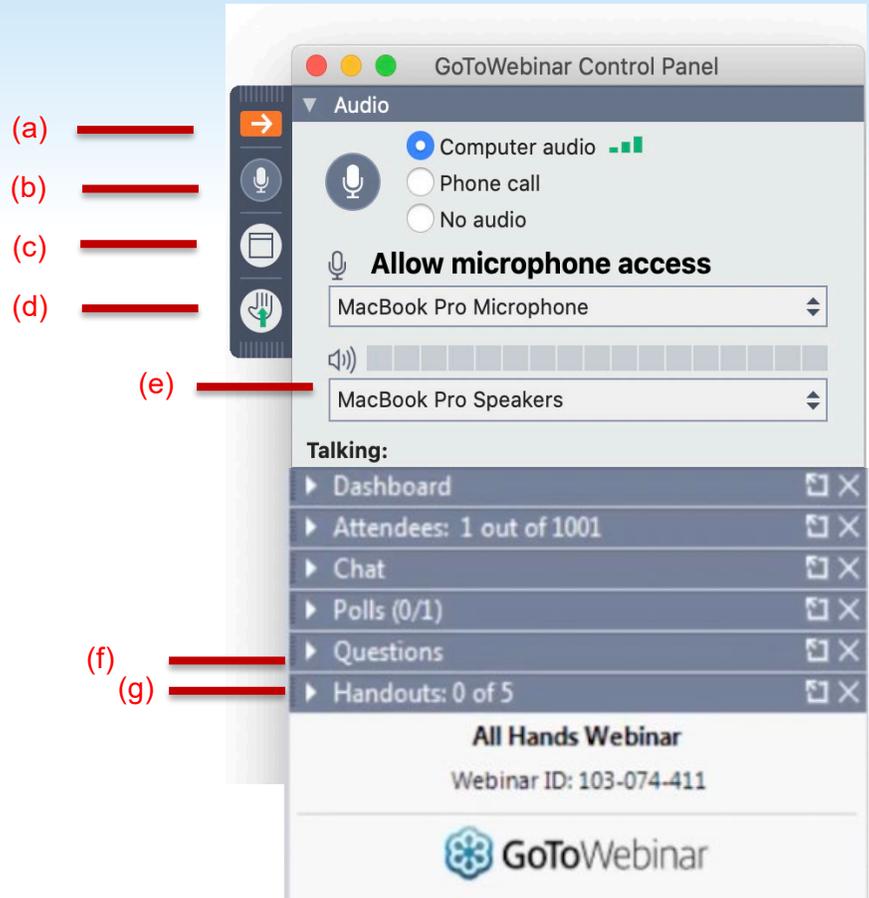


# Dynamics Driving the Accelerated Shift to Cardiac PET and PET/CT

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# CONTROL PANEL



**(a) - Grab Tab** – click arrow to open/close Control Panel.

**(b) - Mute** – By default, attendees are muted (in listen-only mode) to minimize background noises.

**(c) - View in full screen mode**

**(d) - Raise Hand** – When vocal questions/comments are allowed, please select the hand icon to get the presenter's attention. A red arrow means your hand is raised.

**(e) - Audio Pane** – You can choose Computer Audio or Phone Call.

**(f) - Questions pane** – Attendees can ask Questions to organizers during a session. Broadcast messages to attendees will also show here.

**(g) - Handouts** – Organizers can share handouts during webinars. Handouts are made available in the Control Panel during the session, which attendees can then download onto their own devices.



# The Shift to Cardiac PET and PET/CT

- Documented clinical value of cardiac PET as a “preferred” technology\*
- Multiple entry options
- Patient and laboratory-friendly protocols: 30-45 minutes
- Stable Payment
- *Increasing cardiac PET clinical value: the emerging value of myocardial blood flow*
- *Transition from dedicated PET to PET/CT*
- *Cardiac PET in a COVID environment*



# What are the Data Supporting Cardiac PET Perfusion Imaging?

- High diagnostic accuracy
- Consistent high-quality images
- Low radiation exposure
- Short acquisition protocols
- Strong prognostic power
- Quantification of myocardial blood flow

Bateman et al JNC 2016;23:1226-31



# Societies Recommendations Patients for Cardiac PET

## Joint ASNC/SNMMI Position Statement: Patients for Cardiac PET

	Preferred	Recommended
Unable to complete an ETT	✓	
Prior poor quality stress imaging		✓
Anticipated significant attenuation artifact		✓
High-risk patients in whom diagnostic errors carry even greater clinical implications.		✓
Anticipated repeated radiation exposure to minimize exposure		✓
Patients in whom myocardial blood flow quantification is identified by clinicians to be a needed adjunct to the image findings		✓

Reference: Bateman et al JNC 2016 online



# The Emerging Value Of Myocardial Blood Flow

- Clinical value well demonstrated
- Improves cardiac PET accuracy for epicardial CAD as well as identifying microvascular CAD
- Reduces un-necessary catheterizations and identifies low risk patients
- Implementation available for both dedicated and PET/CT systems
- Myocardial blood flow software is now available to clinical sites, multiple options

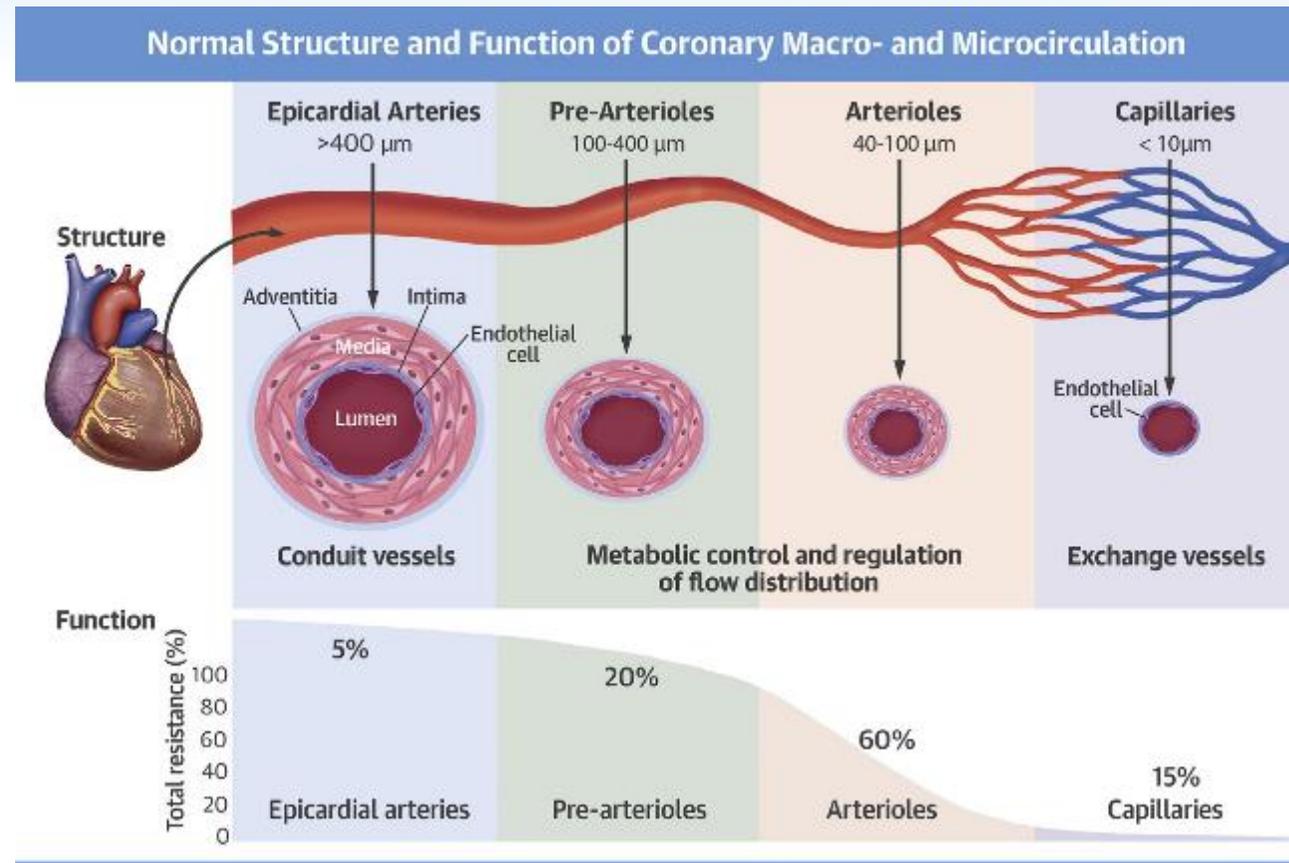


# PET Myocardial Blood Flow Quantitation

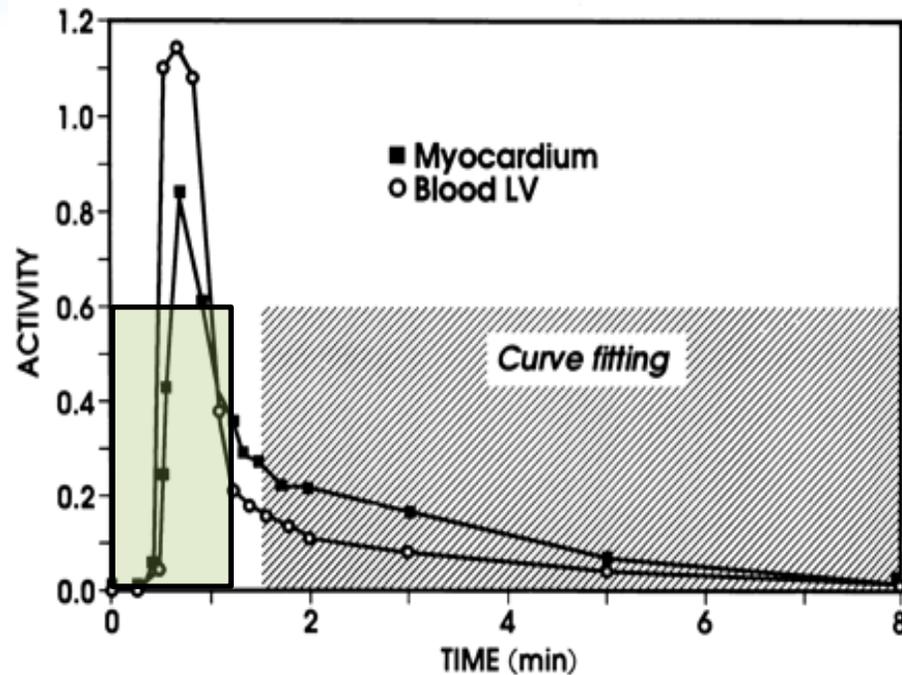
- Does not increase study time, radiation
- Provides further risk stratification beyond perfusion and function
- Identifies patients at risk for microvascular disease
- Assists in clinical decision making:
  - Lower risk of CAD with normal perfusion and blood flow
  - Characterization of abnormal perfusion: multi vs single
  - Identifies “non-responders” to pharmacologic stress



# Myocardial Blood Flow with Cardiac PET: adding a new dimension



# Blood flow and Perfusion Data collection: Rubidium-82

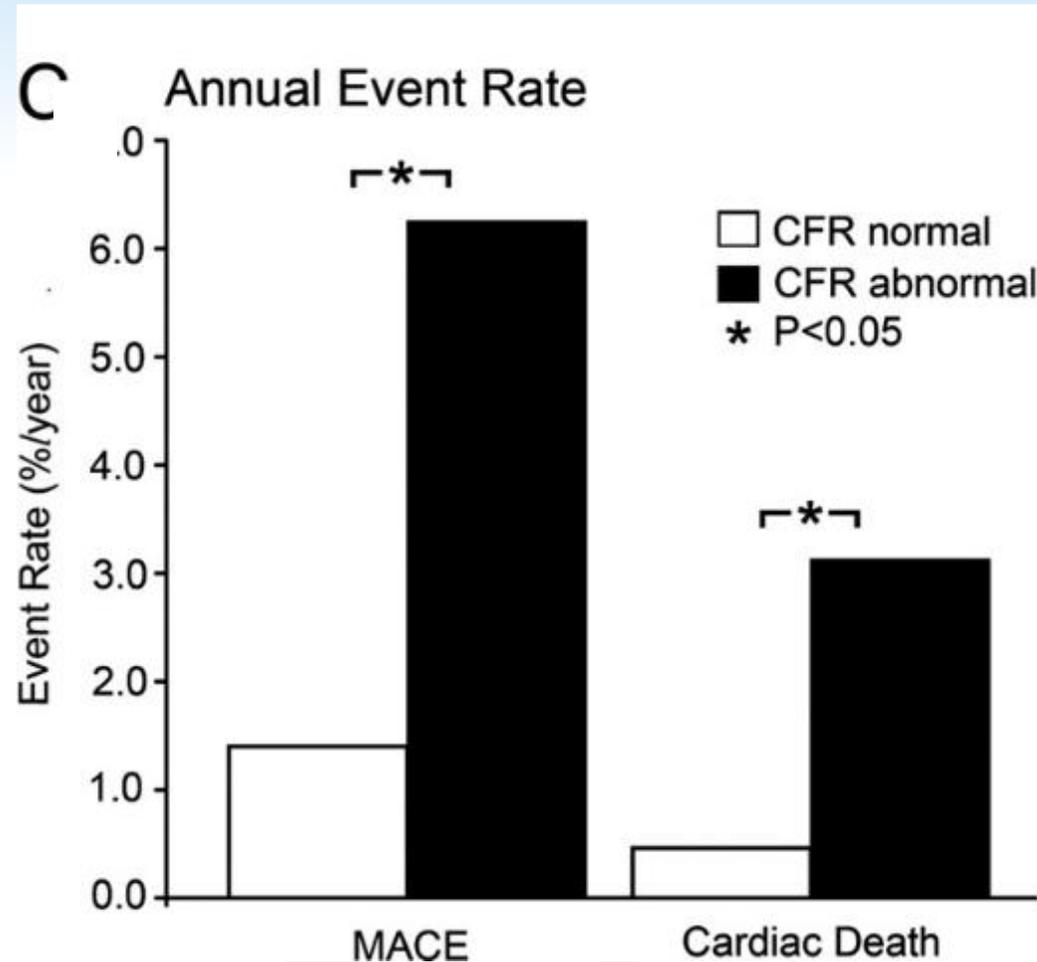


- Radiotracer half-life: 75 seconds
- Pre-scan delay (blood pooling)
  - *Collection of blood flow data*
- Total acquisition time: 7 minutes with *blood flow*

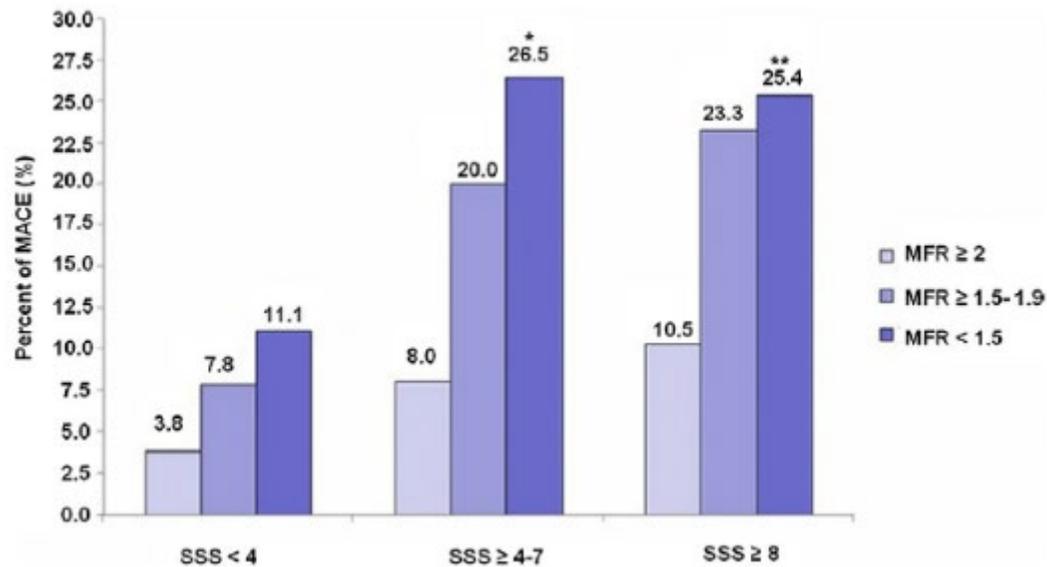
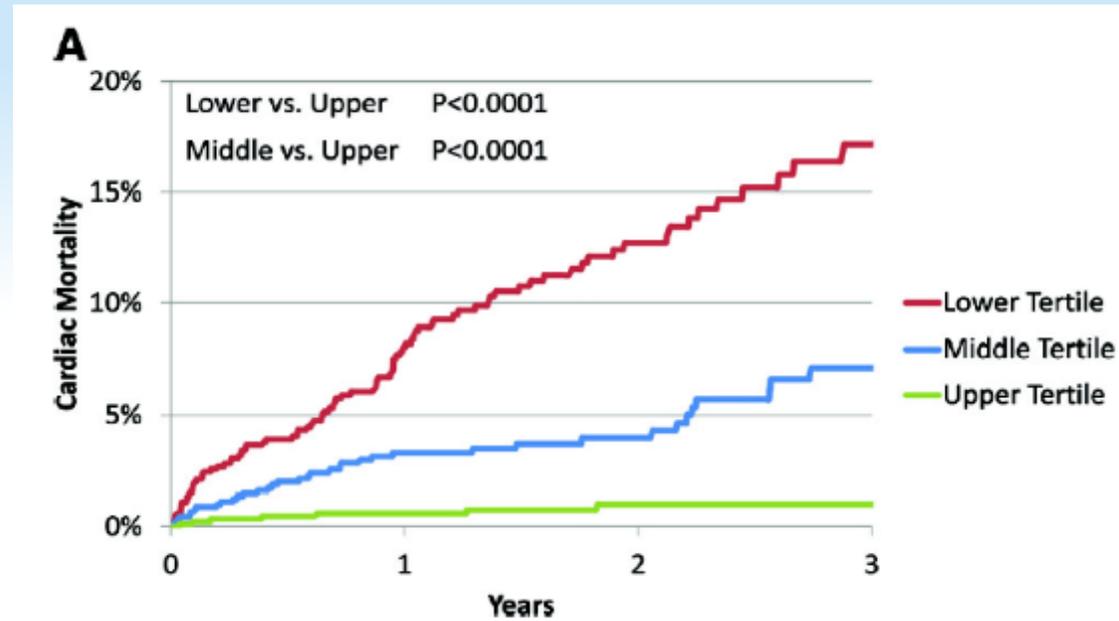
Vom Dahl J, et al. *Circulation*. 1996;93:238-245.



# Added Value of CFR in Predicting Outcome Up to 3 Years After a **Normal** MPI PET Scan



# Coronary Flow Reserve & Prognosis



*Murthy et al, Circulation 2011*

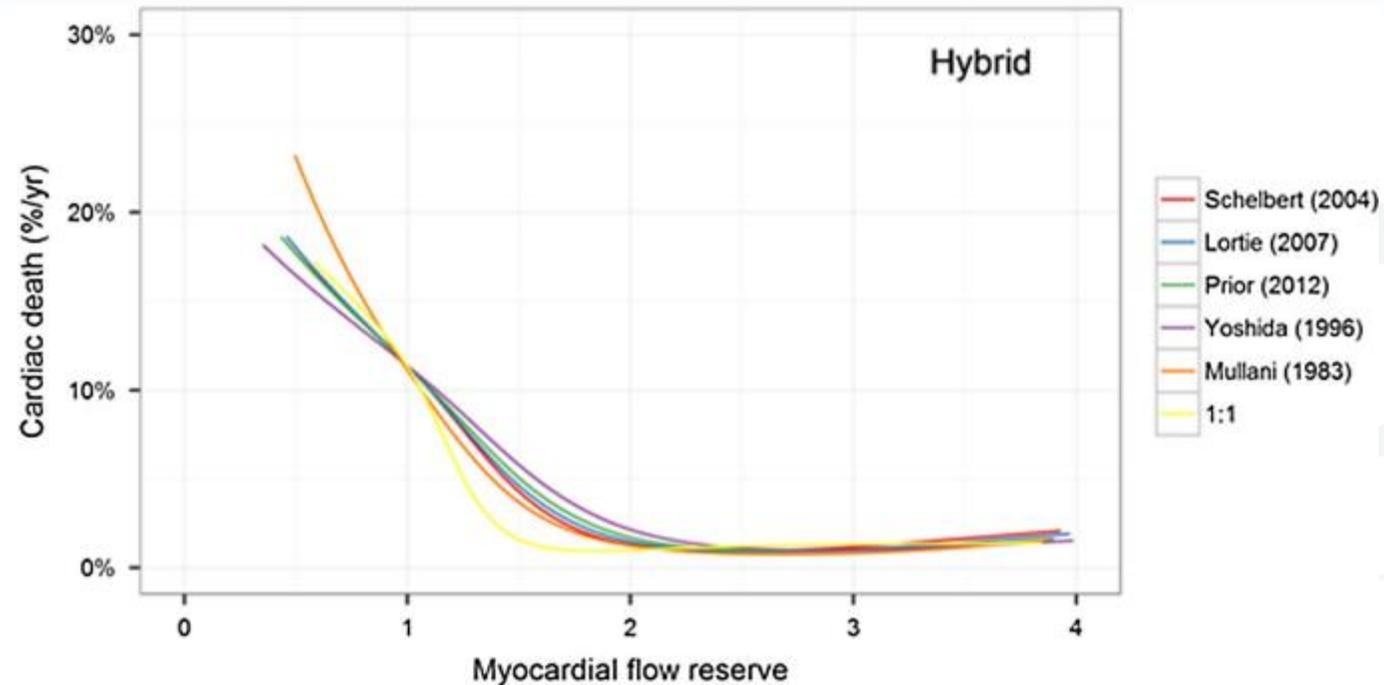
*Ziadi et al, JACC 2011*

# Clinical Value of Myocardial Blood Flow Assessment in conjunction with Perfusion

- Recognizes whether vasodilation has been achieved especially in patients with normal perfusion or fixed defects
- Detects a low risk population of normal perfusion and normal blood flow in which the risk of CAD and cardiac events is minimal
- Identifies a previously missed population of normal perfusion but abnormal blood flow in which CAD has not been excluded
- Characterizes microvascular disease, especially in diabetic, hypertensive and renal failure patients that assists in treatment strategies
- Identifies patients with more extensive CAD beyond perfusion results



# What is Normal? Consensus from Multiple Blood Flow programs



# Key Points to Successful Implementation of Myocardial Blood Flow Program

- Training of technologists for precise data acquisition and processing, especially positioning of blood flow
- Assuring appropriate quality control of MBF results
- Educating reading physicians to interpret blood flow numbers especially in clinical context, especially known or suspected CAD
- Educating healthcare providers on the significance of blood flow findings in the context of perfusion results, especially microvascular disease
- Incorporating MBF results into the clinical report



# Discussion Points for Cardiac PET and MBF

- Dr Sher experience in implementation of cardiac PET in his practice
- Addition of Myocardial Blood Flow to existing PET program
  - Gaining comfort level for reading MBF
  - Clinical value of the MBF program
  - Acceptance of healthcare providers



# *Transition from dedicated PET to PET/CT*

- Cardiac PET uses either line-source or CT technology for attenuation correction
- Many dedicated PET cameras are performing very good cardiac PET
- There is a movement towards PET/CT



# Dedicated Cardiac PET Systems

- Footprint smaller, less weight
- With most cameras, myocardial blood flow possible
- Older systems, replacement parts more difficult
- Dedicated system availability becoming limited
- Ancillary studies with FDG are more difficult



# *PET/CT*

- Protocols are shorter in comparison with dedicated PET
- MBF can be accomplished easier and more software options
- CT attenuation correction is precise for PET emission registration
- CT offers the option of calcium evaluation
  - Visual observation
  - Quantitative score
- Allows wider choices of options beyond perfusion: FDG imaging
- Greater flexibility of camera options: refurbished vs new
  - Purpose of CT in a given practice determines instrumentation needs
  - Considerations for other CT uses: Ca++, CTA, peripheral CT



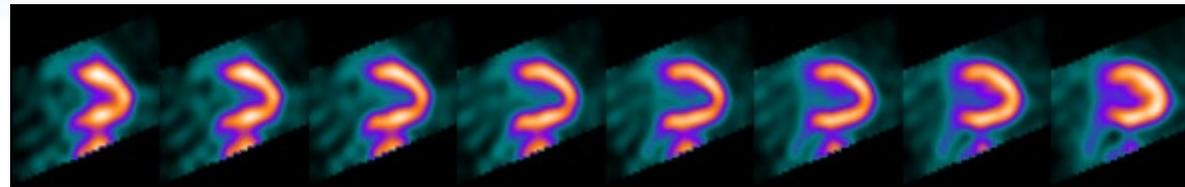
# Practical Considerations for PET/CT

- Instrumentation more expensive
- May require larger space, more floor support
- Maintenance of CT more expensive
- CT image
  - low resolution but does provide clinical data: overread
    - Ignore (attenuation correction only)
    - Member of practice gain skill in CT interpretation
    - Radiology over read (cannot bill)

