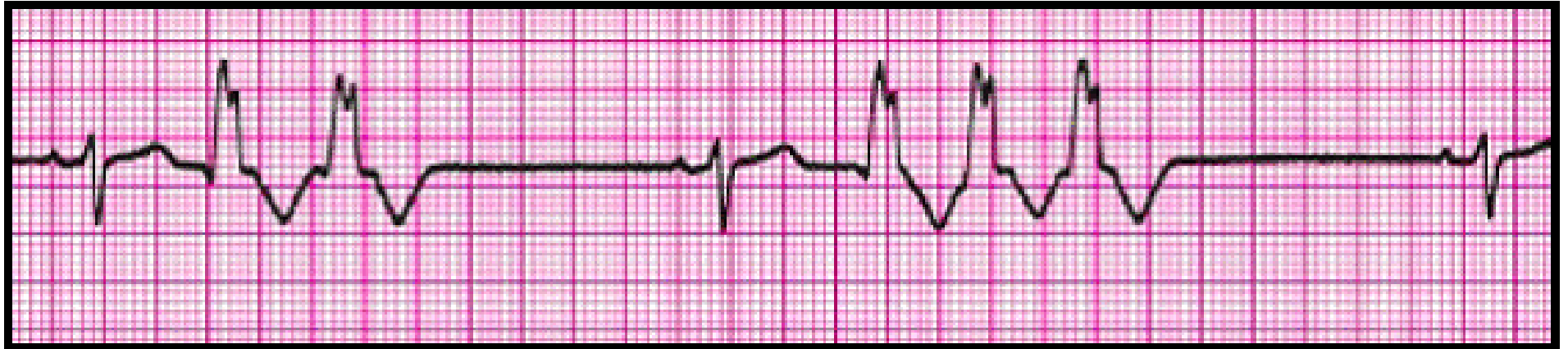


MAIN IDENTIFICATION CHARACTERISTIC(S): **ECTOPIC BEATS ARE WIDE (> 120 ms); PVCs ARE COUPLED TOGETHER (2 = "COUPLET"), (3 or more = RUN OF V-TACH)**

## POTENTIAL PROBLEMS (S):

- **THE UNDERLYING REASON PVCs ARE PRESENT COULD BE A CRITICAL ISSUE . . .**
- **PVCs MAY HAVE A WEAKER PULSE, or NO PULSE**
- **PVCs DURING REFRACTORY PERIOD COULD CAUSE V-FIB**
- **PVCs COUPLED TOGETHER COULD PRECIPITATE V-TACH**

