6 MINUTE WALK (6MWT)

What is it and why do we do it?

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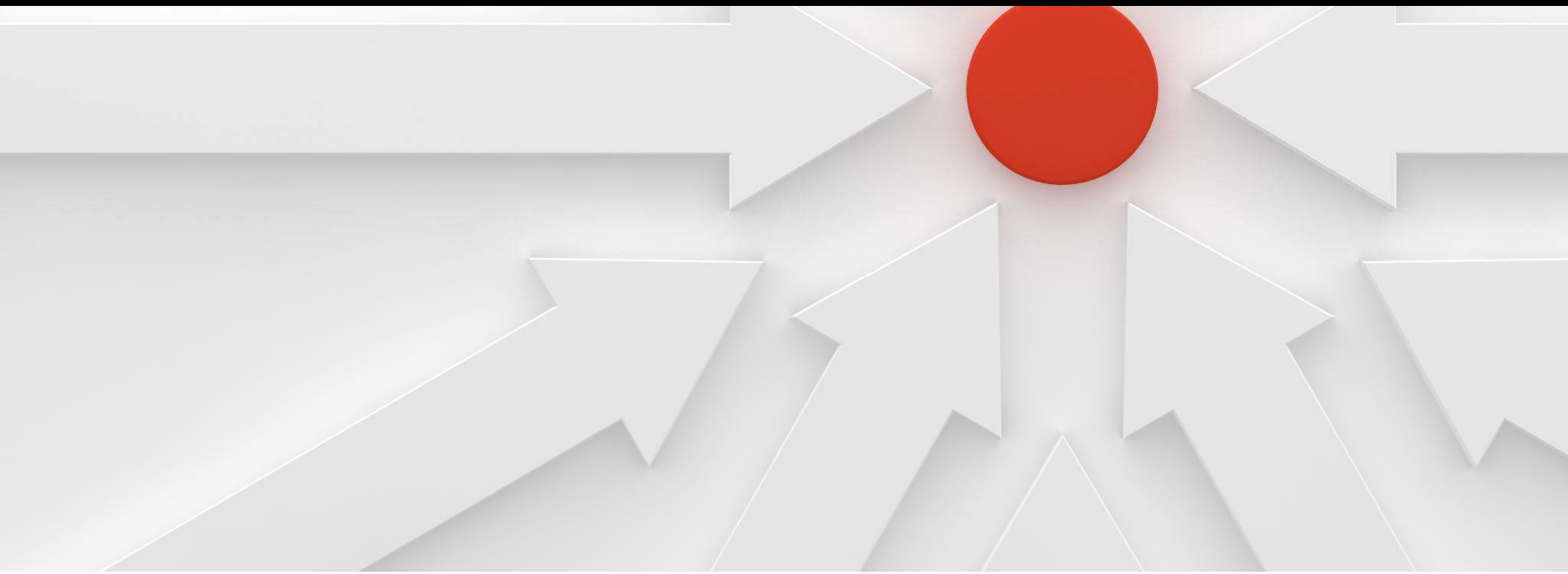
DISCLOSURES

The speaker has no relevant financial relationships with any companies to disclose.

OBJECTIVES



OBJECTIVES

Define the 6-Minute Walk Test and describe its purpose in clinical settings

Identify the key clinical applications of the 6MWT across various patient populations

Explain when and why the 6MWT is performed, including its role in evaluating functional status, treatment response and prognosis

WHAT IS IT?

- The 6-minute walk Test is a simple, widely used clinical test to measure a person' functional exercise capacity- basically, how far someone can walk on a flat, hard surface in six minutes

