Stress testing

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Disclosures

I have no disclosures or conflicts of interest

Background

- Erin Fitzpatrick, PA-C
- Bachelor of Science in biology at California University of PA
- Masters of Physician Assistant studies at Seton Hill University
- Internal Medicine 1 year in Wilkinsburg which is a suburb of Pittsburgh
- Cardiac surgery: 6 months, UPMC Passavant Hospital in Pittsburgh
- Cardiology: ~5 years, Butler Memorial Hospital in Butler, PA
- Current position: PA in Cardiology at Trinity Health Twin City hospital
- Been monitoring, interpreting EKG portion and teaching other providers and students about stress tests for ~7 years

Stress Testing Presentation Overview

- Review why we order stress tests
- DIfferentiate the differences in the types of stress tests and why we order each type
- Review what results look like with both the EKG and nuclear imaging portions
- Medical management vs invasive approach with LHC

Why do we order stress testing?

- Determine if symptoms related to CAD or another cause
- Can be used to determine if medical management is appropriate or not
  - Tachycardia, arrhythmias or treatment of PVCs
  - Also can be used with antiarrhythmics, like flecainide, to make sure that no VT/VF is occurring with stress → a lot of EP providers will do this
- Monitoring tool for past interventions
- They are about 85% accurate so false positives and false negatives can occur.

Coronary artery disease: What is it really?

- **Coronary artery disease or CAD is defined by Uptodate as:**
  - **DEFINITION**
- Causes:
  - Lifestyle
    - Diet
    - Lack of exercise
    - Tobacco use
    - Genetics
    - Drug abuse - especially with cocaine abuse - Prinzmetal angina

Coronary artery disease: What is it really?

- Diagnostic tools:
  - **EKG**
    - **ST-T wave changes can lead you to believe that CAD could be present**
    - **STEMI**
    - **PVCs**
    - **VT/VF**
    - **LBBB**
    - **PICTURES OF ALL OF THESE AS WELL**
  - Echocardiogram:
    - Ultrasound of the heart that is transthoracic and can show heart structure and function
    - Change in LVEF
    - Wall motion abnormality

Noninvasive Imaging Modalities for CAD

- Stress testing
  - Regular Bruce protocol
  - Cardiolite Bruce protocol
  - Lexiscan stress
  - Dobutamine stress echo
  - Stress echo
- Cardiac CTA
  - CT scan of the chest with contrast that specifically look at the perfusion of the coronary arteries
  - Give calcium score to determine if patient has risk of obstructive CAD
  - Score >300 usually indicates further testing needed
  - Can give percentage of artery blocked
  - Also get imaging and 3D rendering of the heart as well
  - About as accurate as stress testing

Reasons to order stress tests

- CP
- SOB
- Family h/o CAD with comorbidities
- Arrhythmias
- Medication control
- Previous ACS with conservative management for risk assessment
- Changes in known CHD
- Management of CAD despite changes present
- Valvular heart disease
- New diagnosis of cardiomyopathy or heart failure
- Determine viability of myocardium in someone who has new systolic CHF
- Cardiac risk determination prior to surgical procedure

Stress testing: Background

Why do we do them?

- Important tool to use when we need to eval for CAD or see how well it is being managed

What do they show?

- Indicator for new CAD or reveal changes to known disease through EKGs, nuclear imaging and symptoms

We will review the steps and reason that we do each one with each stress test described

Equipment

- Treadmill

Equipment

- Computer system:

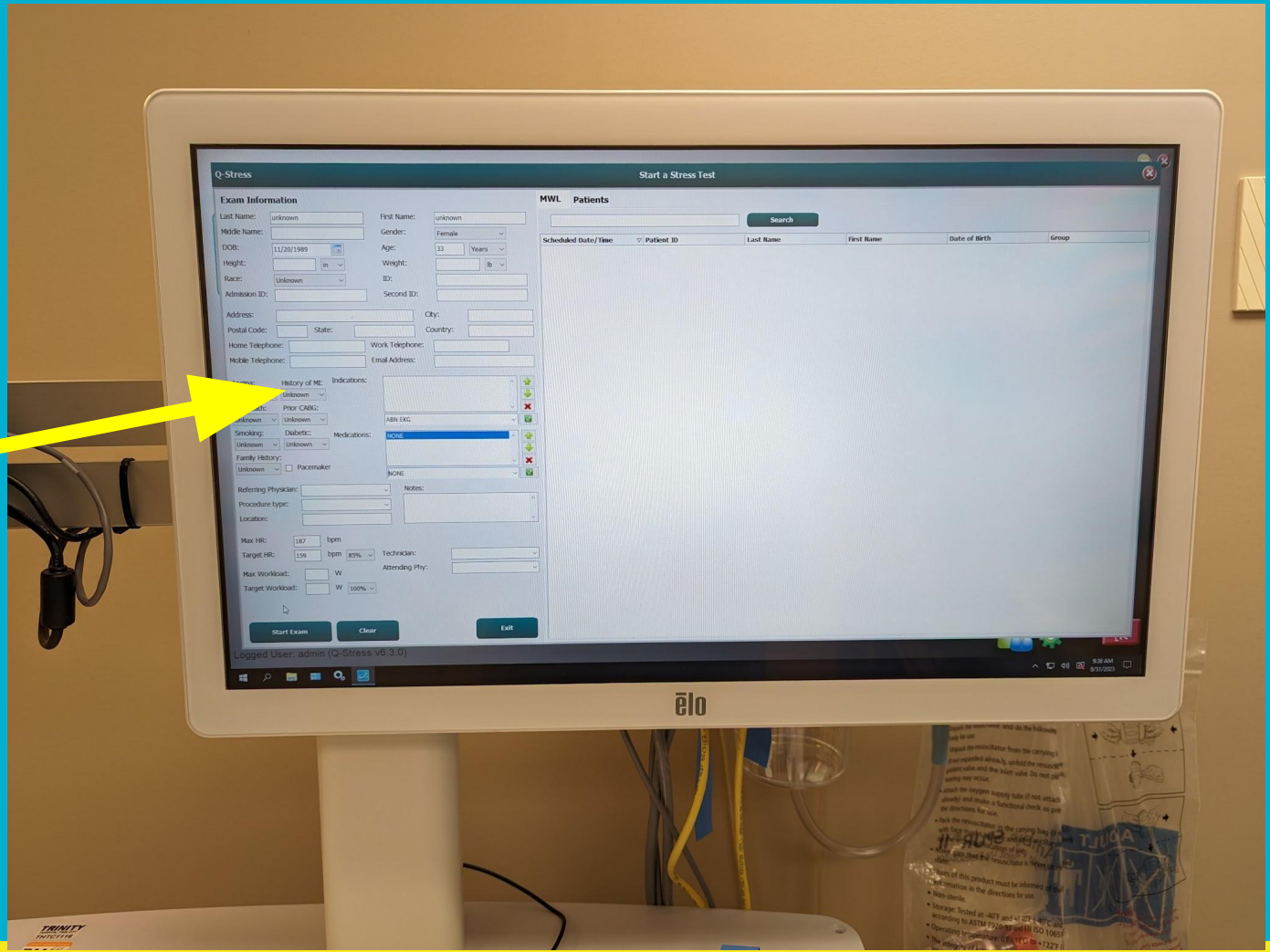
BP machine

EKG printer

Equipment

Computer system continued:

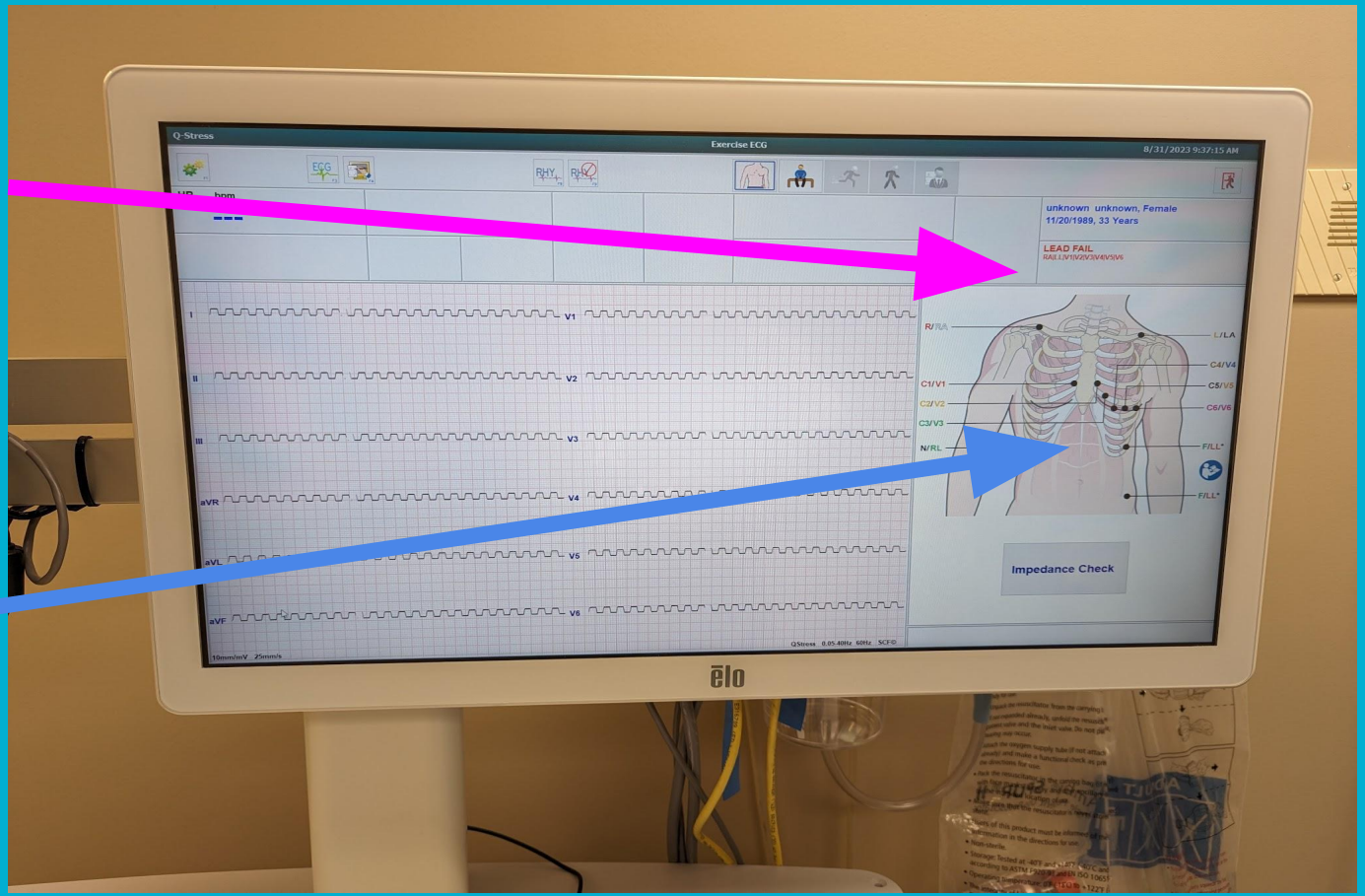
Identifying information:



Equipment:

Lead indicator:

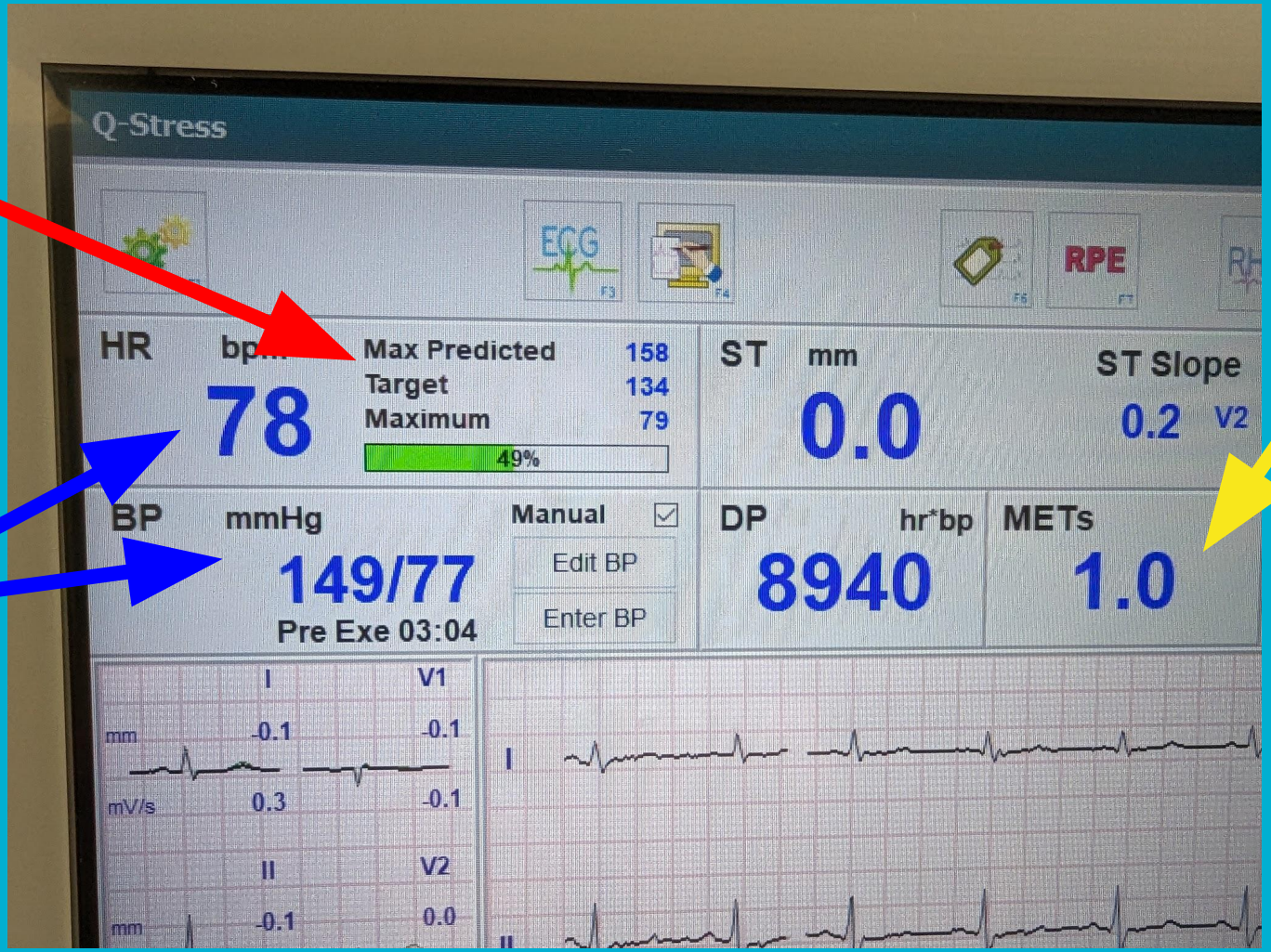
EKG hookups:

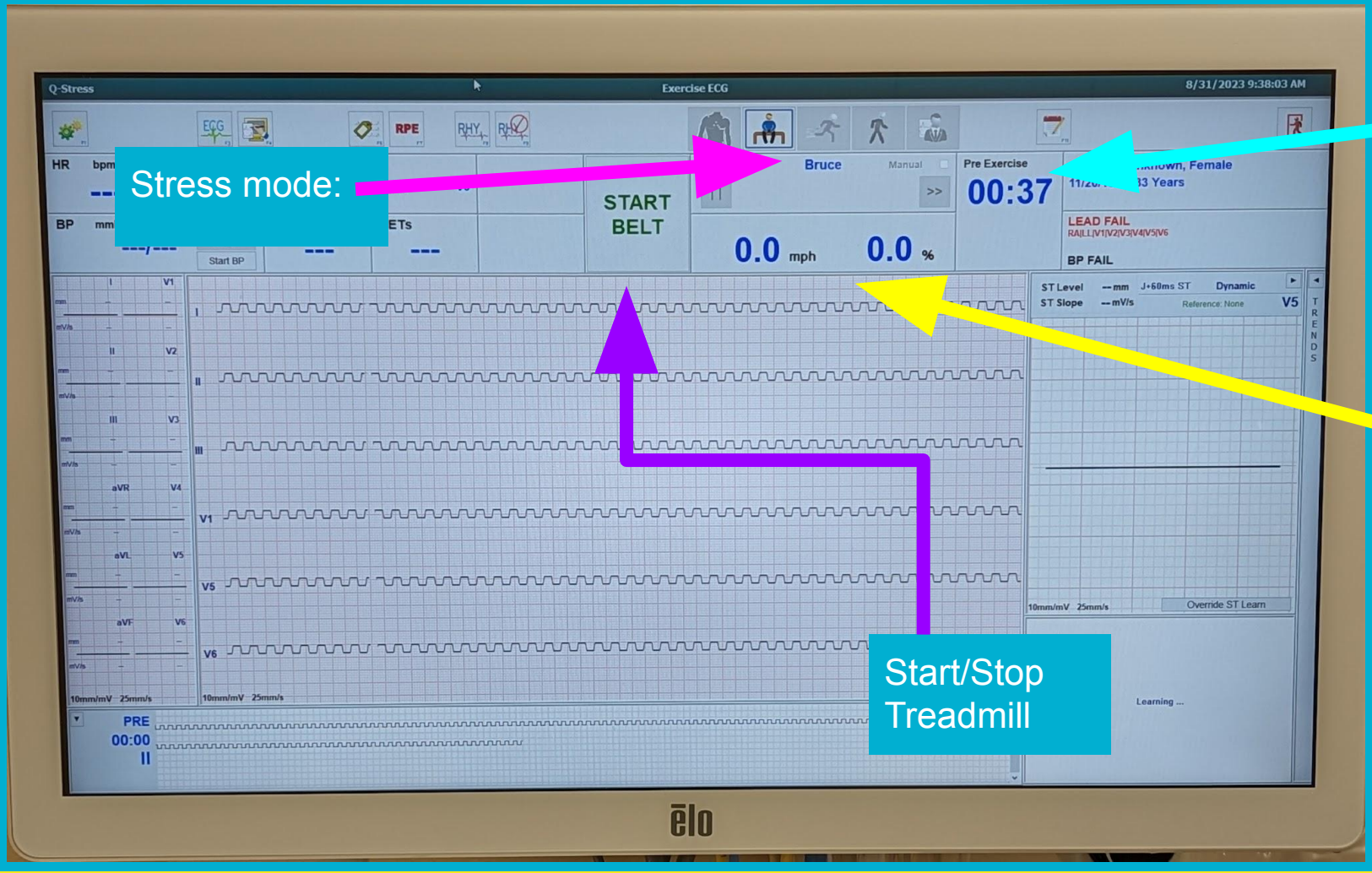


HR monitoring

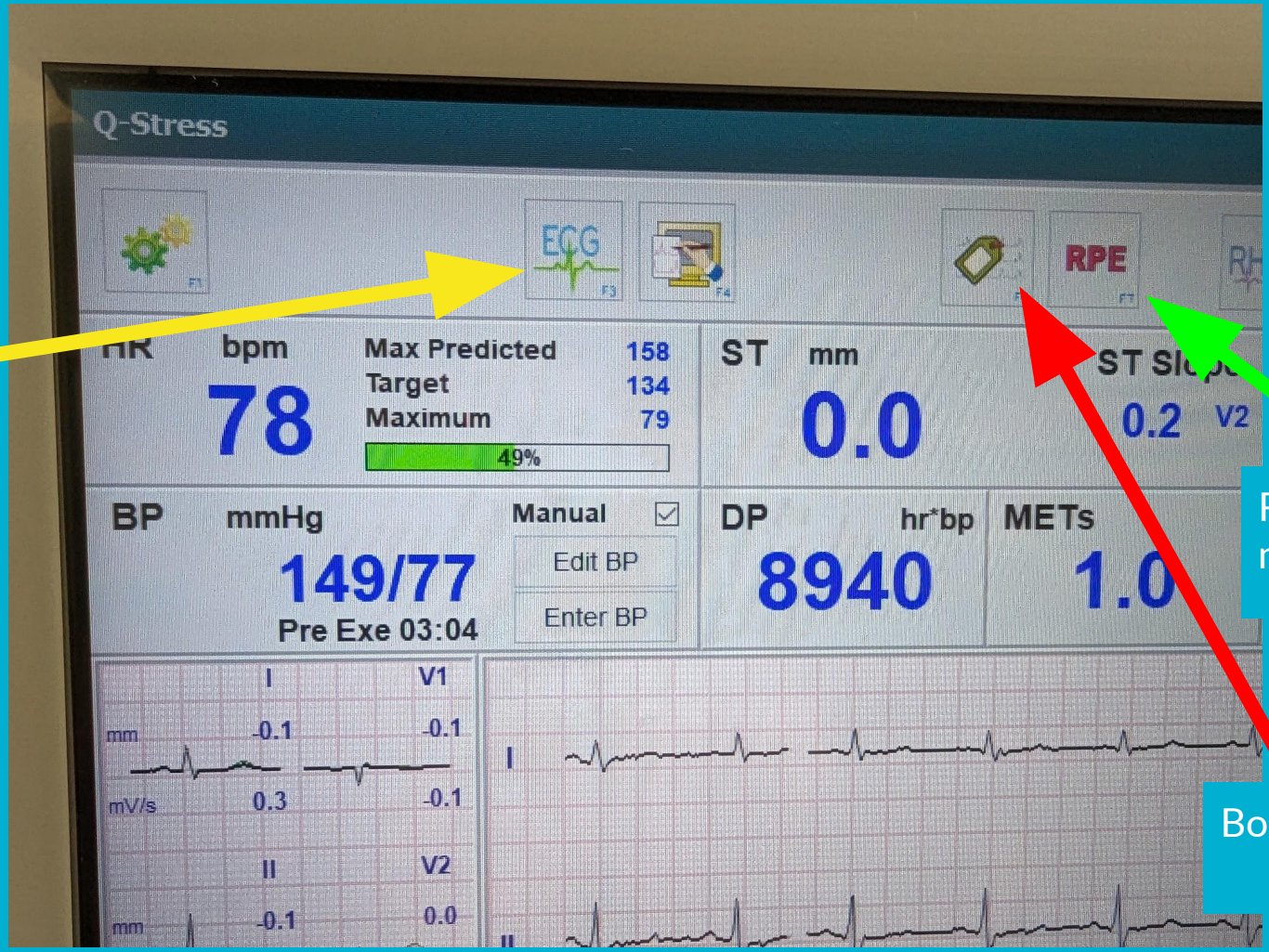
Vital sign monitoring

METs




Q-Stress
Exercise ECG
8/31/2023 9:38:03 AM
Stress mode:
Time
START BELT
Bruce
Manual
Pre Exercise
00:37
0.0 mph
0.0 %
LEAD FAIL
BP FAIL
Speed and incline
Start/Stop Treadmill
PRE
00:00
elo


Exercise ECG
STOP
BELT
Recovery Duration
1%
00:54
0.0 mph
0.0 %
01:00
Pre-exercise
Resting
End test
Recovery
Exercise



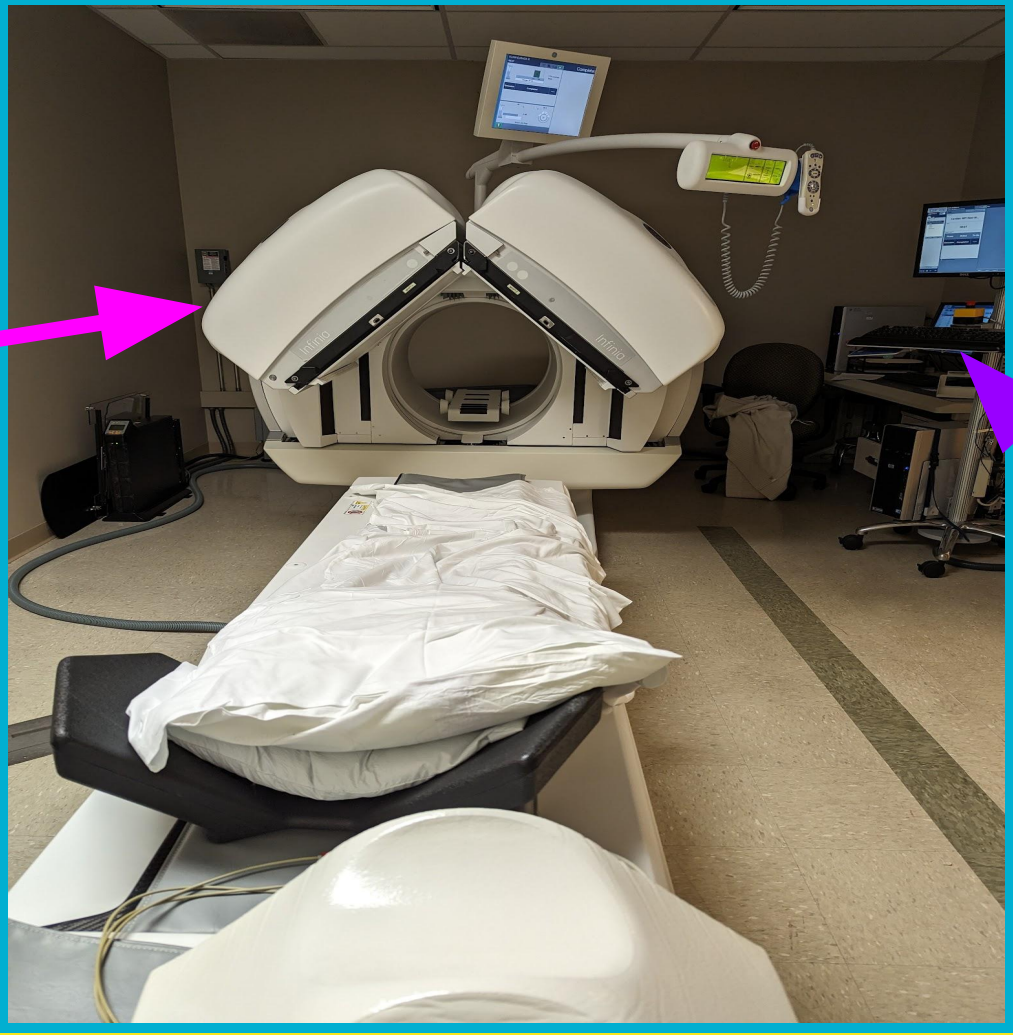
Print EKG

RPE monitoring

Bookmark

Nuclear scanner:

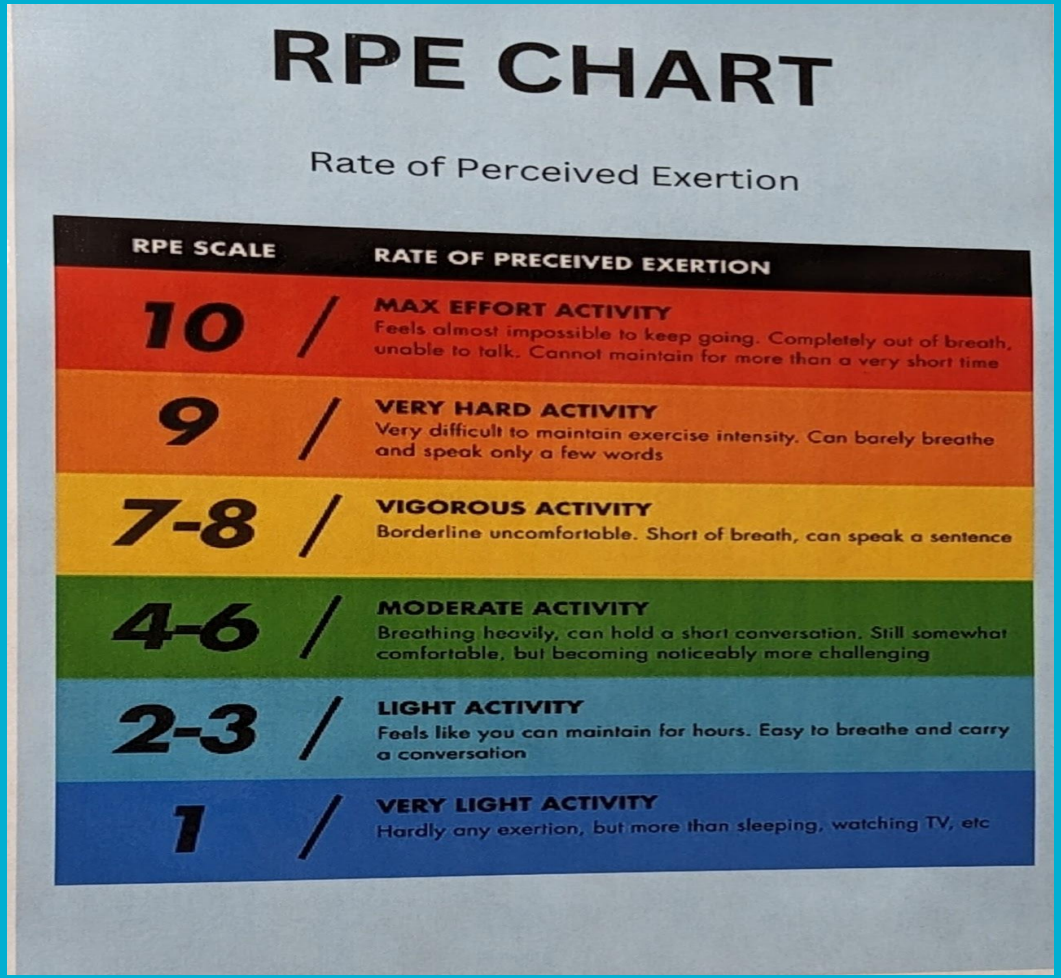
Camera in position post nuclear scanning