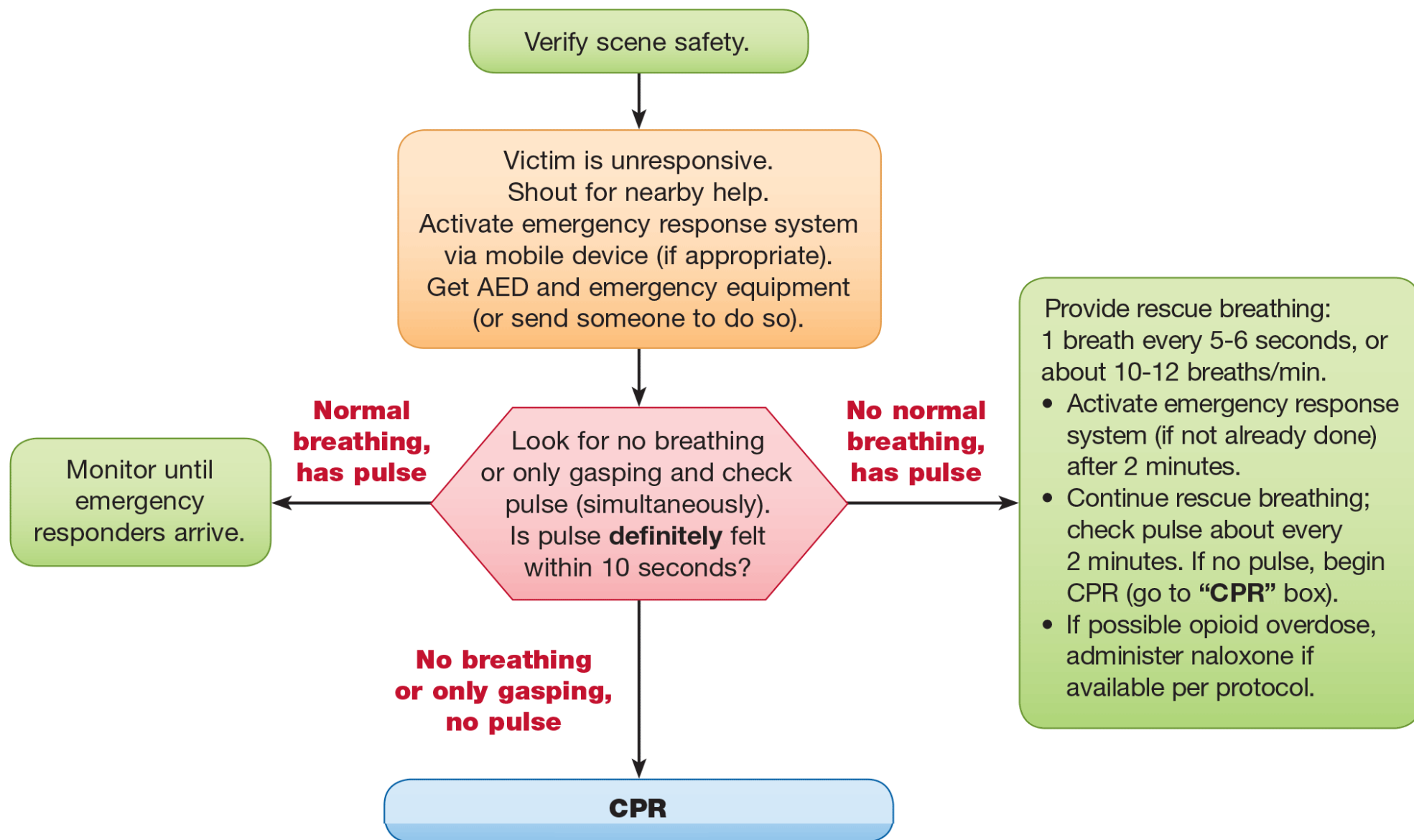
# **THIS RHYTHM IS: NSR w/ COUPLET and **RUN OF V-TACH****



