Pacemaker Training Program
Special Functions:
Sleep Modes

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"Sleep" Modes

- The heart benefits from a decreased heart rate at night
- Without this nightly "rest" diastolic function and systolic function decline
- Affects dysfunctional hearts more than normal hearts

"Sleep" Modes

- Most patients will not have a sleep mode activated
- In those that do have an active sleep mode, it usually will not be an issue
- However in some cases, the sleep mode can be a distraction or even a problem
- Thus you should know how to determine if the pacer or ICD has an active sleep mode

"Sleep" Modes

Manufacturer	Name	Mechanism
• St Jude	Rest mode	Activity based
• Medtronic	Sleep rate	Time based
• Biotronik	Night rate	Time based
• Bost. Scient.	Hysteresis	HR based

St Jude Rest Mode

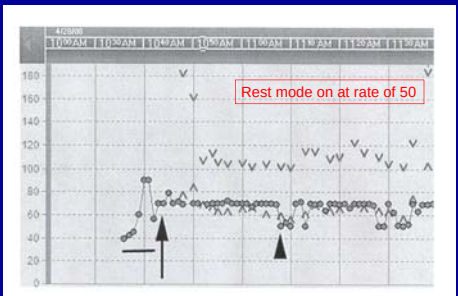
- Uses accelerometer to detect patient activity
- If activity decreases significantly for a sufficient amount of time (e.g., 20 minutes), the Rest Mode activates
- Any new onset activity turns off the Rest Mode quickly

St Jude Rest Mode

- 72 yo W for R breast lumpectomy
- Has a right-sided St Jude DDDR Pacemaker LRL 60
- Pacemaker dependent
- Pacer mode converted to DOO at 70

Streckenbach SC, Anesthesiology 2008; 109:1137-9

Rest Mode: St Jude Medical



Streckenbach SC, Anesthesiology 2008; 109:1137-9

Clinical Outcome

- The heart rate decreases did not affect the patient
- However the anesthesiologist was distracted
- Once I turned off the rest mode, he was able to focus on the patient and not the pacer.

How can one determine if the Rate Response Mode is active?

- Programmer report
- Programmer interrogation

St Jude Programmer Report Rest Rate ON

Basic Operation

Mode	DDIR	Sensor
Magnet Response	Battery Test	Threshold
		Measured Avg
		Slope
		Measured Auto
		Max Sensor Rate
		Reaction Time
		Recovery Time

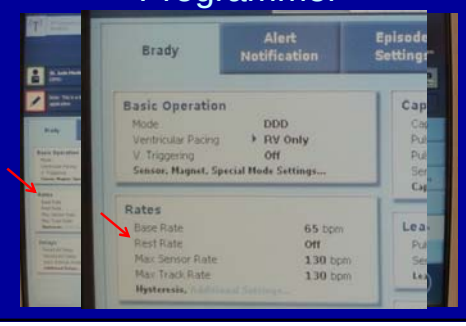
Rates

Base Rate	60 bpm	Hysteresis Rate
Rest Rate	55 bpm	
Max Sensor Rate	120 bpm	

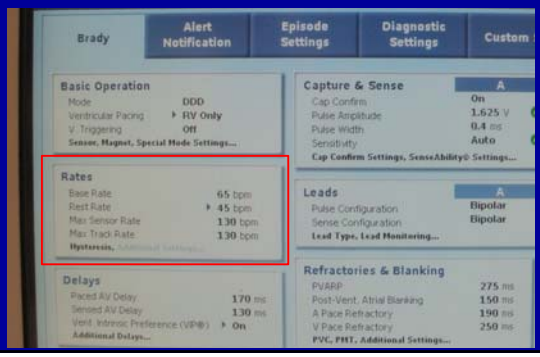
St Jude Programmer Report Rest Rate Off

Basic Operation		Refractories & Blanking	
Mode	DDD	PVARP	275 ms
Ventricular Pacing	LV→RV , 40 ms	Post-Vent. Atrial Blanking	200 ms
V. Triggering	Off	Rate Responsive PVARP/V Ref	Off
Magnet Response	Normal	A/V Pace Refractory	220/220 ms
V. Noise Reversion Mode	Pacing Off	A/V Sense Refractory	93/125 ms
Episodal Pacing Mode	DDI	Ventricular Blanking	52 ms
Sensor	Passive	Ventricular Safety Standby	On
Threshold (Measured Avg.)	Auto (-0.5) (2.0)	Arrhythmia Unhiding	3 intervals
Slope (Measured Auto)	Auto (+2) (9)	PVC Response	Off
Max Sensor Rate	130 bpm	PMT Response	Atrial Pace
Reaction Time	Fast	PMT Detection Rate	110 bpm
Recovery Time	Medium		
Rates		**AT/AF Detection & Response**	
Base Rate	60 bpm	Auto Mode Switch	DDI
Rest Rate	Off	AMS V. Triggering	Off
Max Sensor Rate	130 bpm	A. Tachycardia Detection Rate	180 bpm
Max Track Rate	130 bpm	AMS Base Rate	80 bpm
Hysteresis Rate	Off	AF Suppression™	Off
2:1 Block Rate	148 bpm		

How to Check if Rest Rate Programmed ON with a St Jude Programmer



St Jude Rest Rate On



St Jude Rest Rate Summary

- Activity based
- Heart rate decreases with inactivity
- Easy to find on the programmer report or with the programmer
- Easy to turn off

Medtronic Sleep Rate

- Decreases pacer base rate during a specified time interval
  - Ex. Base rate decreased from 9 pm to 5 am

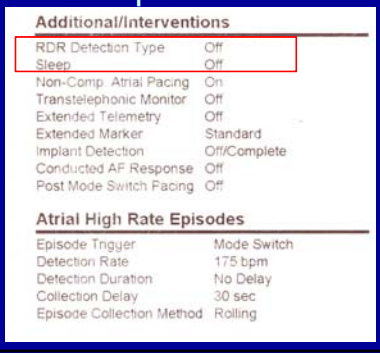
Medtronic Sleep Rate Case

- Clinical scenario
  - Late night bowel resection
  - Pt pacing at 60
  - At 9 pm the paced HR decreases to 50

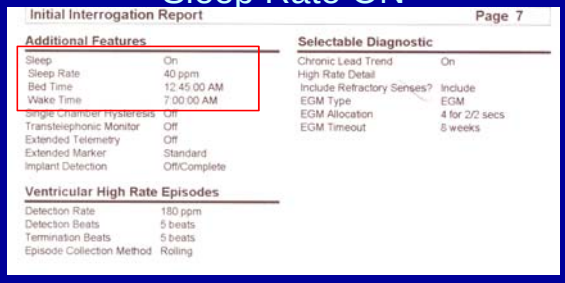
How to determine if the Rate Response Mode is active in a Medtronic Pacer

- Programmer report
- Programmer interrogation

Medtronic Programmer Report Sleep Rate OFF



Medtronic Programmer Report Sleep Rate ON



Initial Interrogation Report — Page 7

Additional Features

Sleep	On
Sleep Rate	40 ppm
Bed Time	12:45:00 AM
Wake Time	7:00:00 AM
Single Chamber Hysteresis	Off
Transtelephonic Monitor	Off
Extended Telemetry	Off
Extended Marker	Standard
Implant Detection	Off/Complete

Selectable Diagnostic

Chronic Lead Trend	On
High Rate Detail	
Include Refractory Senses?	Include
EGM Type	EGM
EGM Allocation	4 for 2/2 secs
EGM Timeout	8 weeks

Ventricular High Rate Episodes

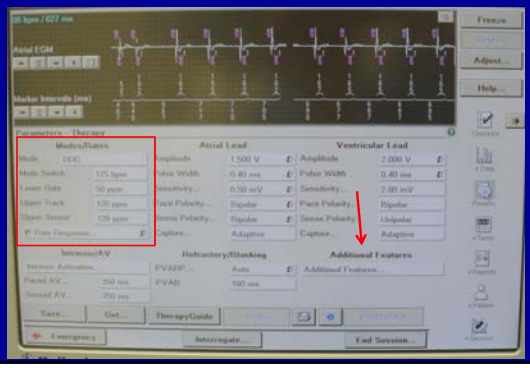
Detection Rate	180 ppm
Detection Beats	5 beats
Termination Beats	5 beats
Episode Collection Method	Rolling

At 12:45 am her pacer's lower rate limit decreases from 50 to 40.

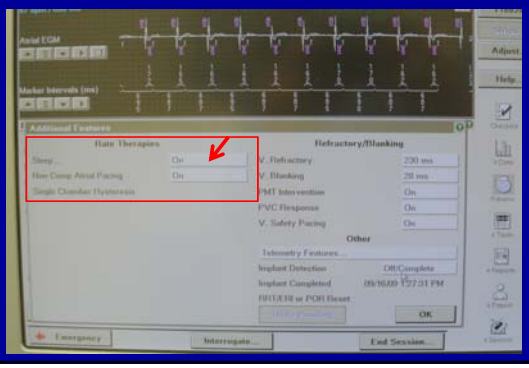
How can you find out if this patient has a Medtronic Sleep Rate Activated using the programmer?

- Slightly more challenging than with the St Jude devices

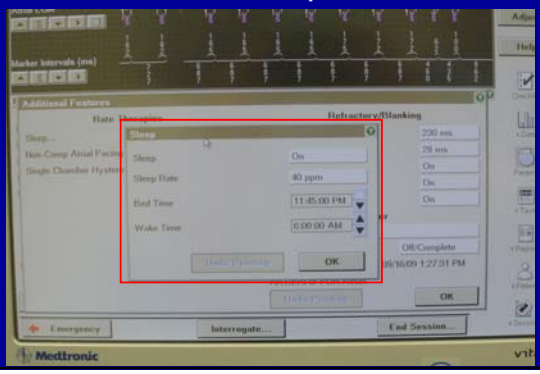
Medtronic Programmer Parameters Tab



Medtronic Sleep Rate On



Medtronic Sleep Rate On



Medtronic Sleep Rate Case

- 48 yo s/p Fontan
- AAI pacing at 60
- Had TAH-BSO→ICU post op
  - Pacing rate increased to 95 to increase BP/CO
- Abrupt decrease in HR and BP at 9 pm
  - Increase in pressor and volume requirement
  - Called EP to interrogate the pacer for presumed malfunction

Medtronic Sleep Rate Case

- Atrial lead impedance, threshold, and sensing all OK
- Sleep mode detected and turned off
- Patient's output and pressure improved significantly

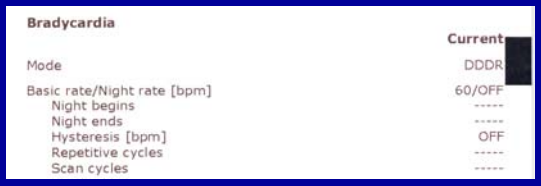
Clinical Management

- If you are concerned that the lower paced HR associated with a sleep rate would compromise the patient's condition during surgery or in the post-op period, simply turn off the Sleep Rate

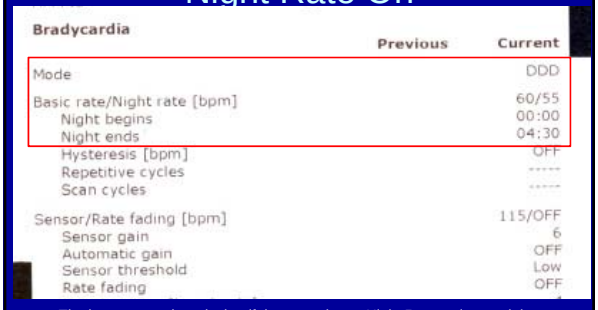
Biotronik Night Rate

- Works just like Medtronic Sleep Rate
- Time based

Biotronik Programmer Report Night Rate Off

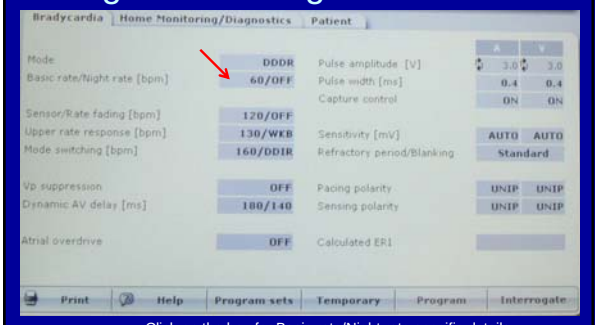


Biotronik Programmer Report Night Rate On



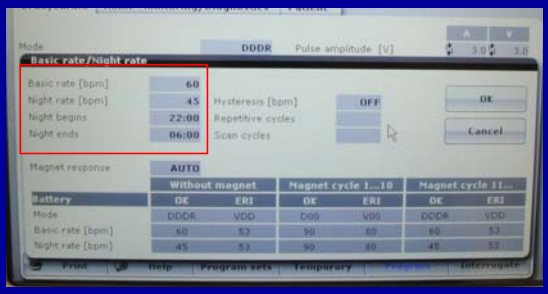
The key concept here is that if the pacer has a Night Rate active, and the HR slows after midnight, you do not need to worry about the pacemaker

Biotronik Programmer Night Rate Programmed OFF



Click on the box for Basic rate/Night rate specific details

Biotronik Programmer Night Rate Programmed ON



Boston Scientific

- No sleep mode per se
- This company uses a Hysteresis program in lieu of a sleep mode

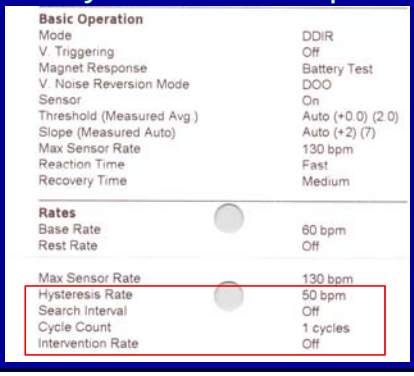
Boston Scientific Hysteresis

- *Hysterein* (Greek)=to be late
- Def=the lagging of a physical effect on a body behind its cause
- Delayed onset of pacing

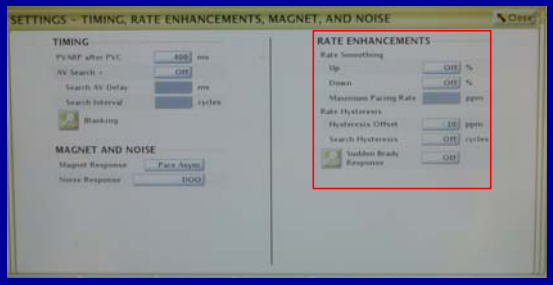
Example

- Pacemaker with Base Rate=60
- If patient has NSR at 62, then goes to sleep and the NSR decreases to 55, do we want the pacer to activate and pace at 60?
- Hysteresis rate set at 50
- No pacing until intrinsic rhythm falls below 50, then the pacer paces at 60

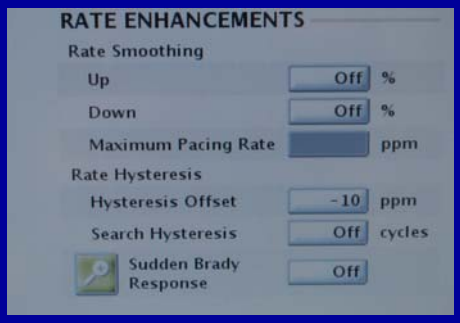
Hysteresis Example



Boston Scientific Programmer Hysteresis



Boston Scientific Hysteresis



Hysteresis

- Allows more extensive use of the patient's intrinsic rhythm
- Saves battery life
- Allows heart to have slower rate at night

Sleep Mode Summary

- All pacers and ICDs have modes that can slow the paced heart rate during inactivity or at night
- Low incidence of utilization
- Can surprise the Anesthesiologist and possibly compromise patient care
- Use the programmer or programmer report to ascertain if such a program is on
- You can modify these modes with a programmer

The End