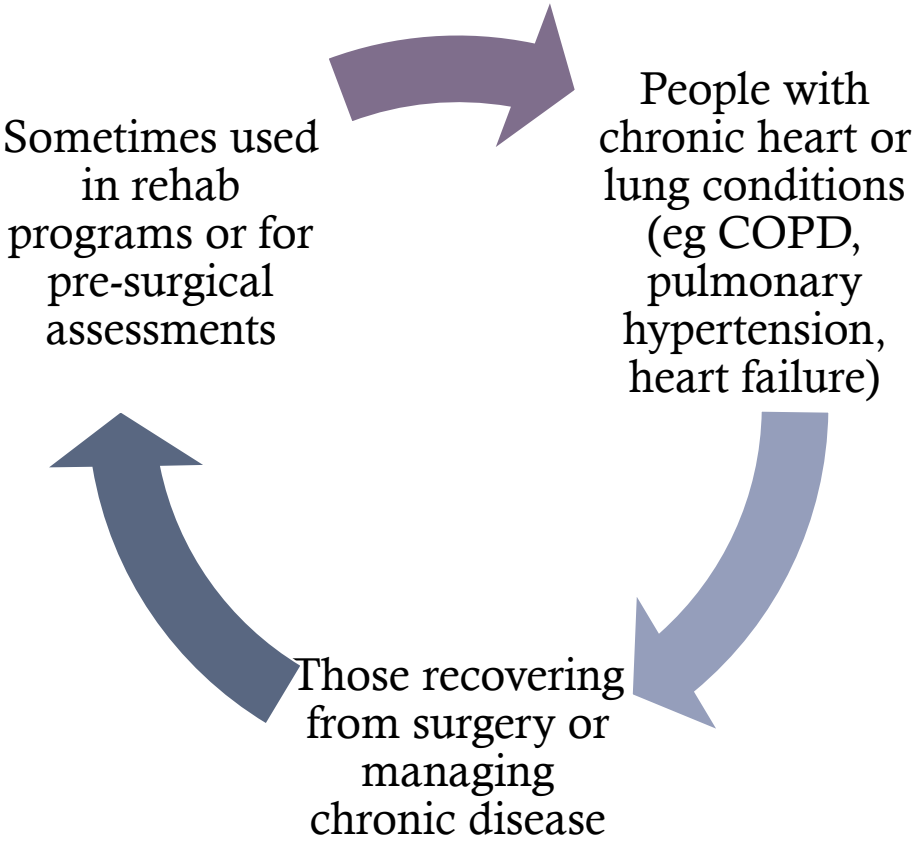
WHAT IT MEASURES

ENDURANCE

HEART AND LUNG FUNCTION UNDER EXERTION

ABILITY TO PERFORM DAILY PHYSICAL ACTIVITIES

WHO'S IT FOR:


People with chronic heart or lung conditions (eg COPD, pulmonary hypertension, heart failure)
Those recovering from surgery or managing chronic disease
Sometimes used in rehab programs or for pre-surgical assessments

HOW'S IT DONE

You walk back and forth along a measured corridor (usually 30 meters/100 feet long) for 6 minutes

The goal is to walk as far as possible, but you can stop or slow down if needed

Distance is measured in meters or feet

WHAT IT TELLS US

Shorter distances can suggest limited heart/lung function or reduced endurance.

It’s useful to track progress over time or in response to treatment or rehab

EXERCISE OPTIONS INCLUDE…

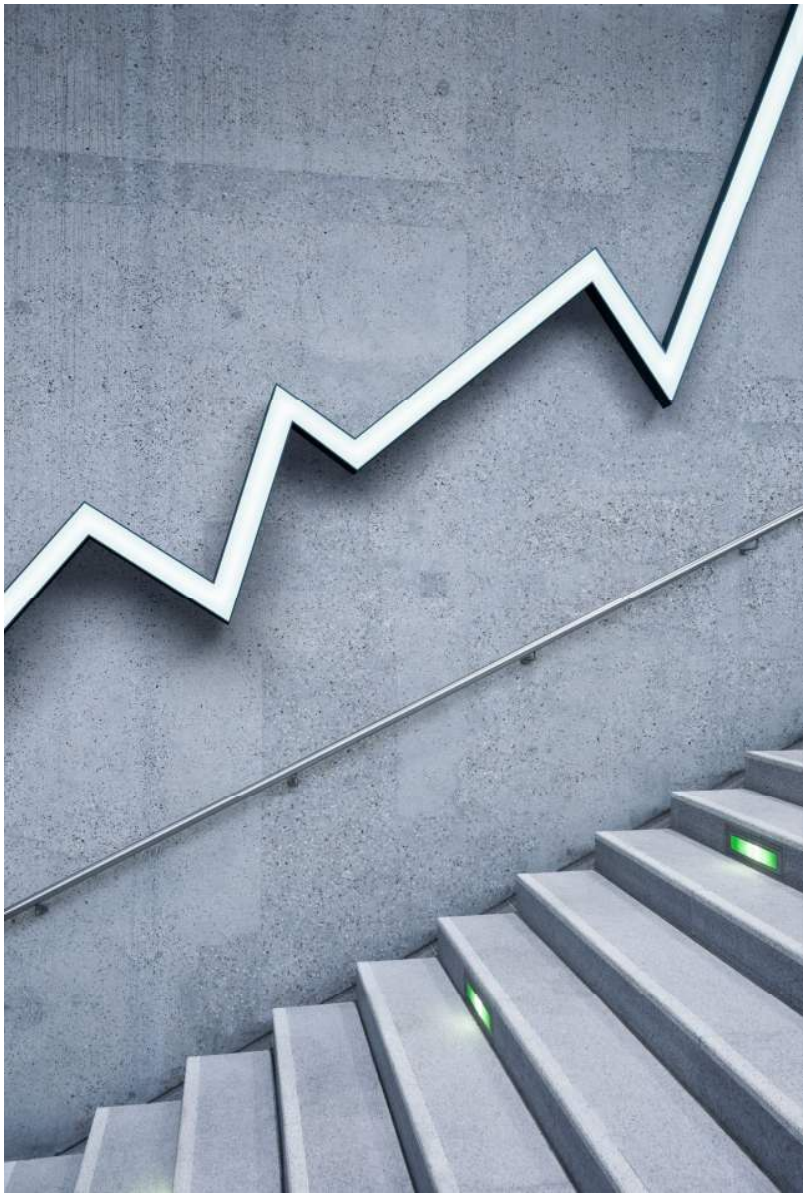
- Questionnaire
- Stair climbing
- 6MWT
- Shuttle-walk test
- EIA/EIB
- Cardiac Stress (e.g. Bruce protocol)
- Cardiopulmonary Stress

QUESTIONNAIRE

- How many flights of stairs can you climb?
- How many blocks can you walk?
- Patient's recollections are not always accurate
- Data is subjective-usually patients overestimate or underestimate
- Objective data is optimal

STAIR CLIMBING

- Easy for most to do- not the patients we see though!
- Not the safest for the patient
- Accessibility to AED, Code cart or other emergency supplies
- Oxygen usage- pulling a tank up the steps?



6MWT

- Easy to administer
- Better tolerated
- Self paced
- No advanced equipment needed
- No excessive training for the staff
- More reflective of activities of daily living than the other walk tests
- Does not determine peak oxygen uptake
- Does not diagnose the cause of dyspnea on exertion or causes of exercise limitation
- It is not a replacement for cardiopulmonary exercise testing but a complement to them

SHUTTLE WALK TEST

- Like 6MWT
- Uses an audio signal to direct the walking pace of the patient (remember the pacer in HS?)
- 10m course required
- Walking speed is increased every minute
- Test ends when patient cannot reach the turnaround point within the required time
- Has good correlation with peak oxygen uptake and the 6MWT
- Has more potential for cardiovascular problems

EIA/EIB

EIB/EIA- exercise induced bronchoconstriction test is typically used with patients with suggested asthma diagnosis or increased shortness of breath with exercise

Typical EIB/EIA patient is usually active in sports- soccer, cheerleading, running etc.

They experience shortness of breath during these activities and then return to their baseline when the activity is ceased.

Some elite athletes need to formally document the presence or absence of SOB with exercise to justify the use of asthma medications

Involves Spirometry and pleth prior to exercise

Spiro measured over a 30-minute period after exercise (5min, 10min, 15,up to 30 minutes)

Bronchodilator can be given for significant decreases in FEV1 post 30-minute stage

CARDIAC STRESS TEST

- Testing doesn't involve spirometry measurements- lung function is not accessed
- ECG, BP and SpO2 baseline is done
- Patient placed on treadmill for incremental exercise using the Bruce protocol
- Speed and incline increase every 3 minutes until patient is unable to keep up the pace
- Test should be stopped for significant changes in BP, arrhythmias etc.
- Cardiologist needs to be available for any emergency situations
- Measures peak exercise levels of exertion

CARDIOPULMONARY STRESS

- Similar to cardiac stress –still running faster and steeper incline every 3 minutes
- Measures not only cardiac capabilities but also pulmonary peak levels
- Involves 2 technicians/RT's
- Objective and extensive data obtained
- Not necessarily designed for a patient with moderate to severe pulmonary disease
- Designed to determine if there are cardiac limitations, pulmonary limitations or both
- Lots of setup involved compared to the 6MWD

6MW PATIENTS ARE…

- Usually experiencing severely limited lung function
- Usually unable to use a treadmill due to a physical limitation- due to gait or other limitations
- Sometimes already using oxygen prior to testing
- May need supplemental oxygen and need the justification- decreased SpO2 with activity but how low does it go?
- Some are unable to do spirometry – can't seal with mouthpiece (scleroderma etc.)

WHERE DID IT COME FROM?

- Developed in the early1960's by Balke
- Test was designed to measure physical fitness in healthy individuals
- Initially test was 12 minutes long
- Adapted test to assess disability in patients with chronic bronchitis
- With research it was determined that 6 minutes yielded the same info as 12
- It was found that the "6MWT is easy to administer, better tolerated and more reflective of activities of daily living than other walk tests"

INDICATIONS

- Measuring the response to medical interventions in patients with moderate to severe heart or lung disease
- Used as a 1-time measurement of functional status as well as predictor of morbidity and mortality

PRE-TREATMENT AND POST-TREATMENT

- lung transplant
- lung resection
- pulmonary rehab
- COPD
- pulmonary hypertension
- heart failure

FUNCTIONAL STATUS- ONE TIME MEASUREMENT

- COPD
- Cystic fibrosis
- Heart failure
- Peripheral vascular disease
- Fibromyalgia
- Older patients

PREDICTOR OF MORBIDITY AND MORTALITY

- Heart failure
- COPD
- Primary pulmonary hypertension

CONTRAINDICATIONS

- Unstable angina during the previous month
- Myocardial infarction the previous month
- Relative contraindications:
  - Heart rate of more than 120
  - Systolic blood pressure of more than 180 mm Hg
  - Diastolic BP of more than 100mm Hg
- Patients with these findings should be referred to the ordering physician for individual assessment

THINGS TO CONSIDER

Testing should be performed in a location where a rapid response to an emergency is possible

Crash cart should be readily available

Supplies needed:

Oxygen as needed:

Sublingual nitroglycerine

Aspirin

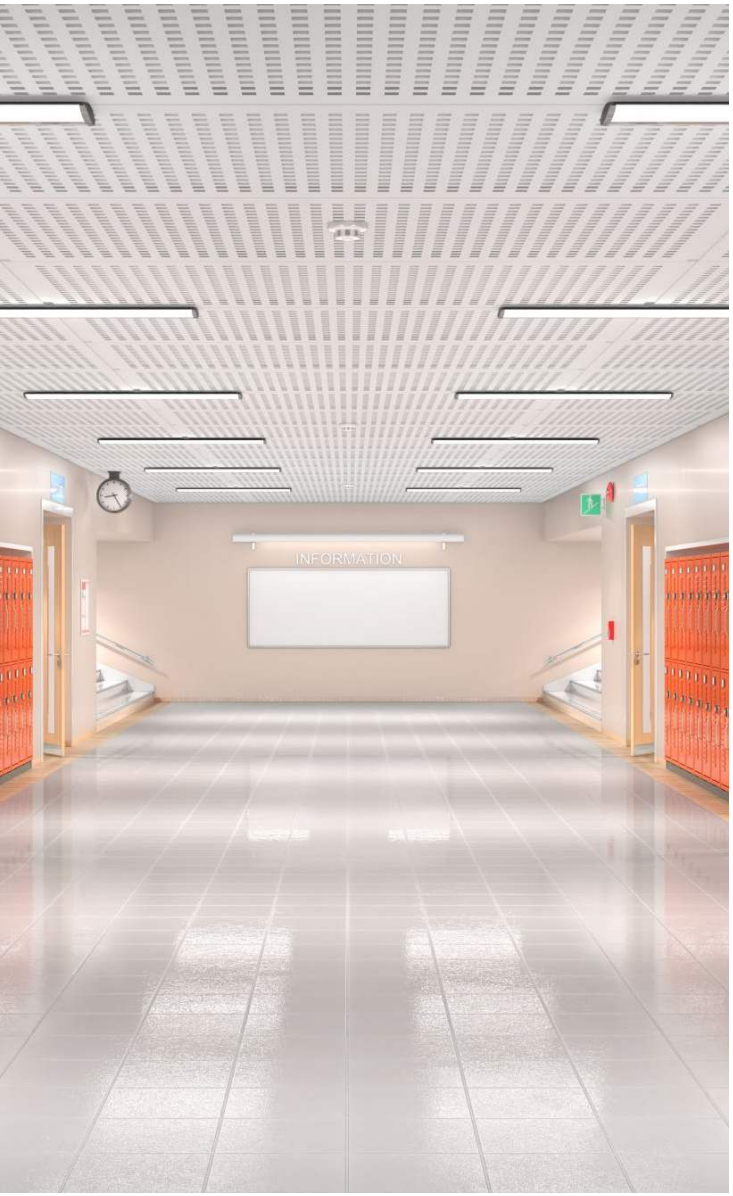
Albuterol MDI or nebulizer

THINGS TO CONSIDER CONT.

- Technician should be certified in BLS or ACLS
- Test can be performed RN, RRT, CPFT, RPFT
- Physician is not required to be present during all tests. The physician ordering the test or a supervising physician may decide whether physician attendance is needed
- Patients on oxygen prior to testing should remain on their standard rate or as directed by a physician or a protocol

REASONS TO STOP THE TEST

- Chest pain
- Intolerable dyspnea
- Leg cramps
- Staggering
- Diaphoresis
- Pale or ashen appearance



TECHNICAL ASPECTS OF THE TEST

- Perform indoors
- Path should be straight and flat
- 100ft hallway is required
- Path should be marked every 3 meters
- Turnaround points require a cone
- Use brightly colored tape to indicate the beginning and ending of each lap

REQUIRED EQUIPMENT

- Countdown timer
- Mechanical lap counter
- Two small cones to mark the turnaround points
- A chair that can be easily moved along the walking course
- Worksheets on a clipboard (Borg scale and additional worksheet to gather number of laps etc)
- A source of oxygen
- Sphygmomanometer
- Telephone
- AED

PATIENT PREP

- Comfortable clothing should be worn
- Appropriate shoes for walking should be worn
- Patients should use their usual walking aids during the test (cane, walker, etc)
- The patient's usual medical regimen should be continued
- A light meal is acceptable before early morning or early afternoon tests
- Patients should not have exercised vigorously within 2 hours of beginning the test

MEASUREMENTS

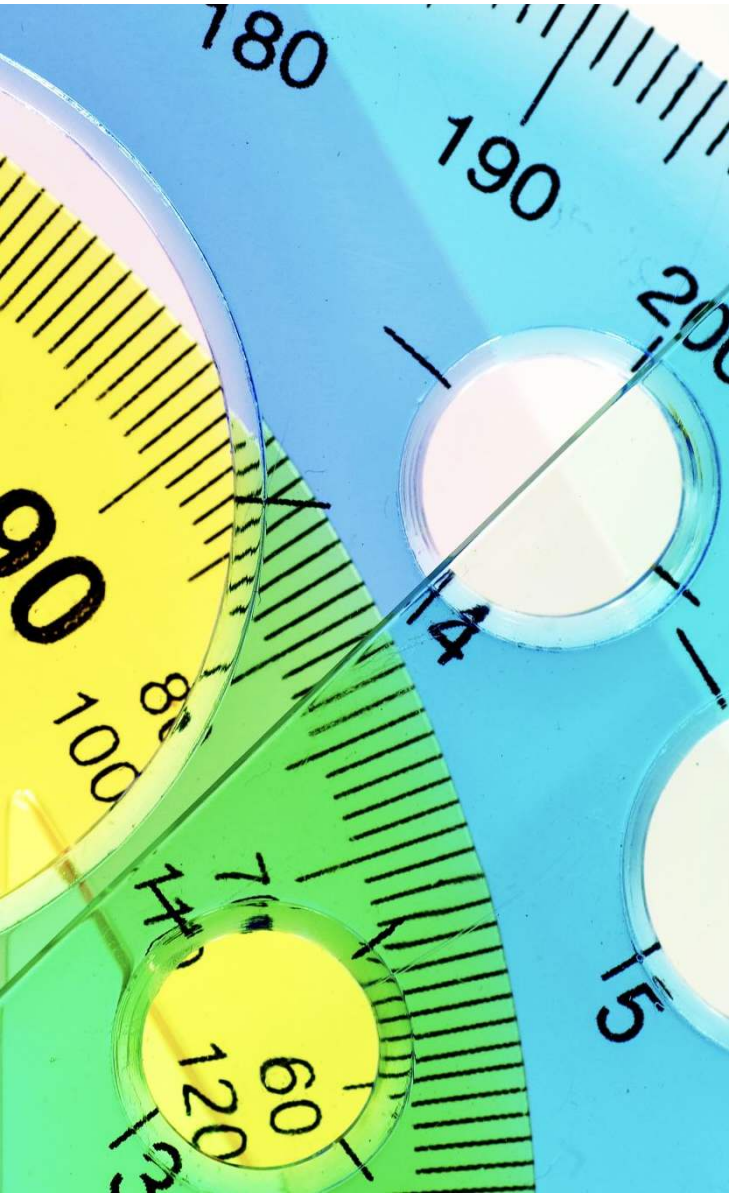
- Repeat testing should be performed about the same time of day to minimize intraday variability
- A “warm up” period before the test should not be performed
- Patient should sit in a chair, located near the start point for at least 10 minutes before the test starts
  - While waiting-check for contraindications, measure pulse and blood pressure
  - Complete first section of the worksheet-
  - Pulse oximetry is optional!

PULSE OXIMETRY

- Yes, you heard that correctly pulse oximetry is optional!
- If it is performed, please assess the patients baseline heart rate and saturation- following the manufacturers instructions for maximizing the signal and minimizing motion artifact
- Thoracic.org states the following on the matter: *the rationale for measuring oxygen saturation is that although the distance is the primary outcome measure, improvement during serial evaluations may be manifest either by an increased distance or by reduced symptoms with the same distance walked. The SpO2 should not be used for constant monitoring during the exercise.* ***The technician must not walk with the patient to observe the SpO2****. If worn during the walk, the pulse oximeter must be lightweight (less than 2 pounds), battery powered and held in place (perhaps by a "fanny pack") so that the patient does not have to hold or stabilize it and so that stride is not affected. Many pulse oximeters have considerable motion artifact that prevents accurate readings during the walk.*

BORG SCALE-

- Also called the Borg Rating of Perceived Exertion or RPE scale
- Developed by scientist Gunnar Borg who rated the scale on a 6-20 scale built around the heart rate
- A tool used to measure a patient's perception of effort or "how hard you feel your body is working" during physical activity
- It helps to guide a provider on what interventions are needed or not needed
- It measures a patient's perception of:
  - Heart Rate
  - Breathing rate
  - Muscle fatigue
  - Overall exertion



BORG SCALE CONT.

- 2 main versions of this scale exist
  - Original Borg RPE Scale (6-20)
  - Modified Borg Scale (0-10)

BORG SCALE CONT.

Original Borg Scale

Borg Rating of Perceived Exertion		
Green	6	Zero Exertion
	7	Extremely light
	8	Minimal effort
Yellow	9	Very light exertion (comfortable)
	10	Just start to hear breathing
	11	Conversation is easy
	12	Light exertion
Orange	13	Somewhat hard
	14	Breathing hard but not struggling
	15	Can converse but not full sentences
	16	Hard work
Red	17	Very hard - getting uncomfortable
	18	Can no longer converse
	19	Extremely hard - body is screaming
	20	Maximal exertion

Modified Borg Scale

1 - 10 Borg Rating of Perceived Exertion Scale	
0	Rest
1	Really Easy
2	Easy
3	Moderate
4	Sort of Hard
5	Hard
6	
7	Really Hard
8	
9	Really, Really, Hard
10	Maximal: Just like my hardest race

WHAT DO THE SCORES IMPLY?

The original Borg scale runs from 6-20 because the score you select should correspond to your heart rate when multiplied by 10. For example, if you felt your RPE was 15, then it is likely that your heart rate would be around 150 BPM

Modified Borg Scale is more intuitive and often used for dyspnea (shortness of breath) or general discomfort

BORG YET? WHICH ONE?

Exertion	RPE scale	Borg scale	Activity examples
none	0	6	laying on the couch
just noticeable	0.5	7 to 8	bending over to put on your shoes
very light	1	9 to 10	easy chores, such as doing laundry
light	2 to 3	11 to 12	leisurely walking that does not increase your heart rate
moderate/ somewhat hard	4 to 5	13 to 14	brisk walking or moderate activity that speeds up your heart rate without making you out of breath
hard	6 to 7	15 to 16	vigorous activity, such as jogging, biking, or swimming (increases your heart rate and makes you breathe harder and faster)
very hard	8 to 9	17 to 18	the highest level of activity that you can continuing doing without stopping, such as running
maximum effort	10	19 to 20	a short burst of activity, such as a sprint, that you cannot keep doing for long

WHY CAN'T I?

- Why do I have to use a 100 ft hallway?- shorter corridors require patients to take more time to reverse directions more often, reducing the 6MWD.
- Why can't I walk with them? This test is self paced. Walking with them causes the patient to feel a need to "keep up with you or make a different effort than if they walked alone"
- Who will pull their oxygen tank?- The patient! Are you going to be with them at home to pull their O2?
- Why can't I use the treadmill? It might save space, but treadmill tests are not interchangeable with 6mwd. Patients are not truly able to self pace with a treadmill

HOW TO INSTRUCT

- It seems silly but in the name of science we should all do the test in the exact same way!
- Thoracic.org gives the verbiage to be used with each 6MWD
- Repeat testing should be performed about the same time of day to minimize intraday variability
- A warm-up period before the test must NOT be performed (do you warm up prior to walking to the kitchen to cook breakfast?)
- Do not talk to anyone during the walk
- Use an even tone of voice when using the standard phrases of encouragement
- Watch the patient and keep up with the number of laps– ADHD?… maybe get someone else to do it!

WHAT DO I SAY?

- **The object of this test is to walk as far as possible for 6 minutes. You will walk back and forth in this hallway. Six minutes is a long time to walk, so you will be exerting yourself. You will probably get out of breath or become exhausted. You are permitted to slow down, to stop, and to rest as necessary. You may lean against the wall while resting but resume walking as soon as you are able.**
- **You will be walking back and forth around the cones. You should pivot briskly around the cones and continue back the other way without hesitation. Now I'm going to show. Please watch the way I turn without hesitation**?
- Demonstrate by walking one lap yourself. Walk and pivot around a cone briskly.
- **"Are you ready to do that? I am going to use this counter to keep track of the number of laps you complete. I will click it each time you turn around at this starting line. Remember that the object is to walk AS FAR AS POSSIBLE for 6 minutes, but don't run or jog.**
- "Start now or as soon as you are ready"

WHILE THEY ARE WALKING…

- Stay alert! 6 minutes can be a long time to watch someone walk and it is easy to get distracted
- After the first minute, tell the patient in even tones: “you are doing well. You have 5 minutes to go”
- When the timer shows 4 minutes remaining, tell the patient: “Keep up the good work. You have 4 minutes to go.”
- When the timer shows 3 minutes remaining: “you are doing well. You are halfway done.”
- When the timer shows 2 minutes remaining: “Keep up the good work. You only have 2 minutes left”.
- When the time shows 1 minute left: “you are doing well. You have only 1 minute to go.”

WHILE THEY ARE WALKING CONT.

- When the timer is 15 seconds from completion, say this:
- In a moment I'm going to tell you to stop. When I do, just stop right where you are and I will come to you."
- When the timer rings (or buzzes), say this: STOP! Walk over to the patient-take a chair if they appear exhausted.
- Mark the spot where they stopped by placing a bean bag or piece of tape on the floor

POST TEST

- Record the post walk Borg dyspnea and fatigue levels and ask," What if anything, kept you from walking farther?"
- Record the additional distance covered (the number of meters in the final partial lap) using markers on the wall as distance guides.
- Calculate the total distance walked, rounding to the nearest meter, and record it on the worksheet
- Congratulate the patient on their good effort and offer a drink of water

NOTES ON ENCOURAGEMENT

I know you want them to do well but…

ONLY the standardized phrases for encouragement (as detailed here from thoracic.org) must be used during the test

Encouragement significantly increases the distance walked.

WHAT IF THEY STOP EARLY?

- You can remind them that they can lean on the wall if they like but continue walking whenever you feel able."
- Do NOT STOP the timer!
- If they refuse to continue prior to the 6 minutes.. Wheel a chair over for them to sit in, discontinue the walk and note on the worksheet the distance, time stopped and the reason for stopping prior to the end of test

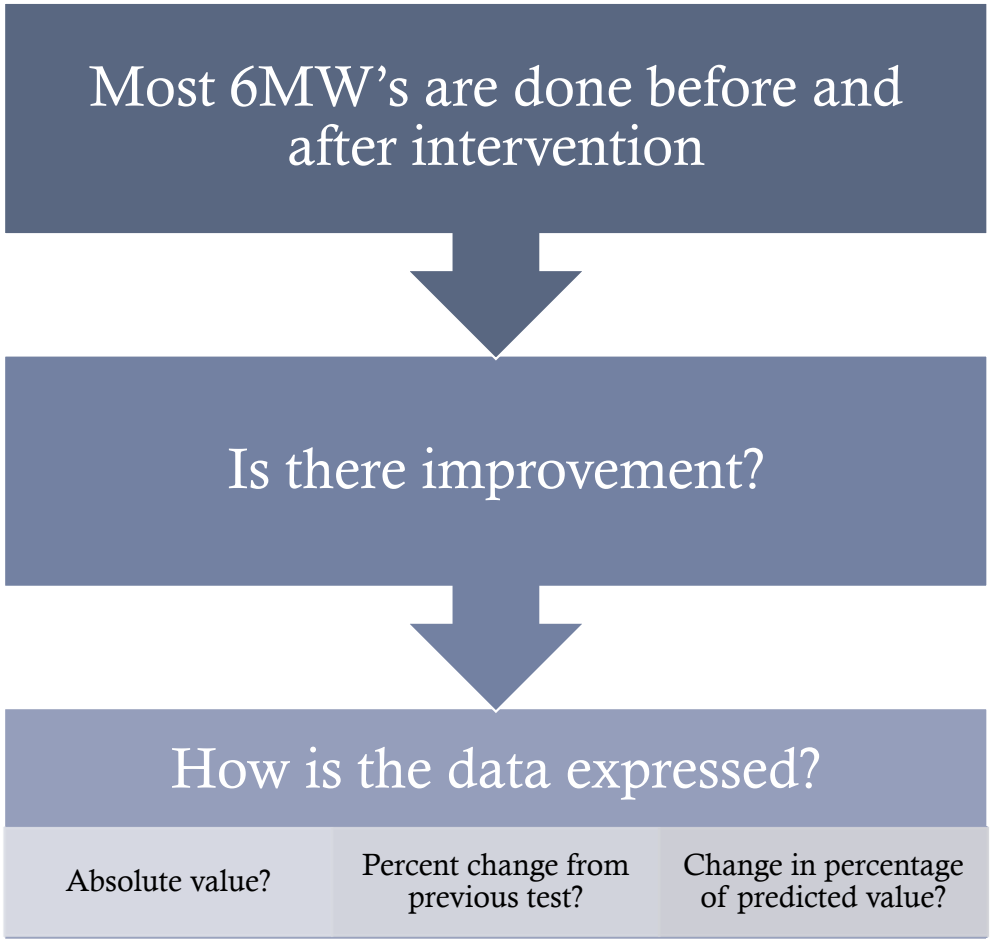
SOURCES OF VARIABILITY

- Factors reducing the 6MWD
  - Shorter height
  - Older age
  - Higher body weight
  - Female sex
  - Impaired cognition
  - A shorter corridor (more turns)
  - Pulmonary disease-(COPD, asthma, cystic fibrosis,interstitial lung disease)
  - Cardiovascular disease (angina, MI, CHF, stroke, TIA, PVD, AAI)
  - Musculoskeletal disorders (arthritis,ankle, knee, or hip injuries, muscle wasting, etc)

SOURCES OF VARIABILITY CONT.

- Factors increasing the 6MWD
  - Taller height (longer legs)
  - Male sex
  - High motivation
  - A patient who has previously performed the test
  - Medication for a disabling disease taken just before the test
  - Oxygen supplementation in patients with exercise-induced hypoxemia

INTERPRETATION



ABSOLUTE VALUES

- Data should be reported in absolute values
- “Patient walked 50m further than previous test with the following interventions…”

WHAT ABOUT SINGLE MEASUREMENTS?

Optimal reference equations from healthy population-based samples using standardized 6MWT methods are not yet available

Age , height, weight and sex independently affect the 6MWD in healthy adults

Take those things into account when interpreting the results of single measurements made to determine functional status

Trend some data!

PREDICTED SETS FOR PEDIATRICS

- Results of 6-minute walk tests in different age groups (4 years-11 years)
- Patients 12 years and older predicted distance is 512 m
- Standards taken from: A.E Lammers, A.a Hislop, Y Flynn, and S.G Haworth; "the 6 minute walk test: normal values for children of 4-11 years of age" Arch Dis Child 2008 93:464-468 originally published online August3,doi: 10.1136/adc.2007.123653 Updated information and services can be found at http://adc.bmj.com/content/93/6/464

Age	4 yo	5 yo	6 yo	7 yo	8 yo	9 yo	10 yo	11 yo
6MWTD (m)	383	420	463	488	483	496	506	512

BUT WAIT THERE'S MORE…

- How often should this test be repeated? Depends on the provider but more chronic illnesses like pulmonary hypertension require testing more often to trend results.
- Can this be used to qualify patients for home oxygen? Yes. What are the guidelines? There are no stringent guidelines, but it does help to qualify a patient for oxygen along with other lab results like ABG's.
- How long should it take to complete? 6 minutes? 1 hour? The actual walk is 6 minutes however the workup prior to the walk and time post testing easily makes this test about 30-40 minutes on average
- 6MWD and 6MWT are these the same? These terms are interchangeable
- Is this covered by insurance? In most cases yes. Does coverage depend on the dx? Yes, the patient should have a pulmonary illness in order for most insurance to cover the procedure
- Who needs one and when? Patients with the inability to do simple spirometry but there is still a need to quantify the patient's pulmonary status
- Are they generally done in the PFT lab, doc office or by the floor RT? Generally done in the PFT lab but can be done in other office spaces like cardiology as well.

CONCLUSIONS

1

6MWT is a widely utilized, easy to perform assessment of functional capacity

2

Targeted at patients with moderate to severe impairment

3

Used for preoperative and post operative evaluation

REFERENCES:

- https://www.atsjournals.org/doi/10.1164/ajrccm.166.1.at1102
- Kammin EJ. The 6-Minute Walk Test: Indications and Guidelines for Use in Outpatient Practices. J Nurse Pract. 2022 Jun;18(6):608-610. doi: 10.1016/j.nurpra.2022.04.013. Epub 2022 May 12. PMID: 35578650; PMCID: PMC9095083.

QUESTIONS?