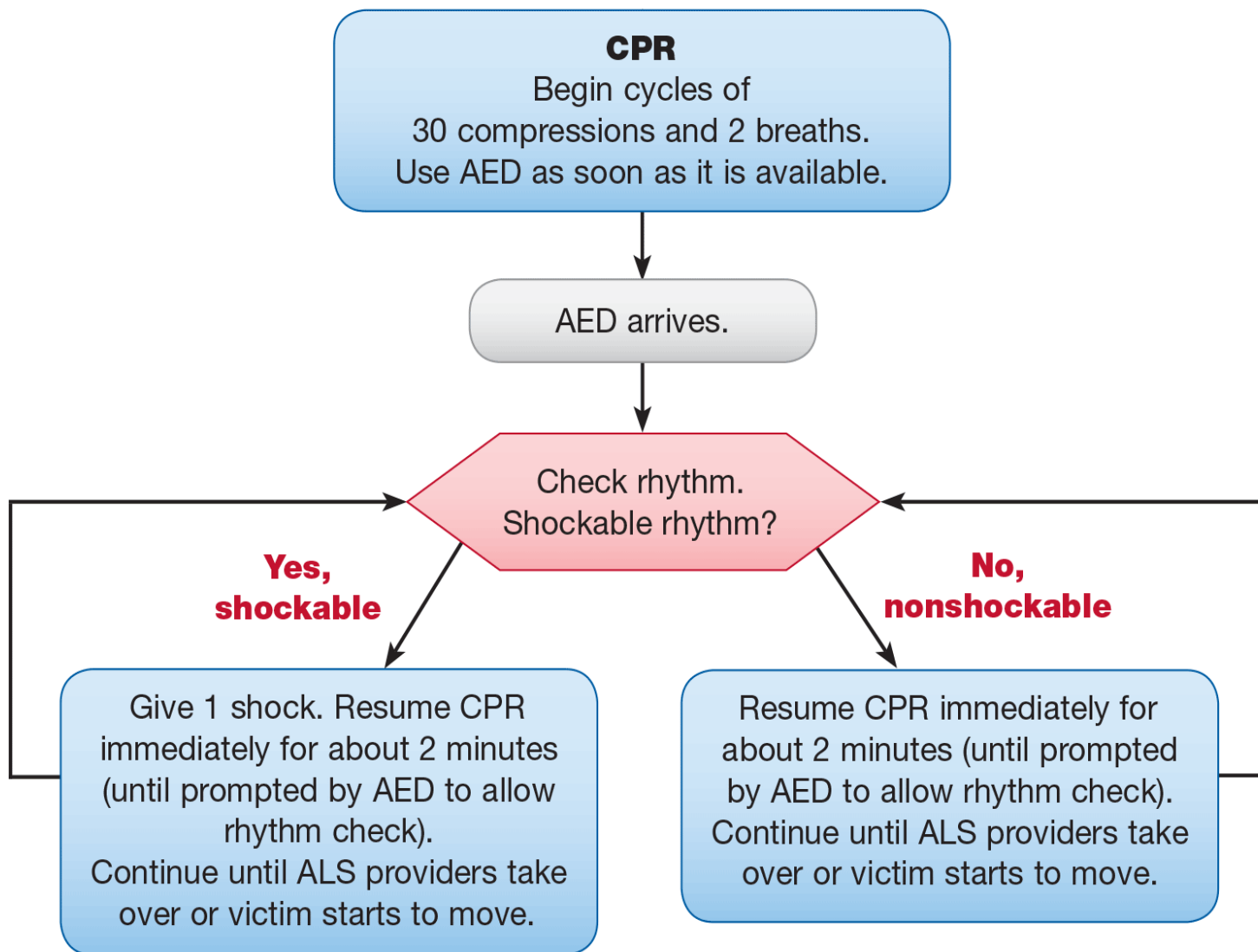
## **TEXTBOOK STANDARDS:**

- **3 or more PVCs IN A ROW = RUN OF VENTRICULAR TACHYCARDIA**
- **DEFINITION OF "SUSTAINED V-TACH" VARIES FROM "3 or more BEATS IN A ROW" to "MORE THAN 30 SECONDS OF V-TACH."**  
(**"Electrophysiologic Testing," by: Richard N. Fogoros, MD, p. 179**)
- **ACLS 2006 Standards DO NOT define WHEN you treat VENTRICULAR ECTOPY, or attempt to define when "RUNS OF PVCs" are to be considered as "VENTRICULAR TACHYCARDIA."**

