

# "Respiratory Problems in Swimmers: How to keep Swimmers "Afloat" and in the Pool!

## A CASE IN POINT

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Jackie is a 16-year-old Caucasian female who presents with respiratory difficulty while swimming. Symptoms were noted about 4 months ago (September) when she began swimming varsity for her high school team, a long term goal. She has experienced shortness of breath and coughing with onset about 5 minutes after beginning her workouts, and sometimes at competitive meets. Workouts are generally 5:30 to 7:30 AM each morning at the school's natatorium . Throughout the day she feels somewhat "tight in her chest" with slight coughing and occasional wheezing. She seems to do better on weekends when there are no practices.

Associated symptoms are chronic nasal congestion. She has also had some nighttime wakening due to shortness of air causing her to be increasingly tired during the day. She is concerned in that she swam outdoors all summer with no respiratory difficulty.

She has mild seasonal allergies in spring and fall. She works part time at a fast food restaurant.

**Exam: Acceptable vital signs. WT 140 lbs ( 75+%)  
Ht 63" ( 50 %) was remarkable for nasal congestion,  
puffiness around her eyes, drainage in the back of her  
throat, a clear chest exam. Heart reg. rate and rhythm**

Diagnosis?

Asthma

Vocal Cord Dysfunction

Gastro Esophageal Reflux

Conditioning



Upper airway disorder

Primary Lung Disorder

Cardiac Disorder

[www.nhlbi.nih.gov/.../asthma](http://www.nhlbi.nih.gov/.../asthma)

•National Heart, Lung, and Blood Institute

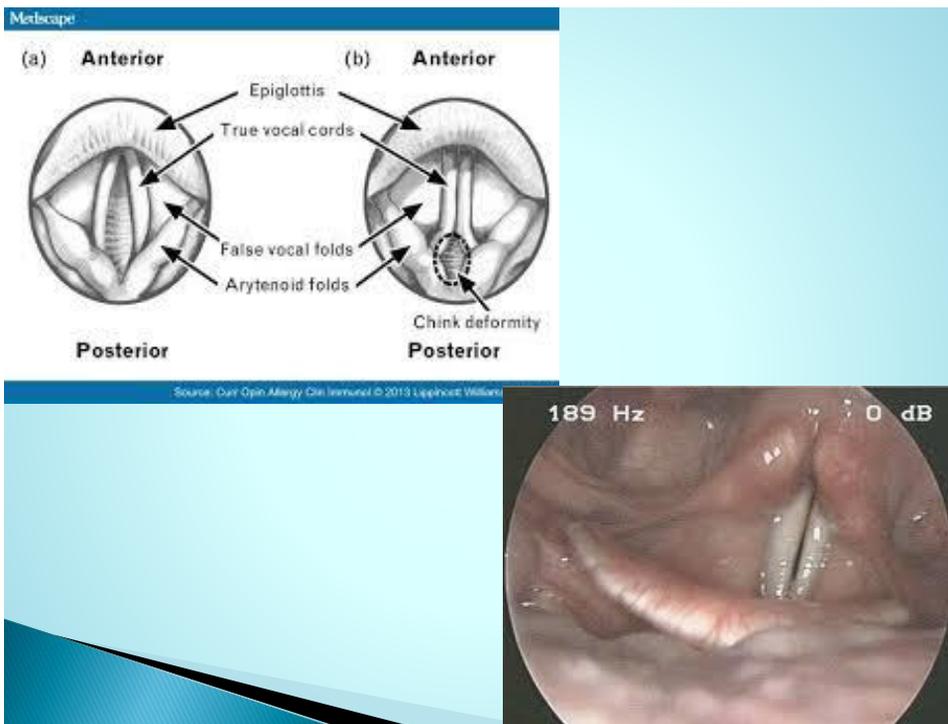
**Asthma** (AZ-ma) is a chronic (long-term) lung disease that inflames and narrows the airways.

**Asthma** causes recurring periods of wheezing (a whistling sound when you breathe), chest tightness, shortness of breath, and coughing. The coughing often occurs at night or early in the morning.

Asthma is also a disease of triggers and may be worsened by exercise, irritants, allergens and infections

<https://my.clevelandclinic.org/.../vocal-cord-dysfunction>  
 •Cleveland Clinic

**Vocal Cord Dysfunction** means that your **vocal cords** do not act normally. With VCD, instead of your **vocal cords** opening up when you breathe in and out, your **vocal cords** close. This closing of your **vocal cords** makes it harder to get air into or out of your lungs



	SABA HELP	SOA	WORSE WITH EXERTION	COUGH	WHEEZE	TIGHT CHEST	HISTORY
VCD	-	+ / -	+	++	++INSPIRATORY	++	ACUTE ONSET
ASTHMA	++	++	++	++	++ OFTEN EXPIRATORY	++	USUALLY HISTORY positive
GER	-	+ / -	+?	++	+	++	CHECK INGESTION HABITS
CONDITIONING	-	++	++	++	+	++	CHECK BMI/WT GAIN/SLEEP

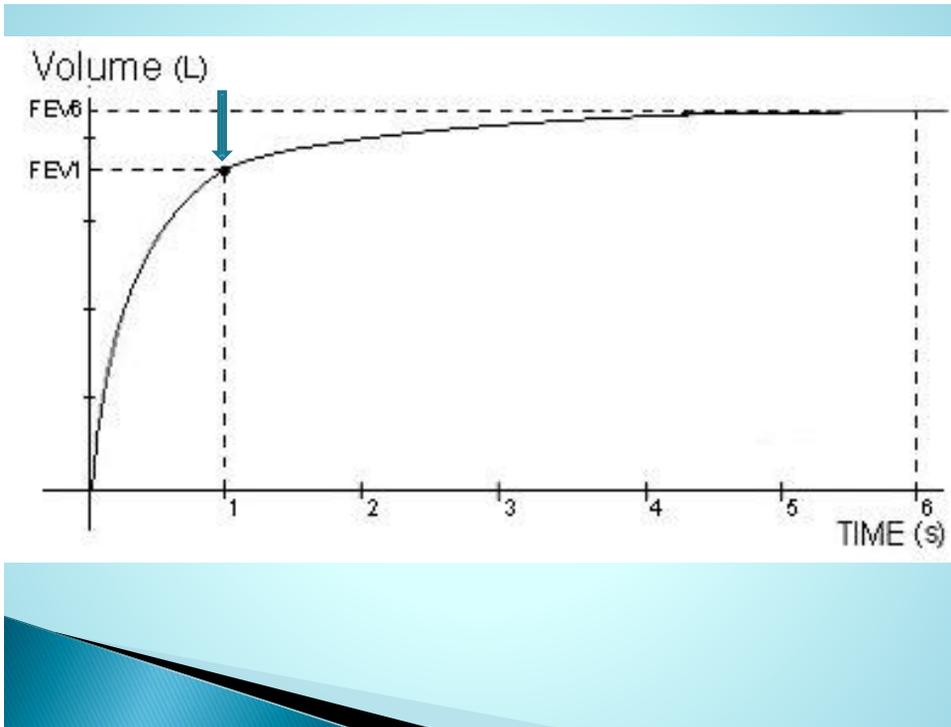
	SABA HELP	SOA	WORSE WITH EXERTION	COUGH	WHEEZE	TIGHT CHEST	HISTORY
UPPER AIRWAY DISORDER	-	+/-	+/-	+	-	+/-	CONGESTION/HEADACHE/ DRAINAGE
PRIMARY LUNG DISEASE	+/-	+	+	++	+	++	FEVER/PRODUCTIVE MUCUS/EXPOSURE HISTORY ( onset)
CARDIAC	-	+	++	+/-	-	+	HISTORY?

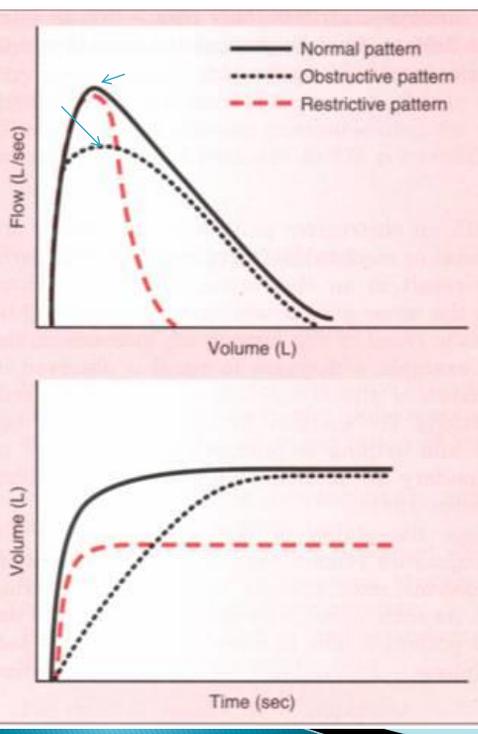
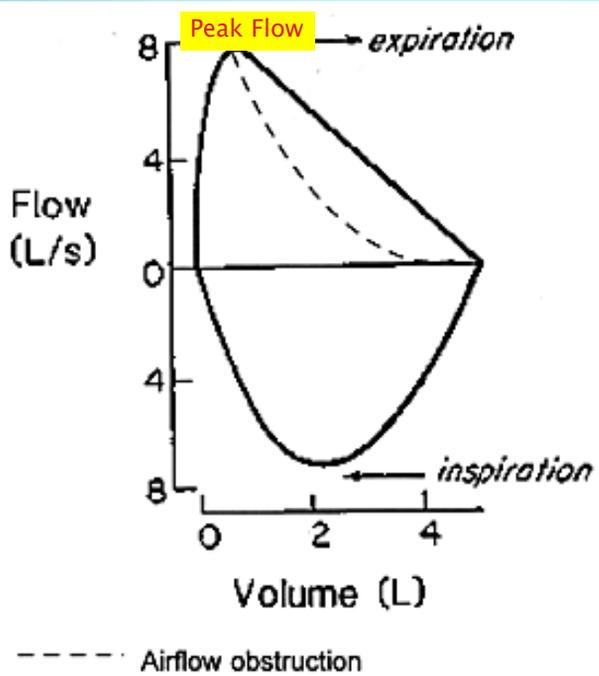
Peak flow meter

Spirometry (With Challenge)

Flow loop







MEASUREMENT	Trial 2	ZPred	Pred	LLN	Trial 2	ZPred	%Chg
FVC (L)	3.45	105	3.26	2.57	3.99	122	15
FEV1 (L)	2.59<	83	3.12	2.67	3.07	98	18
FEV1%	75<	78	96	86	77<	80	2
FEF25-75 (L/S)	2.11	59	3.53		2.66	75	26
PEF(L/S)	4.73	68	6.89		5.55	80	17
FET (S)	3.23				4.22		30

Report Summary:

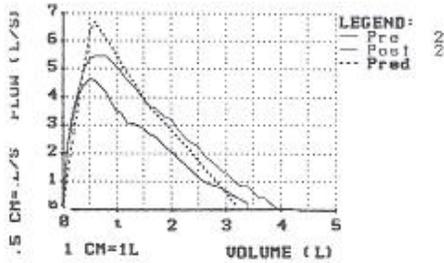
Pre Med: Tests 2 Acceptable 0 Reproducible 1 FVC VAR: 17ML FEV1 VAR: 64ML PEF VAR: 629ML/S  
 Post Med: Tests 3 Acceptable 0 Reproducible 1 FVC VAR: 59ML FEV1 VAR: 100ML PEF VAR: 258ML/S

ATS Interpretation:

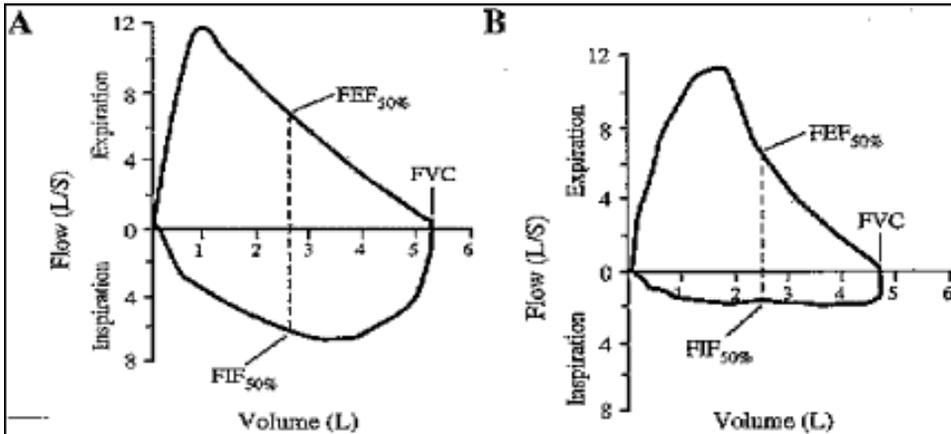
PREMED - Mild Obstruction

POSTMED - Sig. Improv. in FVC FEV1

Comment:



Bronchodilated



	CXR/ Sinus xray	Spirometry	Flow Loop	Exercise challenge	Peak flow	FENO		
VCD	-	+/-	+/-	+	-	-		
Asthma	+/-	+	+	++	+	+		
GER	-	-	-	-	-	=/-		
Conditioning	-	+/-	+/-	-	-	-		

	CXR/ sinus/ xray	Spirometry	Flow loop	Exercise challenge	PFM	FENO	Other
Upper airway	+/-	-	-	-	-	+/-	
Primary lung	+	+/-	-	+/-	-	-	
cardiac	+/-	-	-	-	-	-	EKG

### Labs

1. Spirometry FEV 1 97% predicted value with no reversibility.
2. Inspiratory flow loop normal.
3. Fractionated exhaled nitric oxide was 35 ppb

Further w/u?

### Further labs

1. Exercise challenge positive for an 18% drop of her FEV1
2. Sinus x ray positive for mucosal thickening 3 mm in maxillary sinuses
3. Chest xray normal
4. EKG normal

It is my belief this patient has

1. Seasonal allergic rhinitis/and current rhinitis worsened by swimming pool chemicals
2. S/P Sinusitis prob viral
3. Asthma with exertional componant, currently worsened by swimming pool irritants/ but triggered by her past sinus infection
4. Potential de-conditioning ( wt/ tired/ work load)
5. Caution gastric reflux

## Current Medication Options

### Rescue/Relievers

1. Beta agonist (Short Acting)

### Controller

2. Inhaled corticosteroids
3. Leukotriene receptor antagonist
4. Inhaled corticosteroid/Beta agonist ( Long Acting)

### Nasal

4. Antihistamines
5. Decongestants

**Athletes must check the status of their medication with the US Anti-Doping Agency (USADA) at 719-785-2000.**

*There are strict guidelines in place for the use of asthma inhalers (some have a threshold that cannot be exceeded without a Therapeutic Use Exemption approved in advance, while others may be prohibited). Many over the counter cold medications contain pseudoephedrine which is prohibited in-competition. Even medications prescribed by your physician (such as inhalers, corticosteroids, etc) must be checked before use as they may be prohibited or have requirements in place for advance reporting. Athletes must check the status of all medications (over the counter and prescription) with the US Anti-Doping Agency (USADA) at 719-785-2000 or via Global DRO ([www.globaldro.com](http://www.globaldro.com)).*

## Short acting bronchodilators



## So what do ya do for Jackie??

1. Out of pool ?

2. Asthma rx

a. OICS vs LTRA=daily controller med

b. Saba b4 exercise

3. Wt loss ?

4. Rhinitis therapy

5. f/u exercise challenge



## Swimmers and Respiratory Problems

As pools became more energy efficient recirculation of air changed as well as overall structure

Chlorine count above .5ppm causes irritation to the nose, eyes and lungs.

key is to keep levels below .3ppm

Pool levels are often check for chlorine before swimming begins

Shocking may help bind the chloramines, however the products must be ventilated out of the area

("off gas").

## Swimmers and Respiratory Problems

Chlorine is the primary chemical disinfectant used in pools

Swimmers also add organic and inorganic contaminants to the pool water including sweat, urine, hair spray and body lotions as well as the dyes and skin.

These contaminants may give rise to chlorination of ammonia resulting in chloramines as well the formation of formaldehyde and acetaldehyde, which cause irritation to the resp tract

Potts, Sports Med 96

## Swimmers and Respiratory Problems

- ▶ Many of the chemical irritants in water are volatile and come out of solution in the form of an aerosol or a gas. Since swimmers breath the air just above the surface they may inhale high concentrations of these chemicals
- ▶ Swimmers may breath these compounds at high respiratory rates for prolonged periods of time, estimated as high as 30 times more than normal rates

## Great ideas!



- 1. Properly shower before entering pool all the time**
- 2. Caution ammonia and nitrogen based cleaning products**
3. Swimmers must get out of pool and go to the restroom
4. Rethink when to shock pool (Bacteria)
5. Appropriate ventilation if air outside is "healthy"