Computer monitoring

RPE

- Rate of Perceived Exertion
- Ask patient every minute or two during Bruce protocol testing
- Allows monitoring staff to determine when patient is getting close to needing to be done with stress portion
- Helps with timing of Cardiolite injection
- Want patient to at least get to the 7-8 range if possible



Determining appropriate stress type

Choice determined by many factors, they may include:

- Ability to exercise or not
  - If they can't walk on treadmill then will need Lexiscan
- Resting EKG
  - A fib - lexiscan
  - LBBB - Lexi
  - PPM/AICD -Lexi
  - WPW -Lexi
- Acute endocarditis, myocarditis or pericarditis - no exercise
- Indication for test
  - Chest pain
  - Valve disease
  - Arrhythmias
- Body habitus
- Previous CAD

Steps for all testing

- Assessment is necessary for every test
  - Determine stress test type is appropriate for each patient
- Auscultate chest
  - Murmur
    - AS?
    - A fib?
- Review previous and resting EKG
- BP review
  - If BP too high then cannot perform regular stress test or Bruce cardiolite stress due to risk of CVA risk
- Medication review and when last doses were taken
  - BB/CCB/AV nodal blockers especially
- Consent
- Review stress test modality

BRUCE protocol

What is it?

- Standard protocol in place to determine target and maximum heart rate for regular and cardiolite treadmill testing
- Start at 1.7mph and 10% incline and every 3 minutes treadmill will get steeper and faster until reaching at least target HR

Explain algothorism

- 220-age = max HR
- Max HR x0.85= target HR
  - Patient who is 65:
    - 220-65= 155
    - 155x0.85=132

METs:

- Metabolic equivalent of tasks
- Unit estimates the energy our bodies use during exercise
- Measured in calories
- 1 kilocalorie per kilogram of body weight per minute of activity or 3.5mL of oxygen per kilogram of body weight per minute of activity
- Scale:
  - 1 = quietly sitting
  - 2-3 = light activity
  - 3-6 = moderate activity
  - >6 = vigorous activity

BRUCE Protocol Stages

Stage	Time (min)	Speed (mph)	Incline (%)	METs
1	0-3	1.7	10	5
2	3-6	2.5	12	7
3	6-9	3.4	14	10
4	9-12	4.2	16	13
5	12-15	5.0	18	15
6	15-18	5.5	20	18
7	18-21	6.0	22	20

Regular stress testing

- Uses
  - Mainly for young patients who has no or very few comorbidities
  - Patients who do not want cardiolite injection and able to walk on treadmill
  - Testing medication control only
    - BB/CBB control of HR/PVCs
- Contraindications:
  - Acute MI, unstable angina, uncontrolled arrhythmia, endocarditis, myocarditis, pericarditis, severe AS, acute PE, DVT, unable to walk on treadmill
- BRUCE protocol
  - Patient walks on treadmill to at least target heart rate
  - Goal is to get to maximum HR but may not be able
    - If unable to get to max HR then will need to encourage patient to walk as long as possible
- Once max exercise reached then patient will be slowed and monitored for 6 minutes of recovery
  - At this point we are making sure HR and BP are going back down towards starting vitals
  - Checking to make sure if there were any EKG changes they are going back to baseline

Treadmill stress testing

- Hold AV node blocking agents 24 hours prior to testing
  - CCB such as cardizem and verapamil
  - BB - all
- Fasting for at least 4 hours prior to testing
- Can resume all medications and eat after testing
- Advised to take it easy at home until results given to patient

Cardiolite Stress testing

- Two versions
  - Bruce
  - Lexiscan
- Initially place IV and injection of cardiolite isotope is used
  - Radioactive isotope that once injected lines the coronary arteries of the heart
- About 45-60 minutes later nuclear images are taken of patient's heart at rest
- Once resting images taken then perform stress portion
  - Treadmill → Bruce protocol
  - Medication → Lexiscan - explained in next slides
- With Bruce protocol usually inject cardiolite with one minute left of patient exercise
  - Takes a lot of coordination with patient and nuclear tech
  - Use RPE chart
- If exercise can get stress nuclear imaging 30 minutes after exercise
- If lexiscan usually wait 40-60 minutes to get stress imaging
- Compare imaging to determine if any perfusion defects
  - Will review imaging when we review results

Lexiscan Stress testing

- What is lexiscan:
  - Vasodilator medication
    - Coronary arteries dilate during exercise so mimics this process
  - Generic name: regadenoson
  - Used over adenosine as this has been shown to give better results and better tolerated
  - 0.4mg IVx1 dose given over 10 seconds
- Side effects:
  - Because it is a medication it can cause unwanted side effects for patients
    - SOB, Cough, Headache, Nausea, Flushed, Dizzy, Chest pain, Hypotension, Tachycardia, Any symptoms that can occur with vasodilation
- Side effects can usually last 2-3 minutes but headache, if present can last longer
- Can use caffeine post stress portion as natural reversal agent to lexiscan
- Aminophylline:
  - Medical reversal that can be used if symptoms last too long or become too severe
  - Usually 75 mg IV x1
- Contraindications:
  - Second degree AV nodal block
  - Third degree AV block

Lexiscan Stress testing

- Procedure
  - Need to be used in conjunction with nuclear imaging
  - Same beginning procedure of Bruce protocol cardiolite testing
  - Main difference is stress portion
    - No treadmill used
    - After rest imaging completed patient is hooked up to stress machine and continues to lay on stretcher
    - Inject lexiscan over 10 seconds then flush with 10cc of saline
    - After injected, cardiolite will then be injected and flushed with 10cc of saline
    - Monitor for 6 minutes of recovery as well
    - After 40-60 minutes get stress imaging
    - Can then compare stress and resting imaging
- Contraindications:
  - Bronchospastic airway disease as it can cause bronchospasm
  - Hypotension prior to administration of Lexiscan
  - Sinus node dysfunction or high grade AV block without PPM in place
  - Unstable or complicated ACS - all modalities of stress testing can cause increased risk of ischemic events
- Hold caffeine and theophylline at least 24 hours prior to stress test

Stress Echocardiogram

- Can be used in lieu of nuclear stress test
- Echo tech is needed in order to perform
- Procedure
  - Resting echo imaging
  - Bruce protocol stress testing procedure then used
    - Need to get HR as high as possible because will have a couple minutes to get stress echo imaging
  - Once highest HR is reached and patient cannot walk on treadmill any longer will need to lie back on stretcher
  - Stress echo imaging completed
- Can compare in real time stress vs resting imaging
- Difficulty is timing and procedure
- Looking for wall motion abnormalities instead of perfusion defects on stress imaging
- Can use stationary bike or treadmill
  - Stationary bike is beneficial because can get imaging while on bike but not used much

Stress Echocardiogram

- Can look at hemodynamics during stress
  - Diastolic function
  - Systolic pulmonary artery pressure
  - Valvular heart disease
- Look at structure of heart
  - Assess for pericardial effusion which could mean pericarditis
- Wall motion abnormalities
  - New vs worsening
  - LVEF
  - Extent of ischemia
  - Ischemic territory
- Advantages:
  - Shorter time commitment
  - No radiation

Dobutamine Stress

- Dobutamine:
  - Stimulates beta adrenergic receptor and alpha 1 receptor
  - Increase HR and contractility
  - Vasodilation in peripheral vasculature when stimulate same receptors
- Used in conjunction with echocardiogram imaging
  - Images at rest, at start of dobutamine infusion and at the completion of each stage as well as during recovery
- Stages:
  - Graded infusion in five three-minute stages
    - 1: 5 mcg/kg/min
    - 2: 10 mcg/kg/min
    - 3: 20 mcg/kg/min
    - 4: 30 mcg/kg/min
    - 5: 40mcg/kg/mion
  - Some use 2.5mcg/kg/min to start and infuse upwards from there but each place does this differently

- Assess myocardial viability and contractile reserve
- Used to evaluate mitral stenosis and aortic stenosis in patient who cannot due nuclear imaging or with low gradient aortic stenosis
- Eval LV outflow tract gradients, MR, PH in patient with hypertrophic cardiomyopathy

Dobutamine Stress

- Assess myocardial viability and contractile reserve
- Used to evaluate mitral stenosis and aortic stenosis in patient who cannot due nuclear imaging or with low gradient aortic stenosis
- Eval LV outflow tract gradients, MR, PH in patient with hypertrophic cardiomyopathy
- Contraindications:
  - Tachyarrhythmias
  - Systemic HTN
- Side effects:
  - Chest pain
  - Headache
  - Dizziness
  - Palpitations
  - ST segment changes
  - Major cardiac event
- Beta Blockers
  - May cause results to show no signs of MI or cause issues with HR response
    - If occurs can use atropine to counteract these effects
  - If on all medications can show if BB treatment efficient or not

Coronary CTA

- Used to detect CAD in patient with angina or ACS
- Detects presence and extent of artery stenosis but also coronary plaque
- Highest diagnostic accuracy for the detection of obstructive CAD defined as >50% narrowing in major epicardial vessels
- Protocol:
  - Need CT scan with ability to perform test
  - Imaging is synchronized to the ECG
  - IV iodine dye used the prior to testing SL NTG given in spray or tablet form
    - Dilate arteries and allow us to see luminal narrowing
  - Need to have HR between 60-70bpm
    - Use IV BB or corlanor to achieve this

Coronary CTA Continued:

- Contraindications:
  - Severe renal insufficiency
  - Iodine allergy → can use pre-test allergy medications like benadryl, pepcid and prednisone
  - Unable to hold breath → need to hold breath for 5-10 seconds at times during the test
  - Tachycardia/tachycardic arrhythmias such as atrial fibrillation
  - Unable to hold still
  - Claustraphobia
- Assess LVEF, LV morphology, perfusion, CAD

CAD-RADS reporting and data system for patients presenting with acute chest pain, negative first troponin, negative or non-diagnostic electrocardiogram, and low to intermediate risk (TIMI score <4) in an emergency department or hospital setting

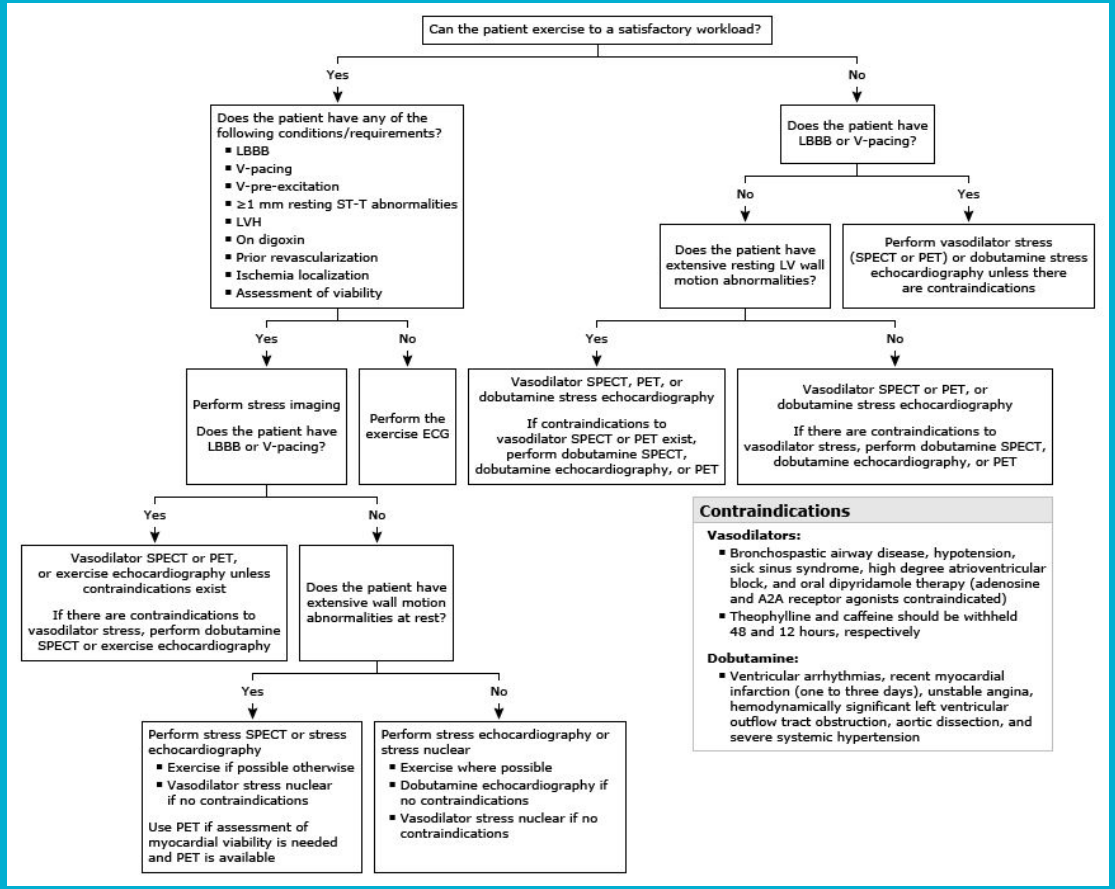
	Degree of maximal coronary stenosis	Interpretation	Management
CAD-RADS 0	0%	ACS highly unlikely	▪ No further evaluation of ACS is required. ▪ Consider other etiologies.
CAD-RADS 1	1 to 24%*	ACS highly unlikely	▪ Consider evaluation of non-ACS etiology, if normal troponin and no ECG changes. ▪ Consider referral for outpatient follow-up for preventive therapy and risk factor modification.
CAD-RADS 2	25 to 49%¶	ACS unlikely	▪ Consider evaluation of non-ACS etiology, if normal troponin and no ECG changes. ▪ Consider referral for outpatient follow-up for preventive therapy and risk factor modification. ▪ If clinical suspicion of ACS is high or if high-risk plaque features are noted, consider hospital admission with cardiology consultation.
CAD-RADS 3	50 to 69%	ACS possible	▪ Consider hospital admission with cardiology consultation, functional testing and/or ICA for evaluation and management. ▪ Recommendation for anti-ischemic and preventive management should be considered as well as risk factor modification. Other treatments should be considered if presence of hemodynamically significant lesion.
CAD-RADS 4	**A:** 70 to 99% or **B:** >50% (left main) or ≥70% (3-vessel) obstructive disease	ACS likely	▪ Consider hospital admission with cardiology consultation. Further evaluation with ICA and revascularization as appropriate. ▪ Recommendation for anti-ischemic and preventive management should be considered as well as risk factor modification.
CAD-RADS 5	100% (total occlusion)	ACS very likely	▪ Consider expedited ICA on a timely basis and revascularization if appropriate if acute occlusion.Δ ▪ Recommendation for anti-ischemic and preventive management should be considered as well as risk factor modifications.
CAD-RADS N	Non-diagnostic study	ACS cannot be excluded	▪ Additional or alternative evaluation for ACS is needed.

The CAD-RADS classification should be applied on a per-patient basis for the clinically most relevant (usually highest-grade) stenosis. All vessels greater than 1.5 mm in diameter should be graded for stenosis severity. CAD-RADS will not apply for smaller vessels (<1.5 mm in diameter).

MODIFIERS: If more than one modifier is present, the symbol "/" (slash) should follow each modifier in the following order:

- First: modifier N (non-diagnostic)
- Second: modifier S (stent)
- Third: modifier G (graft)
- Fourth: modifier V (vulnerability)

Choosing the best test for your patient:



Sensitivity and specificity in Diagnosing CAD:

Test	Sensitivity (%)	Specificity (%)
Regular Exercise Stress	45-61	70-90
Exercise Stress Echo	70-85	77-89
Cardiolite Exercise Stress	73-92	63-88
Dobutamine Stress Echo	72-90	79-95
Lexiscan Stress	88-91	75-90
Coronary CTA	93-99	64-90

Results:

- Comes in the form of reports and images based on the type of test performed.
- If regular stress test then only get report on EKG portion.
  - This can either lead you to getting Cardiolite stress or find another source for pain.
- If Cardiolite then can will get two separate reports - one for EKGs and one for imaging
  - Imaging is most important portion of these as can have abnormal EKG and normal images
  - If normal imaging then need to reassess patient and determine if further testing needed or medical management

Reports:

Procedure

Type of Study: Stress Procedure

Procedure Date/Time: 2/15/2023 9:50:00 AM

Indication

Reason for Ending

Clinical Data

Protocol: Manual Mode
Total Exercise Time: 07:26
Max HR: 161 % Max HR Achieved: 85%
Max BP: 185/71/153/73
METS: 9.5 HRxBP: 1.65

Rest ECG

Stress ECG

Symptoms

Arrhythmias

Conclusions

No electrocardiographic evidence of ischemia.
Normal Exercise Stress Test

Reports:

Procedure

Type of Study: Stress Procedure

Procedure Date/Time: 2/2/2023 9:42:00 AM

Indication	Reason for Ending
cp	protocol completed

Clinical Data

Protocol: Lexiscan
Total Exercise Time: 01:00
Max HR: 99 % Max HR Achieved: 85%
Max BP: 181/71/181/71
METS: 1.0 HRxBP:

Rest ECG

Normal Sinus Rhythm with T wave inversion of anteriolateral leads

Stress ECG

Nonspecific ST-T wave changes

Symptoms

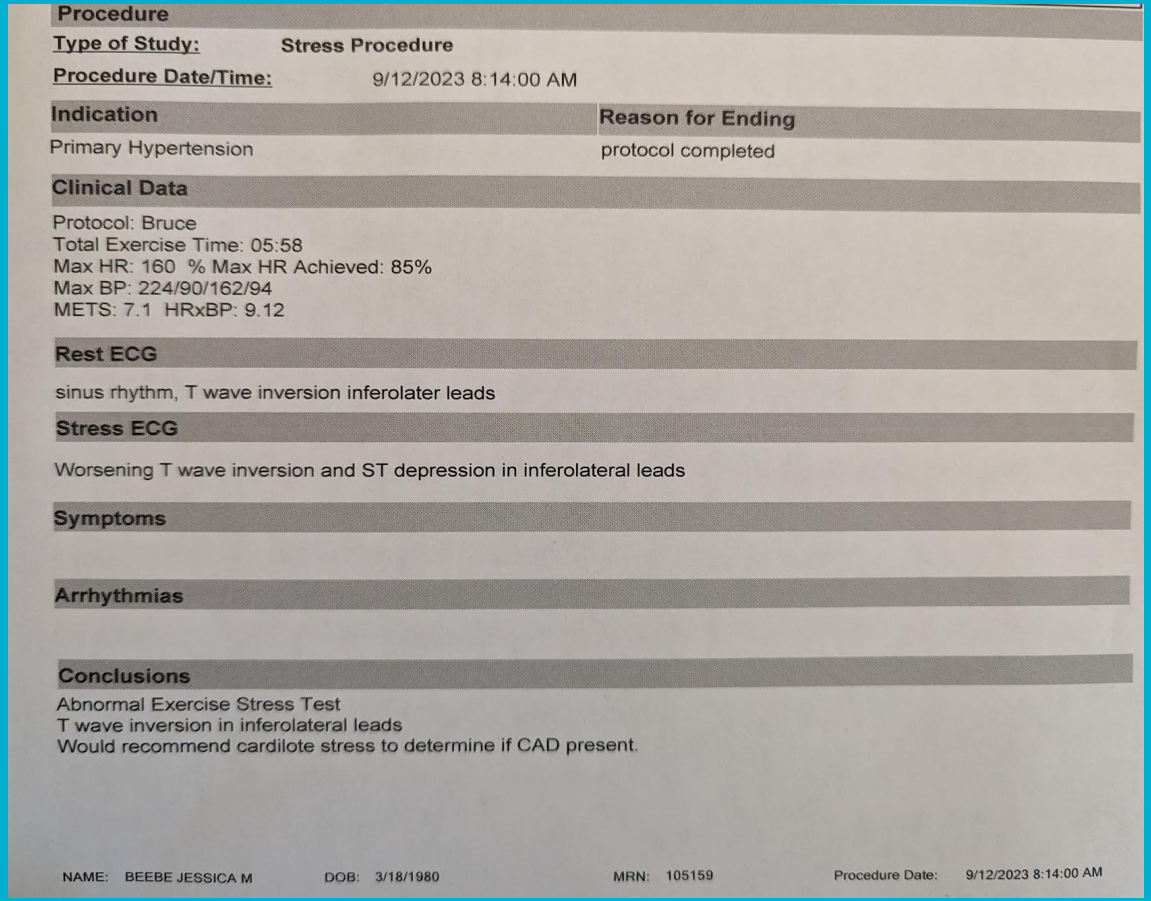
CHEST PRESSURE

Arrhythmias

Conclusions

Normal Sinus Rhythm with T wave inversion of anteriolateral leads
Nonspecific ST-T wave changes with Lexiscan
The Nuclear portion of the study is reported separately.

Reports:



Procedure

Type of Study: Stress Procedure

Procedure Date/Time: 9/12/2023 8:14:00 AM

Indication	Reason for Ending
Primary Hypertension	protocol completed

Clinical Data

Protocol: Bruce
Total Exercise Time: 05:58
Max HR: 160 % Max HR Achieved: 85%
Max BP: 224/90/162/94
METS: 7.1 HRxBP: 9.12

Rest ECG

sinus rhythm, T wave inversion inferolater leads

Stress ECG

Worsening T wave inversion and ST depression in inferolateral leads

Symptoms

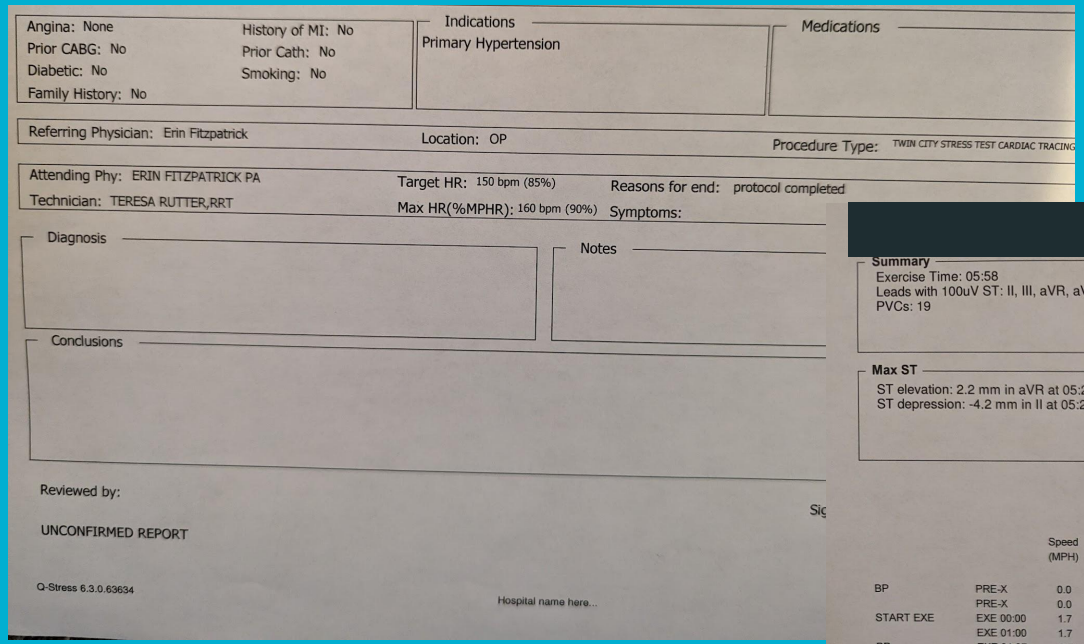
Arrhythmias

Conclusions

Abnormal Exercise Stress Test
T wave inversion in inferolateral leads
Would recommend cardilote stress to determine if CAD present.

NAME: BEEBE JESSICA M DOB: 3/18/1980 MRN: 105159 Procedure Date: 9/12/2023 8:14:00 AM

Reports:



Angina: None
History of MI: No
Prior CABG: No
Prior Cath: No
Diabetic: No
Smoking: No
Family History: No

Indications
Primary Hypertension

Medications

Referring Physician: Erin Fitzpatrick
Location: OP
Procedure Type: TWIN CITY STRESS TEST CARDIAC TRACING

Attending Phy: ERIN FITZPATRICK PA
Technician: TERESA RUTTER,RRT
Target HR: 150 bpm (85%)
Max HR(%MPHR): 160 bpm (90%)
Reasons for end: protocol completed
Symptoms:

Diagnosis

Notes

Conclusions

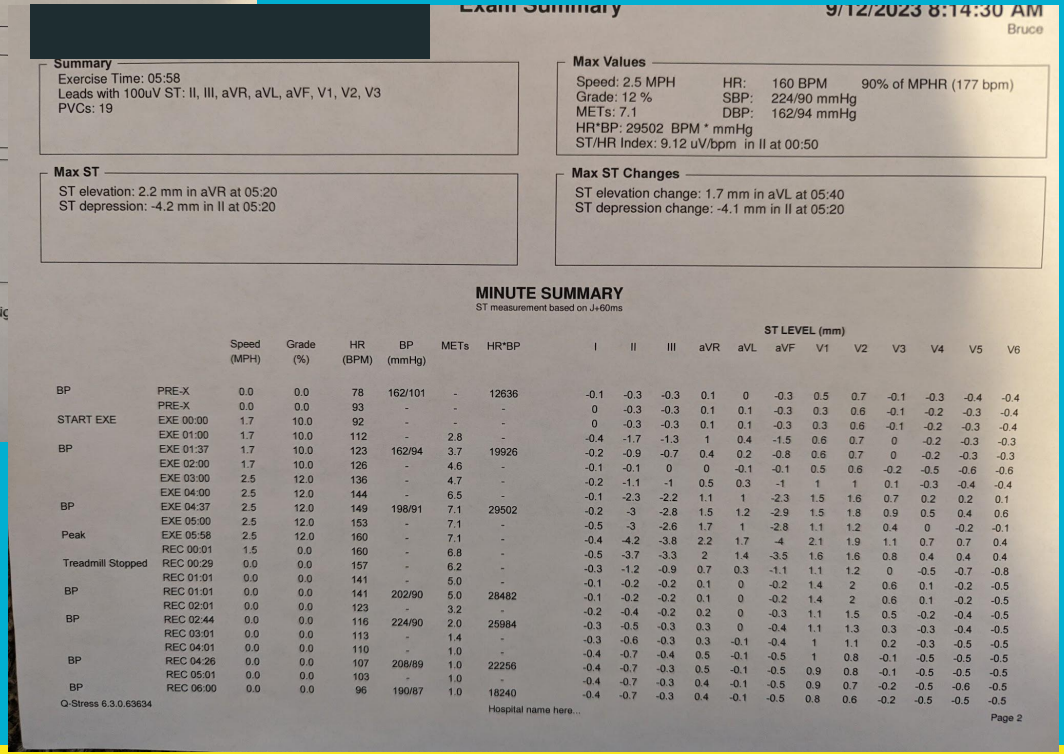
Reviewed by:

Sig

UNCONFIRMED REPORT

Q-Stress 6.3.0.63634

Hospital name here...



Exam Summary
9/12/2023 8:14:30 AM
Bruce

Summary
Exercise Time: 05:58
Leads with 100uV ST: II, III, aVR, aVL, aVF, V1, V2, V3
PVCs: 19

Max Values
Speed: 2.5 MPH
Grade: 12 %
METs: 7.1
HR*BP: 29502 BPM * mmHg
ST/HR Index: 9.12 uV/bpm in II at 00:50
HR: 160 BPM
SBP: 224/90 mmHg
DBP: 162/94 mmHg
90% of MPHR (177 bpm)

Max ST
ST elevation: 2.2 mm in aVR at 05:20
ST depression: -4.2 mm in II at 05:20

Max ST Changes
ST elevation change: 1.7 mm in aVL at 05:40
ST depression change: -4.1 mm in II at 05:20

MINUTE SUMMARY

ST measurement based on J+60ms

		Speed (MPH)	Grade (%)	HR (BPM)	BP (mmHg)	METs	HR*BP	ST LEVEL (mm) I	II	III	aVR	aVL	aVF	V1	V2	V3	V4	V5	V6
BP	PRE-X	0.0	0.0	78	162/101	-	12636	-0.1	-0.3	-0.3	0.1	0	-0.3	0.5	0.7	-0.1	-0.3	-0.4	-0.4
	PRE-X	0.0	0.0	93	-	-	-	0	-0.3	-0.3	0.1	0.1	-0.3	0.3	0.6	-0.1	-0.2	-0.3	-0.4
START EXE	EXE 00:00	1.7	10.0	92	-	-	-	0	-0.3	-0.3	0.1	0.1	-0.3	0.3	0.6	-0.1	-0.2	-0.3	-0.4
	EXE 01:00	1.7	10.0	112	-	2.8	-	-0.4	-1.7	-1.3	1	0.4	-1.5	0.6	0.7	0	-0.2	-0.3	-0.3
BP	EXE 01:37	1.7	10.0	123	162/94	3.7	19926	-0.2	-0.9	-0.7	0.4	0.2	-0.8	0.6	0.7	0	-0.2	-0.3	-0.3
	EXE 02:00	1.7	10.0	126	-	4.6	-	-0.1	-0.1	0	0	-0.1	-0.1	0.5	0.6	-0.2	-0.5	-0.6	-0.6
	EXE 03:00	2.5	12.0	136	-	4.7	-	-0.2	-1.1	-1	0.5	0.3	-1	1	1	0.1	-0.3	-0.4	-0.4
	EXE 04:00	2.5	12.0	144	-	6.5	-	-0.1	-2.3	-2.2	1.1	1	-2.3	1.5	1.6	0.7	0.2	0.2	0.1
BP	EXE 04:37	2.5	12.0	149	198/91	7.1	29502	-0.2	-3	-2.8	1.5	1.2	-2.9	1.5	1.8	0.9	0.5	0.4	0.6
	EXE 05:00	2.5	12.0	153	-	7.1	-	-0.5	-3	-2.6	1.7	1	-2.8	1.1	1.2	0.4	0	-0.2	-0.1
Peak	EXE 05:58	2.5	12.0	160	-	7.1	-	-0.4	-4.2	-3.8	2.2	1.7	-4	2.1	1.9	1.1	0.7	0.7	0.4
	REC 00:01	1.5	0.0	160	-	6.8	-	-0.5	-3.7	-3.3	2	1.4	-3.5	1.6	1.6	0.8	0.4	0.4	0.4
Treadmill Stopped	REC 00:29	0.0	0.0	157	-	6.2	-	-0.3	-1.2	-0.9	0.7	0.3	-1.1	1.1	1.2	0	-0.5	-0.7	-0.8
	REC 01:01	0.0	0.0	141	-	5.0	-	-0.1	-0.2	-0.2	0.1	0	-0.2	1.4	2	0.6	0.1	-0.2	-0.5
BP	REC 01:01	0.0	0.0	141	202/90	5.0	28482	-0.1	-0.2	-0.2	0.1	0	-0.2	1.4	2	0.6	0.1	-0.2	-0.5
	REC 02:01	0.0	0.0	123	-	3.2	-	-0.2	-0.4	-0.2	0.2	0	-0.3	1.1	1.5	0.5	-0.2	-0.4	-0.5
BP	REC 02:44	0.0	0.0	116	224/90	2.0	25984	-0.3	-0.5	-0.3	0.3	0	-0.4	1.1	1.3	0.3	-0.3	-0.4	-0.5
	REC 03:01	0.0	0.0	113	-	1.4	-	-0.3	-0.6	-0.3	0.3	-0.1	-0.4	1	1.1	0.2	-0.3	-0.5	-0.5
	REC 04:01	0.0	0.0	110	-	1.0	-	-0.4	-0.7	-0.4	0.5	-0.1	-0.5	1	0.8	-0.1	-0.5	-0.5	-0.5
BP	REC 04:26	0.0	0.0	107	208/89	1.0	22256	-0.4	-0.7	-0.3	0.5	-0.1	-0.5	0.9	0.8	-0.1	-0.5	-0.5	-0.5
	REC 05:01	0.0	0.0	103	-	1.0	-	-0.4	-0.7	-0.3	0.4	-0.1	-0.5	0.9	0.7	-0.2	-0.5	-0.6	-0.5
BP	REC 06:00	0.0	0.0	96	190/87	1.0	18240	-0.4	-0.7	-0.3	0.4	-0.1	-0.5	0.8	0.6	-0.2	-0.5	-0.5	-0.5

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Hospital name here...

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Reports:

	REC 06:01	0.0	0.0	96	-	1.0	-	-0.4	-0.7	-0.4	0.5	-0.1	-0.5	0.8	0.5	-0.2	-0.5	-0.5	-0.6
END REC	REC 06:21	0.0	0.0	97	-	1.0	-	-0.4	-0.7	-0.3	0.5	-0.1	-0.5	0.8	0.6	-0.2	-0.5	-0.5	-0.5

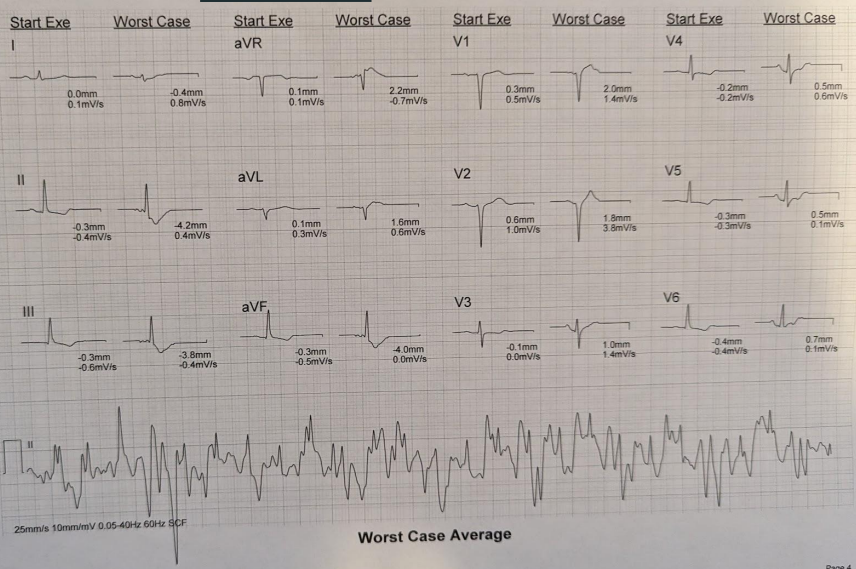
Q-Stress 6.3.0.69634

Hospital name here...

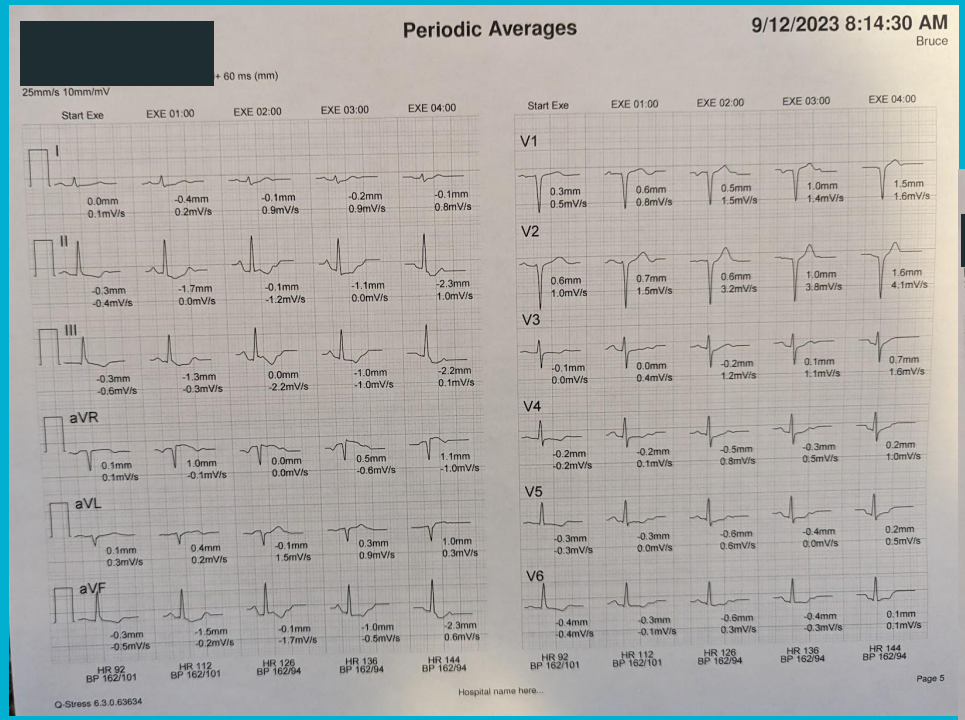
[redacted]

Exam Start: 9/12/2023 8:14:30 AM
Event Time: 9/12/2023 8:35:21 AM
[redacted]

05:20 EXER 2.5 MPH HR: 156
02:20 STAGE 2 12 % BP: 198/91
EXER 04:37



Reports:


[redacted]
Periodic Averages
9/12/2023 8:14:30 AM
Bruce
+ 60 ms (mm)
25mm/s 10mm/mV
Start Exe
EXE 01:00
EXE 02:00
EXE 03:00
EXE 04:00
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
HR 92 BP 162/101
HR 112 BP 162/101
HR 126 BP 162/94
HR 136 BP 162/94
HR 144 BP 162/94
Q-Stress 6.3.0.63634
Hospital name here...
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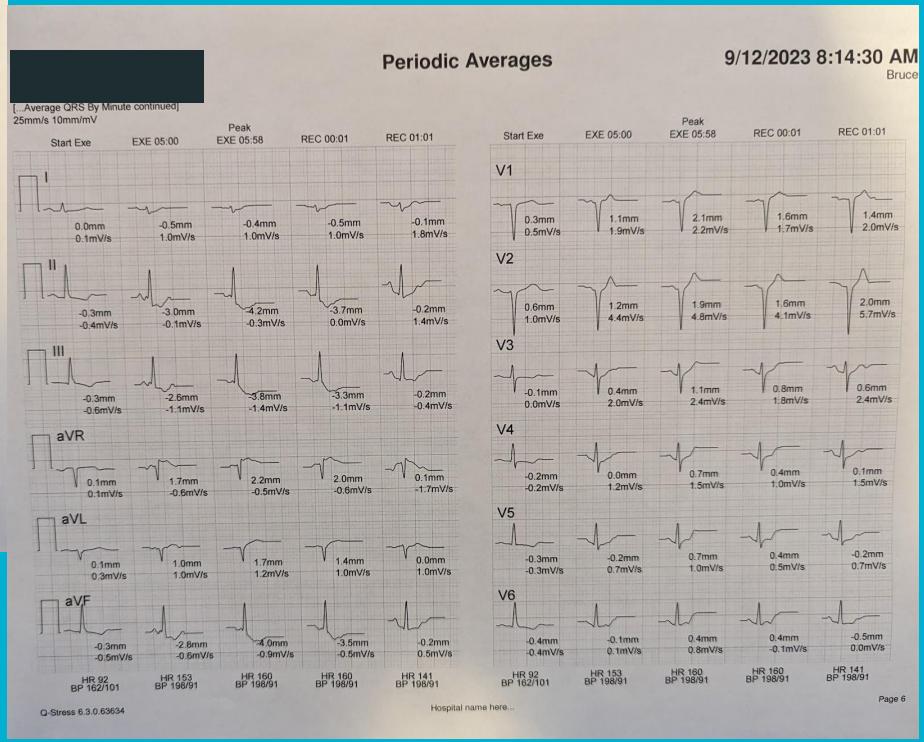
[redacted]
Periodic Averages
9/12/2023 8:14:30 AM
Bruce
[...Average QRS By Minute continued]
25mm/s 10mm/mV
Start Exe
EXE 05:00
Peak EXE 05:58
REC 00:01
REC 01:01
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
HR 92 BP 162/101
HR 153 BP 198/91
HR 160 BP 198/91
HR 141 BP 198/91
Q-Stress 6.3.0.63634
Hospital name here...
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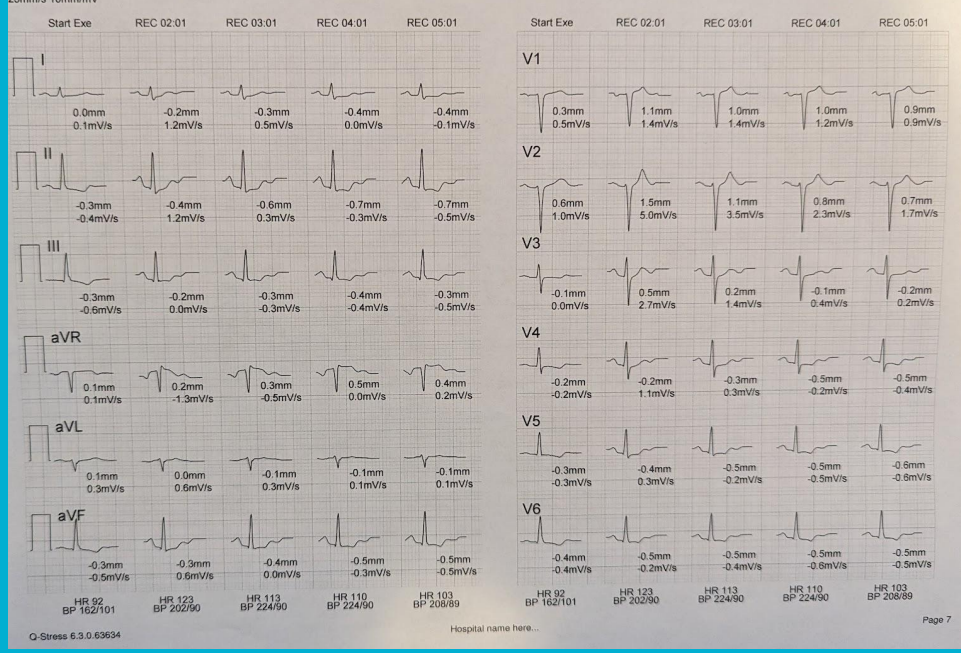
Reports:

[redacted]

Periodic Averages

9/12/2023 8:14:30 AM
Bruce

[...Average QRS By Minute continued]
25mm/s 10mm/mV



Q-Stress 6.3.0.63634

Hospital name here...

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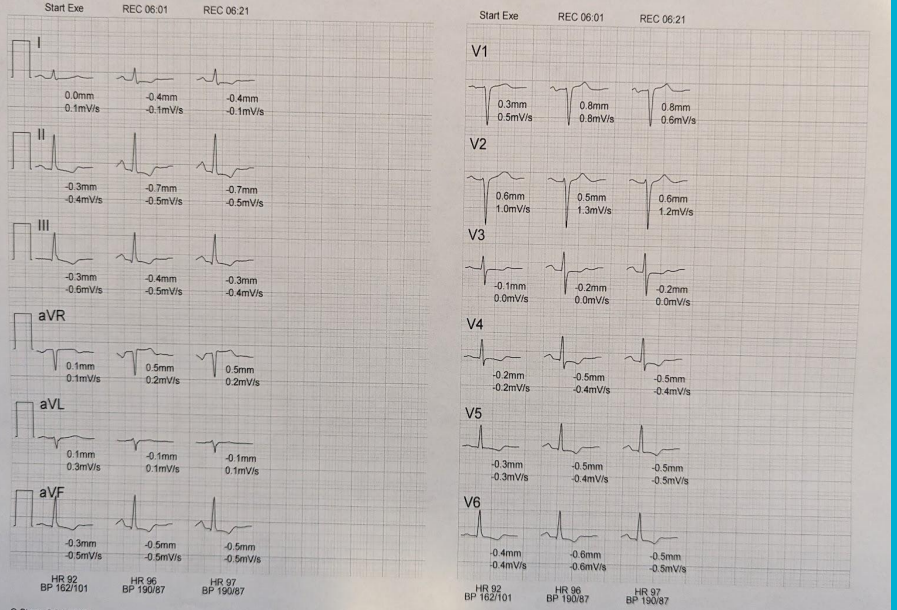
[redacted]

Periodic Averages

9/12/2023 8:14:30 AM
Bruce

[...Average QRS By Minute continued]
25mm/s 10mm/mV



Q-Stress 6.3.0.63634

Hospital name here...

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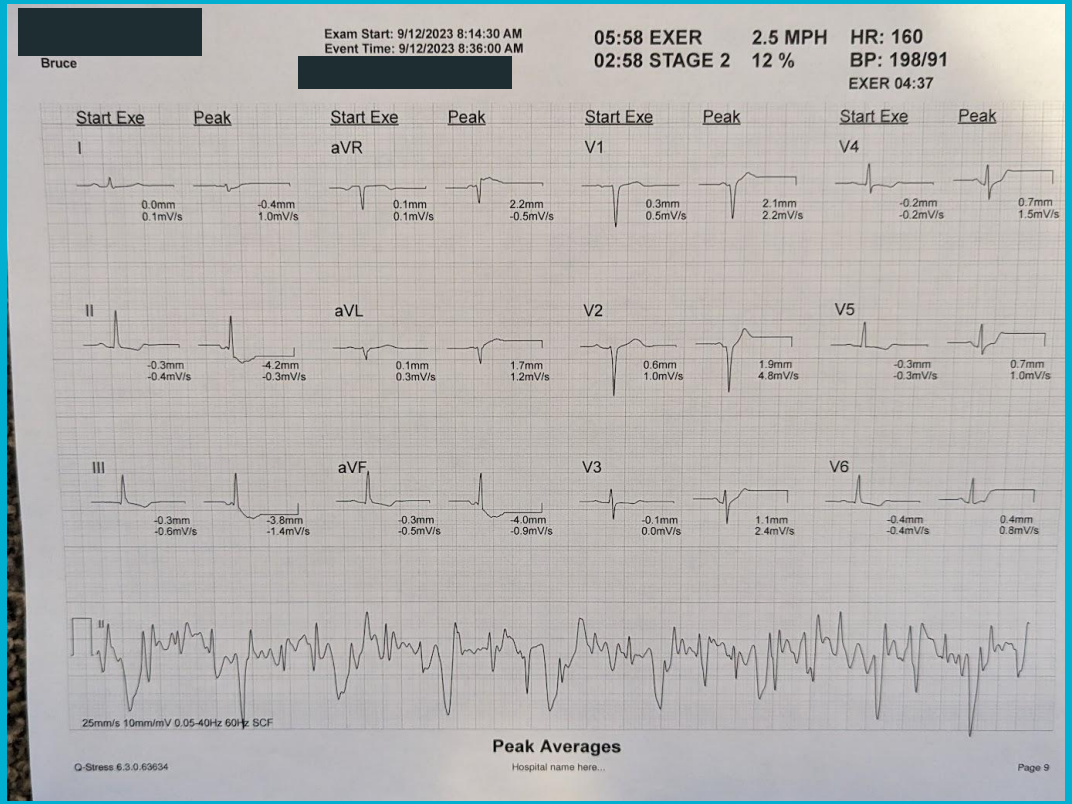
Reports:


[redacted]
Bruce
Exam Start: 9/12/2023 8:14:30 AM
Event Time: 9/12/2023 8:36:00 AM
[redacted]
05:58 EXER 2.5 MPH HR: 160
02:58 STAGE 2 12 % BP: 198/91
EXER 04:37
Start Exe Peak Start Exe Peak Start Exe Peak Start Exe Peak
I 0.0mm 0.1mV/s -0.4mm 1.0mV/s
aVR 0.1mm 0.1mV/s 2.2mm -0.5mV/s
V1 0.3mm 0.5mV/s 2.1mm 2.2mV/s
V4 -0.2mm -0.2mV/s 0.7mm 1.5mV/s
II -0.3mm -0.4mV/s -4.2mm -0.3mV/s
aVL 0.1mm 0.3mV/s 1.7mm 1.2mV/s
V2 0.6mm 1.0mV/s 1.9mm 4.8mV/s
V5 -0.3mm -0.3mV/s 0.7mm 1.0mV/s
III -0.3mm -0.6mV/s -3.8mm -1.4mV/s
aVF -0.3mm -0.5mV/s -4.0mm -0.9mV/s
V3 -0.1mm 0.0mV/s 1.1mm 2.4mV/s
V6 -0.4mm -0.4mV/s 0.4mm 0.8mV/s
II
25mm/s 10mm/mV 0.05-40Hz 60Hz SCF
Peak Averages
Q-Stress 6.3.0.63634
Hospital name here...
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