# BLS Healthcare Provider Adult Cardiac Arrest Algorithm—2015 Update



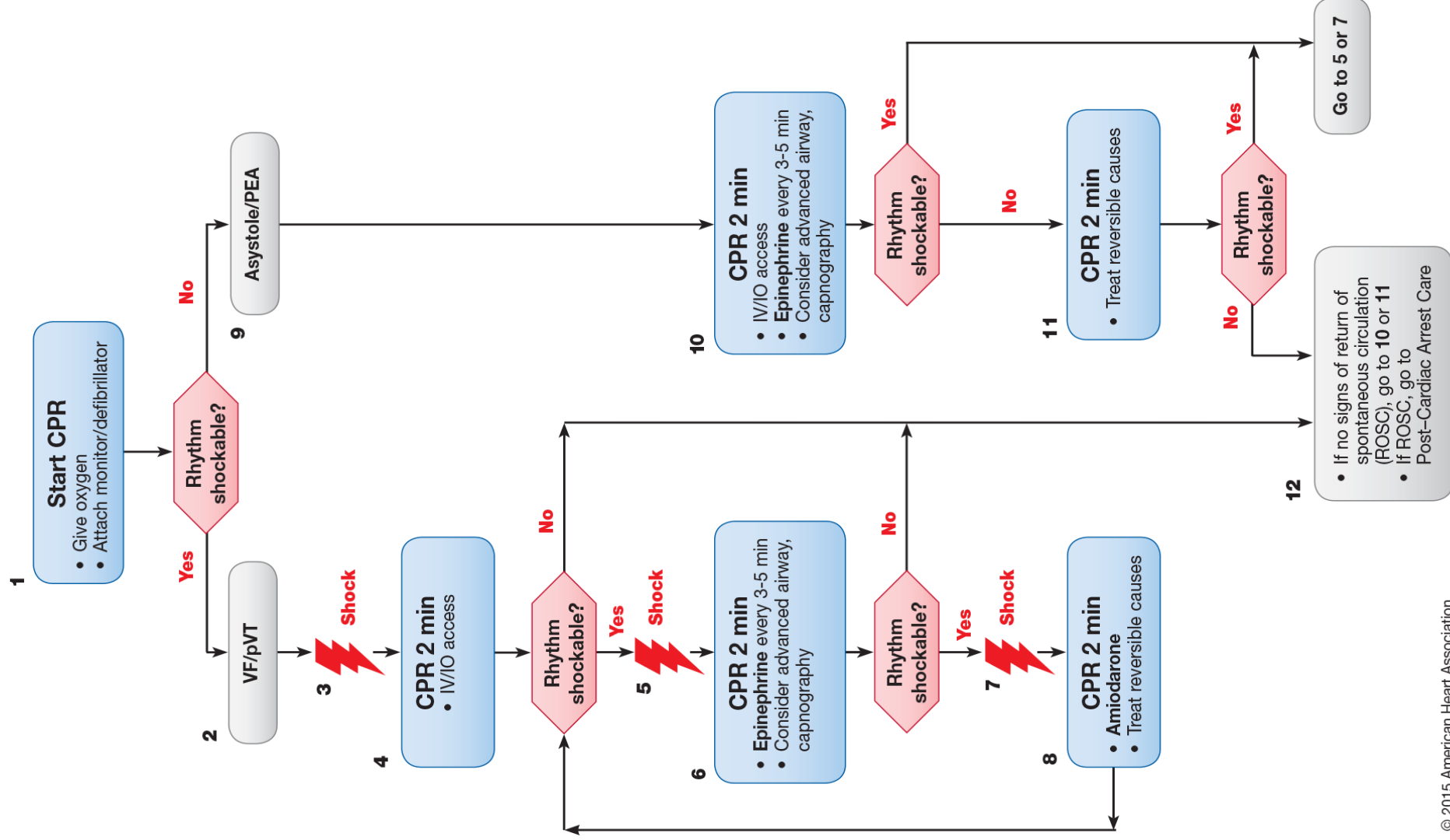
# BLS Healthcare Provider Adult Cardiac Arrest Algorithm—2015 Update





**IF NO PULSE WITH THIS RHYTHM?**

# Adult Cardiac Arrest Algorithm – 2015 Update



## CPR Quality

- Push hard (at least 2 inches [5 cm] and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If PETCO<sub>2</sub> <10 mm Hg, attempt to improve CPR quality.
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

## Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

## Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.

## Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

## Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in PETCO<sub>2</sub> (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

## Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary