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# I SURVIVED COVID NOW WHAT?

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# Disclosures

- Pharmaceutical Speaker Bureau for:
  - Boehringer Ingelheim
  - Bristol-Meyer Squibb
  - Janssen
  - Pfizer

- As of September, 2021 there have been 42.3 million documented cases of Covid 19 infections in the United States resulting in 676K Deaths
- Worldwide there have been 219 million documented cases with 4.6 million deaths
- The Institute of Health Metrics and Evaluation reports that these numbers are grossly under reported with the actual total deaths approximately 6.9 million.

- Before we talk about what our patients can do to recover from their Covid infections, lets review what we all have all lived through for the last year and half, and more importantly what people experience when infected by this unholy virus

# Most common symptoms of Covid 19

- Fever and chills
- Cough
- Shortness of Breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

# Incidence of Covid symptoms reported by the CDC

- Cough in 50 percent
- Fever (subjective or  $>100.4^{\circ}\text{F}/38^{\circ}\text{C}$ ) in 43 percent
- Myalgia in 36 percent
- Headache in 34 percent
- Dyspnea in 29 percent
- Sore throat in 20 percent
- Diarrhea in 19 percent
- Nausea/vomiting in 12 percent
- Loss of smell or taste, abdominal pain, and rhinorrhea in fewer than 10 percent each
- Other studies have reported loss of taste and smell in upwards of 50% of patients

# **Comorbidities** – Comorbidities and other conditions that have been associated with severe illness and mortality include:

- Increased Age
- Cardiovascular disease
- Diabetes mellitus
- Chronic obstructive pulmonary disease and other lung diseases
- Cancer (in particular hematologic malignancies, lung cancer, and metastatic disease)
- Chronic kidney disease
- Solid organ or hematopoietic stem cell transplantation
- Obesity
- Smoking

# Clinical Manifestations:

- Pneumonia is the most frequent serious manifestation of infection, characterized primarily by fever, cough, dyspnea, and bilateral infiltrates on chest imaging
- Mild disease (no or mild pneumonia) was reported in 81 percent.
- Severe disease (e.g., with dyspnea, hypoxia, or >50 percent lung involvement on imaging within 24 to 48 hours) was reported in 14 percent.
- Critical disease ( respiratory failure, shock, or multiorgan dysfunction) was reported in 5 percent.

# Clinical Manifestations:

- **Respiratory failure** – Acute respiratory distress syndrome (ARDS) is the major complication in patients with severe disease and can manifest shortly after the onset of dyspnea.
- In a retrospective study of 138 hospitalized patients, ARDS developed in 20 percent at a median of eight days after the onset of symptoms
- mechanical ventilation was implemented in 12.3 percent

# Clinical Manifestations:

- **Thromboembolic complications** – Venous thromboembolism (VTE), including extensive deep vein thrombosis (DVT) and pulmonary embolism (PE), is common in severely ill patients with COVID-19, particularly among patients in the intensive care unit, among whom reported rates have ranged from 10 to 40 percent
- **Arterial thrombotic events**, including acute stroke (even in patients younger than 50 years of age without risk factors) and limb ischemia

# Clinical Manifestations:

- **Neurologic complications** – Encephalopathy is a common complication of COVID-19, particularly among critically ill patients; as an example, in one series of hospitalized patients, encephalopathy was reported in one-third of the hospitalized patients
- Stroke( as previously stated), movement disorders, motor and sensory deficits, ataxia, and seizures occur less frequently.

# Clinical Manifestations:

- **Inflammatory complications** – Some patients with COVID-19 have laboratory evidence of a severe inflammatory response, with persistent fevers, elevated inflammatory markers (e.g., D-dimer, ferritin), and elevated proinflammatory cytokines.
- This is now referred to as MIS-A
- Multisystem Inflammatory Syndrome in Adults
- these laboratory abnormalities have been associated with critical and fatal illnesses.

# Clinical Manifestations:

- Although these features had been likened to cytokine release syndrome (e.g., in response to T cell immunotherapy)
- the levels of proinflammatory cytokines in COVID-19 are substantially lower than those seen with cytokine release syndrome as well as with sepsis.
- MIS-C Multisystem Inflammatory Syndrome in Children has also been described

# Cardiovascular complications seen at the Oklahoma Heart Institute

- Most patients with COVID-19 and cardiac test abnormalities (such as cardiac troponin elevation, electrocardiographic [ECG] abnormalities, or cardiac imaging findings) lack symptoms of heart disease.
- The overwhelming number of patient we see admitted to the Hospital with elevated troponin levels have a Type II Demand myocardial infarction.

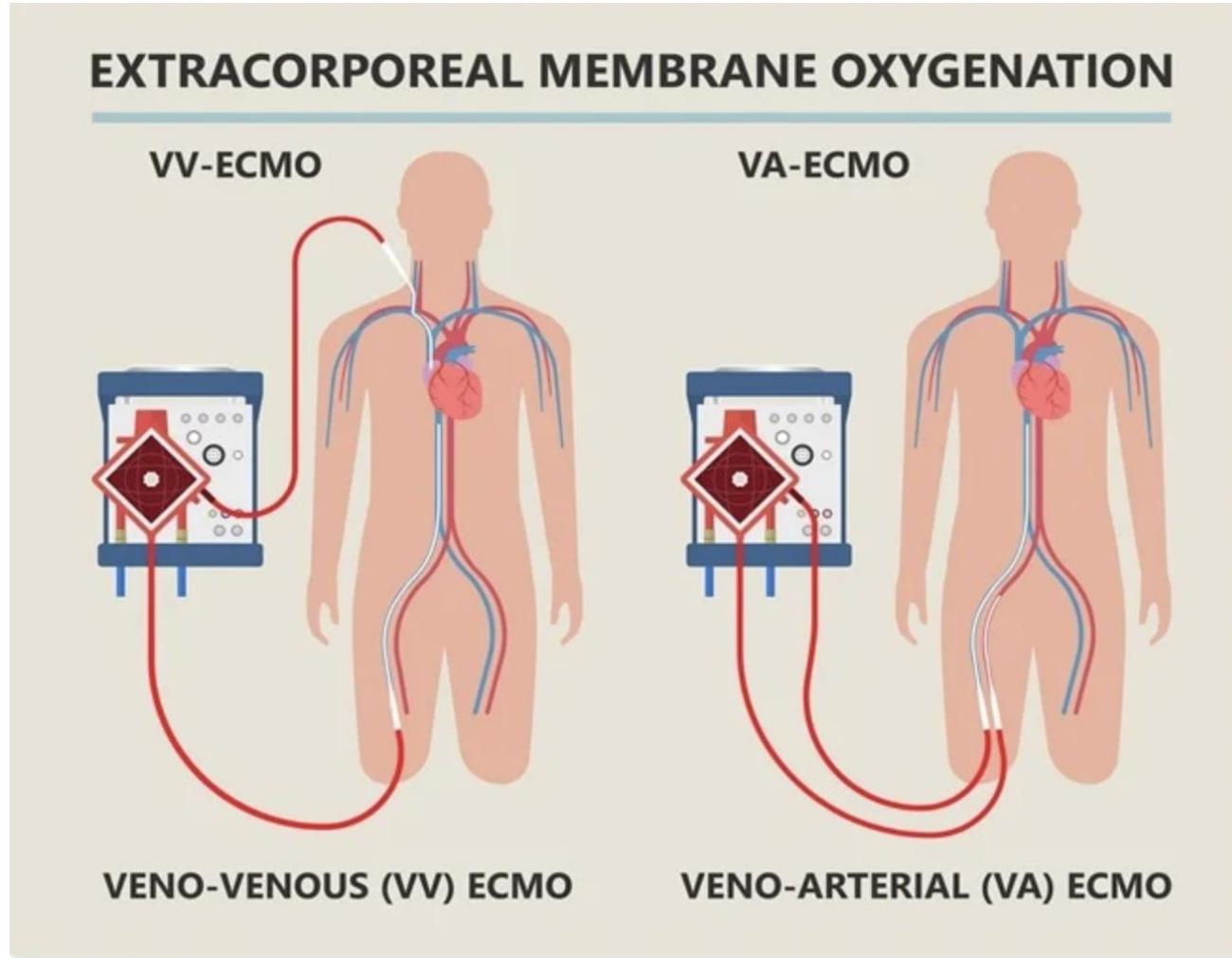
# Cardiovascular complications seen at the Oklahoma Heart Institute

- Unfortunately, we have also seen too many people present with STEMI, NSTEMI, Congestive heart failure Both (HFrEF and HFpEF), malignant arrhythmias, Pulmonary Embolism with DVT, Cardiogenic Shock, Stress Induced Cardiomyopathy (Takotsubo), Stroke, MIS-A and Myocarditis

# Cardiovascular complications seen at the Oklahoma Heart Institute

- The Heart Institute is only one of the two hospitals in Oklahoma that has ECMO capabilities
- Extracorporeal membrane oxygenation has become for some, the last best chance of survival for critical Covid infections with ARDS

# Cardiovascular complications seen at the Oklahoma Heart Institute



# Cardiovascular complications seen at the Oklahoma Heart Institute

- Early on in the pandemic we had a young EMT suffering from ARDS with MIS-A features stuck on the ventilator and on V-V ECMO
- The thinking at that point was to avoid steroids at all costs.
- Finally, since she was not making any progress, she was given high dose steroids and turned the corner
- She was the one of first people that we successfully went on to decannulate from ECMO

# Cardiovascular complications seen at the Oklahoma Heart Institute

- The Critical Care team reached out to other ECMO centers across the country and the use of steroids for MIS-A patients on ECMO quickly was adopted as standard practice

# Myocarditis

- In March of 2020 the NBA cancelled its season after 2 of its players tested positive for SARS-CoV2
- Soon there after the NCAA cancelled the March Madness National Championship
- A significant factor in the decision to cancel sporting events was concerns of myocardial involvement and injury associated with coronavirus disease 2019 (COVID-19)

# Myocarditis

- Early observational studies described some degree of cardiac involvement in up to 78% of infected patients, ranging from troponin elevations to features of myocarditis and myopericarditis on cardiac magnetic resonance imaging (MRI).

# Myocarditis

- The uncertain risks for myocarditis, a leading cause of sports-related sudden cardiac death
- The heightened risks for transmission among athletes with limited ability to don personal protective equipment
- These things factored heavily in the decision to halt play during the early months of the pandemic.

# Myocarditis

- Early case series suggested that upwards of 40% of athletes that tested positive for Covid-19 had findings on cardiac MRI consistent with myocarditis
- These early findings on subsequent studies were not reproducible
- These early studies highlighted the challenges in interpreting cardiac MRI in athletes and determining the clinical significance and specificity of findings suggestive of acute inflammatory changes.

# Myocarditis

- Recent evidence suggests true COVID-19 myocarditis may in fact be uncommon, presenting pathologically in <5% of patients undergoing autopsy or referred for myocardial biopsies in a recent case series
- Subsequent studies of athletes recovering from COVID-19 have since demonstrated much lower rates of myocardial involvement than earlier studies, ranging from 0.6% to 3%, despite similar proportions of symptomatic athletes.

# Myocarditis

- In a recent article in Circulation, Moulson and colleagues report findings from a large, multicenter, prospectively collected observational registry (Outcomes Registry for Cardiac Conditions in Athletes) including data from COVID-19–positive collegiate athletes gathered during Fall 2020
- In the largest study of COVID-19–positive athletes to date, the authors reviewed symptoms, cardiac screening studies, and cardiac MRI reports from 3018 athletes recovering from COVID-19.

# Myocarditis

- In 2820 athletes, MRI was obtained only if clinically indicated on the basis of abnormal screening cardiac testing (n=34) or presence of moderate or greater symptoms (n=85).
- Screening tests included ECG, serum Troponin and Echocardiogram
- A total of 119 MRIs was performed in this group.

# Myocarditis

- Using this framework, the authors observed low rates of cardiac involvement on cardiac MRI (0.5%) in 15 out of the 2820 athletes who underwent a selective screening algorithm on the basis of cardiac screening tests or symptoms.
- Of the 119 athletes who underwent cardiac MRI screening with this approach, 12.9% (n=15) had cardiac involvement

# Myocarditis

- No athlete with MRI abnormalities had clinical cardiac complications during the study follow-up period, although there was 1 case of cardiac arrest that was deemed to be unrelated to COVID-19.
- Ten athletes in the overall cohort experienced noncardiac COVID-19 complications, including pulmonary embolism and pleural effusion.

# Myocarditis

- The results of this study are similar to previous studies.
- In studies where cardiac MRI was performed inclusively in all athletes, rates of suspected myocarditis ranged from 0% to 15%, with 3 out of the 4 studies reporting rates between 0% and 3%.
- In the 2 studies where MRI was done selectively, rates of suspected myocarditis were 0% and 0.6%.

# Myocarditis

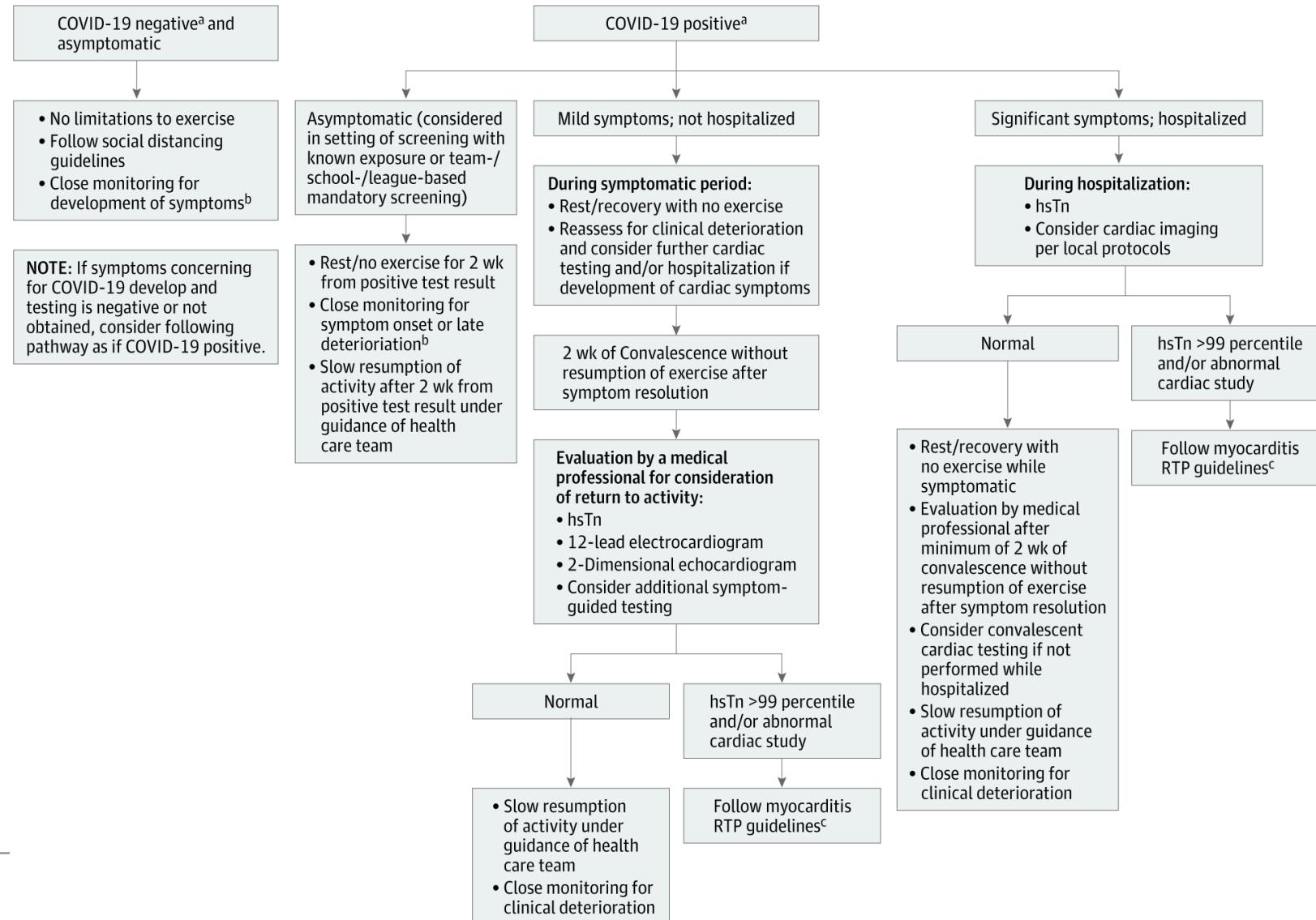
- These findings support recommendations from the Return to Play algorithms and consensus statements for athletes after COVID-19 from the American College of Cardiology
- The algorithm relies on a symptom-driven approach such that the presence of moderate to severe symptoms with initial COVID-19, or persistent or recurrent symptoms, requires initial cardiac evaluation with ECG, serum troponin, and echocardiogram.

# Myocarditis

- Cardiac MRI is recommended for athletes with abnormalities on these initial cardiac screening tests that are likely COVID-19-related as well as those with persistent, unresolving symptoms
- It is important to note that the reassuring results of this study cannot be easily extrapolated to hospitalized patients with COVID-19 or older noncompetitive athletes.

**From: A Game Plan for the Resumption of Sport and Exercise After Coronavirus Disease 2019 (COVID-19) Infection**

JAMA Cardiol. 2020;5(10):1085-1086. doi:10.1001/jamacardio.2020.2136



- So, you have recovered from your illness what now?
- **Get up and move!**
- (Exercise should not resume if a patient with COVID-19 has persistent fever, dyspnea at rest, cough, chest pain, or palpitations).

- People who are active for 150 minutes per week are less likely to be hospitalized and die from COVID-19.
- A new study shows physical activity levels may be more important than most other risk factors when it comes to limiting the effects of the disease.
- Most people stand to benefit from regular activity, regardless of other health factors.

- In a study published in February in the *International Journal of Obesity*, researchers found that, regardless of whether they had obesity, people who walked briskly were less likely to develop severe COVID-19 compared to those who walked slowly.
- In a new study of nearly 50,000 Californians who developed COVID-19, researchers found that people who did regular physical activity were less likely to end up in the ICU or die from the disease.

- An otherwise healthy patient with a self-limited course of COVID-19 who has been asymptomatic for 7 days may begin resuming physical activity at 50% of normal intensity and volume.

- In the initial phases of return to exercise after recovery from mild infection, we recommend a gradual guided activity modification plan such as the 50/30/20/10 rule developed by the National Strength and Conditioning Association and Collegiate Strength and Conditioning Coaches Association Joint committee for use over a 4-week period

- The conditioning volume for the first week is reduced by at least 50% of the normal exercise load, followed by 30%, 20%, and 10% in the following 3 weeks if comfortable at the end of each week.
- This would be adjusted by the severity of the disease and may require a graduated return to activity occurring over many months rather than weeks

- Consultation with a provider is recommended if patients who have had COVID-19 develop chest pain, fever, palpitations, or dyspnea on the resumption of exercise.

- The recovery process from COVID-19 exists on a continuum; early in the course of acute COVID-19, management is focused on detecting and treating acute COVID-19-related complications, while after recovery from the acute phase, some patients require evaluation and management for persistent or new symptoms.

- The CDC has proposed two categories of Covid-19 infections
- **Acute COVID-19** – Symptoms of COVID-19, up to four weeks following the onset of illness
- **Post-COVID conditions** – Broad range of symptoms (physical and mental) that develop during or after COVID-19, continue for  $\geq 4$  weeks, and are not explained by an alternative diagnosis

# Long Covid

- Post Covid symptoms have also been called: Long Covid, Long Haulers Syndrome, post-acute sequelae of SARS-CoV-2 infection (PASC) or Post Covid Syndrome.
- The symptoms people report, and the duration of symptoms are very different for different people and may reflect their severity of illness and pre-existing conditions.
- As a result, Long Covid means many things to many different people

# Long Covid

- In March 2020 the Body Politic, a web-based wellness collective, coordinated a series of online surveys released in May 2020.
- Many of the survey respondents who attributed their symptoms to a Covid-19 infection likely never had the virus in the first place
- Of those who self-identified as having persistent symptoms attributed to Covid, not even a quarter of them had tested positive for the virus.

# Long Covid

- Nearly half (47.8%) never had testing and 27.5% tested negative.
- This is not to say that early on we didn't have restrictions on testing or that the first generations of testing had significant false negative results

# Long Covid

- Based in part on the strength on these patient-led research initiatives, the NIH committed \$1.15 billion in long Covid research
- In a second survey published in December, of 3762 COVID-19 "long-haulers", the most frequent symptoms reported at least 6 months after illness onset were fatigue (78%), post exertional malaise (72%), and cognitive dysfunction ("brain fog") (55%).

# Long Covid

- If these symptoms seem familiar they should:
- Individuals experiencing long-term symptoms following acute COVID-19 infection often meet the criteria for ME/CFS (myalgic encephalomyelitis/chronic fatigue syndrome)

# CHRONIC FATIGUE SYNDROME

New consensus recommendations for **ME/CFS** include the following diagnostic criteria, along with updated treatment guidance:



- Although there is considerable overlap with symptoms of Chronic Fatigue Syndrome, our experience at the Heart Institute has been that many of our patient recovering from Covid have struggled to return to full function
- It was with this in mind that we launched our Post Covid Clinic. This clinic is run by our Advance Practice Providers with Physician back up.
- The clinic is open for consultation with the only stipulation that patients had a positive Covid-19 test
- Consultation and established patients are usually scheduled 3 or 4 weeks following the onset of illness with in-person or telemedicine visit.

# Post Covid Clinic

- Our approach has been symptom driven as related to the Cardiopulmonary system
- All visits start with a through history inquiring about ongoing dyspnea (at rest and exertion), cough, chest discomfort, pleuritic pain, and wheezing.
- We also inquire about orthopnea, chest pain (exertional, positional), peripheral edema, palpitations, dizziness, orthostasis, and pre-syncope or syncope.

# Post Covid Clinic

- In office patient visits, we check complete vital signs, with special attention to SpO<sub>2</sub> and in patients with orthostasis, pre-syncope or syncope, postural blood pressure, and pulse rate
- Physical exam include a full chest exam with auscultation and percussion looking for fine or coarse crackles concerning for volume overload or fibrosis. Percussion maybe able to identify dullness consistent with pleural effusion and egophony concerning for consolidation

# Post Covid Clinic

- Cardiac auscultation is done listening for new murmurs, pericardial rub, third or fourth heart sounds and we look for jugular venous distention and peripheral edema
- **General laboratory testing** — The need for laboratory testing in patients who have recovered from acute COVID-19 is determined by the severity and abnormal test results during their acute illness and current symptoms.
- Most patients who have abnormal laboratory testing at the time of diagnosis improve during recovery

# Post Covid Clinic

- For patients recovering from more severe illness, those with identified laboratory abnormalities, patients who were discharged from hospital or an inpatient rehabilitation facility, or for those with unexplained continuing symptoms, it is reasonable to obtain the following:
- Complete blood count
- Blood chemistries, including electrolytes, blood urea nitrogen (BUN) and serum creatinine
- Liver function studies, including serum albumin

# Post Covid Clinic

- Additional laboratory tests that might be appropriate for select patients include:
- Brain natriuretic peptide (BNP) and troponin in patients whose course was complicated by heart failure or myocarditis or in those with possible cardiac symptoms from covert myocarditis (dyspnea, chest discomfort, edema).
- D-dimer in patients with unexplained persistent or new dyspnea or in any patient in whom there is a concern for thromboembolic disease.
- Thyroid studies in those with unexplained fatigue or weakness.
- Antinuclear antibody and creatinine kinase in patients with arthralgias, myalgias, or other symptoms concerning for rheumatologic disorders.

# Post Covid Clinic

- Cardiopulmonary testing is also done based on presenting symptoms with most people getting an ECG
- Chest x-ray, CT scans of the chest and Pulmonary function tests are ordered for persistent SOB and Dyspnea. If any abnormalities are found on testing, we have partnered with our Pulmonary Medicine Clinic to continue the evaluation.

# Post Covid Clinic

- We have an extremely low threshold to rule out Pulmonary Embolism and DVT given what we know about Covid infections and increased thrombosis
- We also have a low threshold for ordering Transthoracic Echocardiogram for anyone with elevated troponin while hospitalized, or persistent dyspnea
- One study reported that among those who were admitted to the ICU with COVID-19 and had persistent symptoms at four months following discharge, 10 percent had an ejection fraction less than 50 percent

# Post Covid Clinic

- Our experience has been that there is a disproportionate amount of young people who had minimal symptoms when infected that now present with palpitations and symptoms of dysautonomia
- This presentation has become so common that the term Covid Dysautonomia has begun to show up in the literature
- For these people we do extended Holter monitoring

# Post Covid Clinic

- If people have exaggerated symptoms with standing, we do autonomic testing to correlate symptoms with heart rate changes, confirm the diagnosis, and assess the degree of objective signs of orthostatic intolerance

# Post Covid Clinic

- Baseline heart rate and blood pressure should be measured after at least 5 minutes of rest supine and again after one minute of standing.
- If initial values are nondiagnostic, repeating the measurement of vital signs at 3, 5, or 10 minutes is often informative.
- The patient should be asked to stand quietly and still.

# Post Covid Clinic

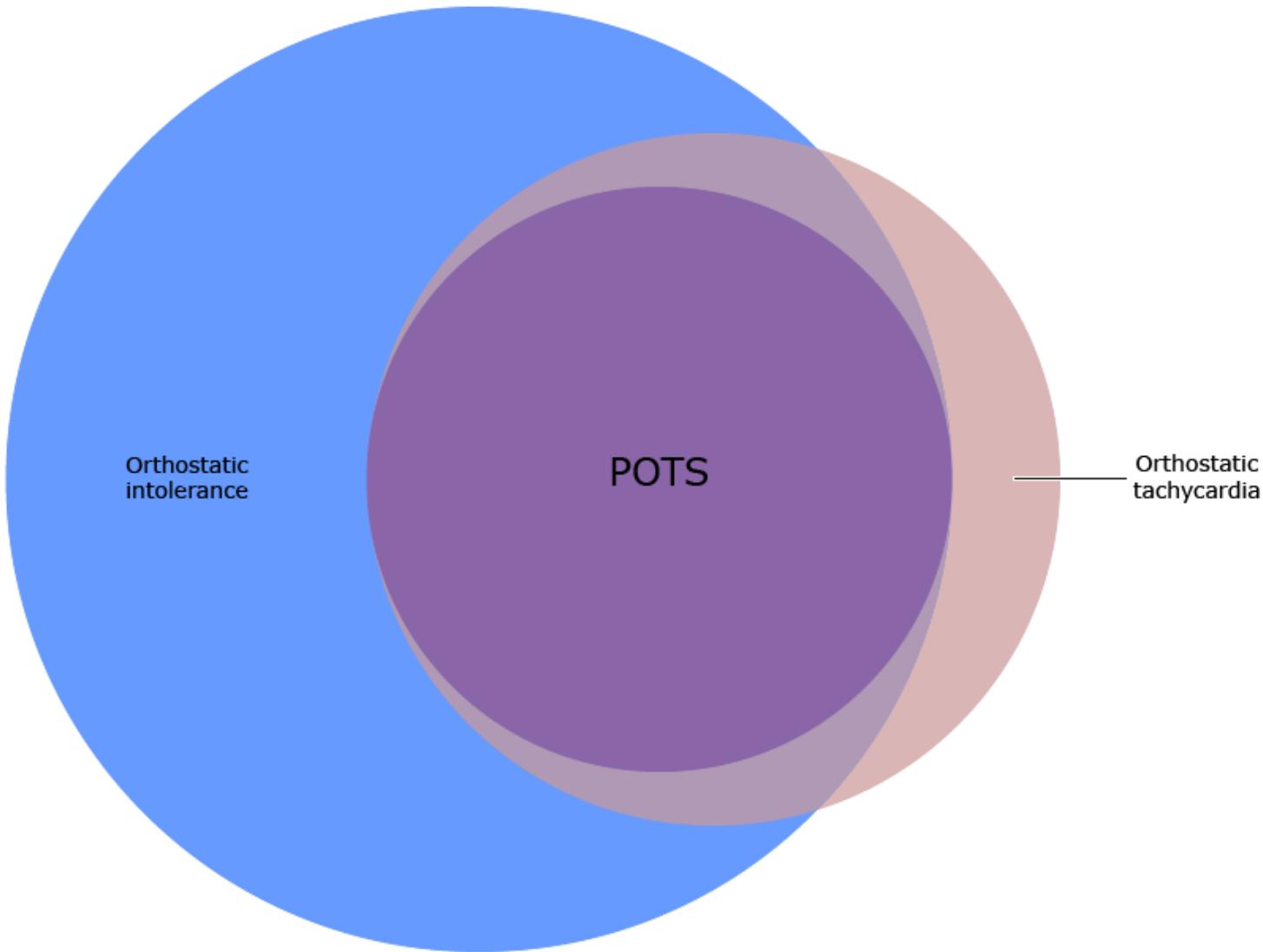
- Pulse oximeter devices are useful for measuring orthostatic heart rates to display values much faster than the traditional method of counting the pulse over 15 seconds and multiplying by 4.
- The heart rate can vary greatly from moment to moment, so average rather than transient peak values should be recorded.

# Post Covid Clinic

- It has been our experience at the Oklahoma Heart Institute that a thorough history and good autonomic testing will confirm the diagnosis of Covid Dysautonomia, tilt table testing in many cases is unnecessary

## Orthostatic intolerance syndromes

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POTS: postural tachycardia syndrome.

Courtesy of William P Cheshire, MD.

UpToDate®

# Post Covid Clinic

- Patients with POTS should experience orthostatic intolerance symptoms during testing with excessive tachycardia
- In POTS, blood pressure during standing remains normal or may increase.
- By contrast, in orthostatic hypotension, there is a reduction of standing systolic or diastolic blood pressure by at least 20 or 10 mmHg, respectively.

# Post Covid Clinic

- Treatment for Covid Dysautonomia is largely supportive with the hall mark being volume resuscitation
- Patient are asked to drink 3 liters of fluid a day and salt their food
- Compression stockings bike pants and abdominal binders are also considered
- If symptoms persist, a trial of B-Blocker, Midodrine, fludrocortisone and now Ivabridine can be considered

# Post Covid Clinic

- Finally, since we are a Cardiology Practice , and Oklahoma , according to the Kaiser Foundation data from June 4 2020 has the highest death rate linked to heart disease in the country ....
- We are finding way too many patients that are presenting with new and worsening chest pain, or atypical anginal symptoms of SOB/DOE that go on to have abnormal stress tests or go directly to cardiac catheterization

- Deaths from ischemic heart disease and hypertensive diseases in the United States increased during the COVID-19 pandemic over the prior year, while globally, COVID-19 was associated with significant disruptions in cardiovascular disease testing.
- Unhealthy eating habits, increased alcohol, lack of physical activity and the mental toll of quarantine isolation and the fear of contracting the virus in health care settings all adversely impact cardiovascular risk.

- COVID-19 has taken a huge toll worldwide and is now officially ranked as the third leading cause of death in the US.
- Unfortunately, Heart disease remains the number one cause of death and stroke the fifth cause of death in the US.
- The influence of Covid-19 will directly and indirectly impact rates of cardiovascular disease prevalence and deaths for years to come.



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