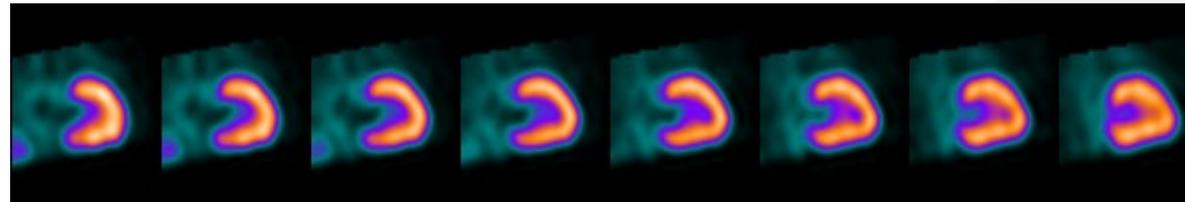


# Image Quality Can be Successful with a Variety of Dedicated and PET/CT Systems

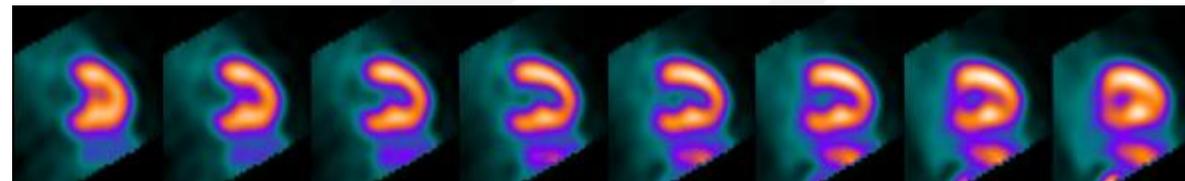
Dedicated  
PET 2D



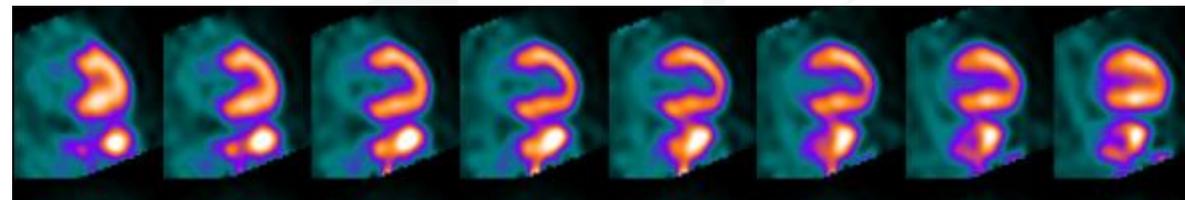
Dedicated  
PET 3D



16 slice  
PET/CT



128 slice TOF  
PET/CT



# Improving the Value of Assessing Patients with no known CAD with PET/CT

- Myocardial perfusion and function: accepted clinical value over SPECT
- Myocardial Blood Flow Assessment
  - Assess effective vasodilation
  - Improve CAD assessment
  - Identify microvascular disease
- Calcium Scoring
  - Further risk stratification
  - Complimentary role with myocardial perfusion: non-obstructive CAD with normal perfusion
  - Complimentary role with Myocardial Blood Flow abnormal in the setting of normal perfusion
    - Low calcium: likely microvascular CAD, high Calcium: likely epicardial CAD



# *Cardiac PET in a COVID Environment*

- Of great concern during COVID is exposure of the patient with potential COVID to laboratory staff
- Issues during COVID
  - Time of patient in practice area: wait time during completion of protocol
  - Exercise vs pharmacologic stress: sweating, breathing, proximity to staff
  - Duration of pharmacologic stress protocol to minimize staff exposure



# *Cardiac PET in a COVID environment comparison*

## **SPECT**

- Protocol duration: 3-4 hours
- Pharmacologic stress duration: 3-4 hours
- Pharmacologic stress proximity: multiple interactions with staff

## **PET**

- Protocol duration: 25-40 min
- Pharmacologic stress duration: 25-40 minutes
- Pharmacologic stress proximity: under camera, protocol complete when stress done



# Potential Solutions

- SPECT only laboratories
  - Stress-only imaging protocol
  - Convert from exercise to pharmacologic stress
- SPECT-PET laboratories
  - Convert from SPECT (3-4 hours) to PET (30-45 minutes)
  - Convert from exercise SPECT to pharmacologic PET



# Discussion Points with Dr Sher

- Shift from SPECT exercise to PET?
- CMS, Insurance issues
- Perception of staff



# Conclusion: Dynamics Driving the Accelerated Shift to Cardiac PET and PET/CT

- *Increasing cardiac PET clinical value: the emerging value of myocardial blood flow*
- *Transition from dedicated PET to PET/CT*
- *Cardiac PET in a COVID environment*

