

Pulmonary Function Symposium - 2018

Spirometry Workshop

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Overall Objective

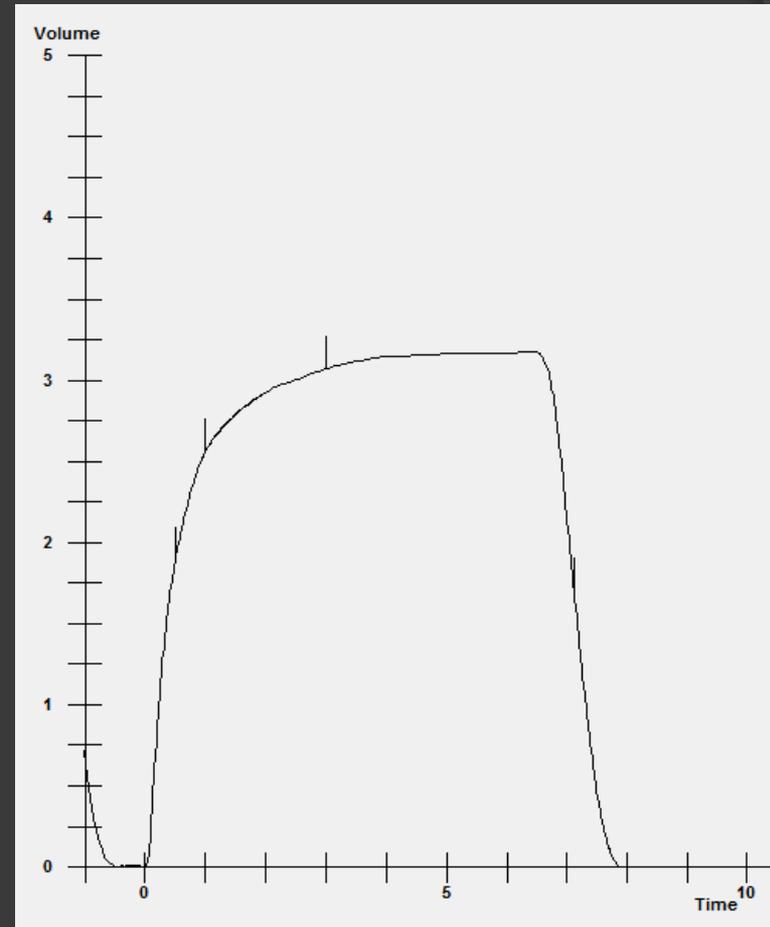
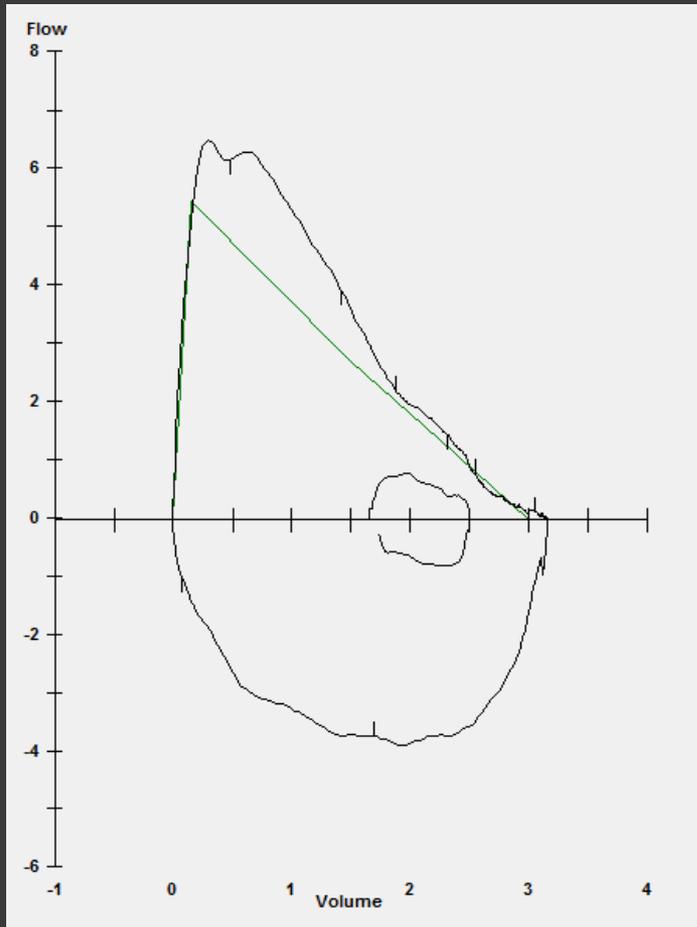
To be better adept in obtaining useful and accurate information while performing Spirometry. This will provide the medical team meaningful information to diagnosis and treat patients with lung disease. This objective will be met through demonstration, practice and sharing information by participants in this workshop

Objectives

- Review of information obtained from Spirometry
- Review acceptability and reproducibility Criteria for Spirometry
- Demonstrate and practice performing Spirometry tests.
- Discuss coaching tips as result of demonstration.
- Review of common problems when performing PFTs

Label Flow Volume Loop and Spirogram

FVC, FEV1, PEFR, FEF25-75%, FEF50%, FEF75%, Insp. VC



Spirometry

- Measures: FVC, FEV1, FEF25-75, PEF, IVC and PIF. FEV1/FVC is calculated.
- Pt. is asked to breathe quietly for a few breathes, then breath in to TLC, blow out quickly and as hard as possible and to keep blowing out until they are empty.

What is Acceptability Criteria?

- Take a moment now to write down on your pad what are the acceptability criteria?

Criteria for Acceptability

- Start of Test Criteria – No hesitation (Back extrapolated volume 150 ml or 5% of VC, whichever is greater. For age 2–6, extrapolated volume, 12.5% of FVC or 0.080L)
- Maximal effort throughout maneuver
- End of Test Criteria - sustain effort for > 6 secs **AND** achieve a plateau (no flow < 0.025 L in 1 sec)
- No cough during first second
- No Glottis closure, or early termination that influences the measurement
- No obstructed mouthpiece
- Free from artifacts and leaks

Repeatability Criteria

Repeatability

- Two highest FVC and FEV1 are within 150ml from 3 acceptable curves.
- If FVC <1.0 L : Two highest FVC and FEV1 must be within 100 ml

Test can be acceptable but not repeatable.

When acceptable maneuvers are achieved with good coaching it is not difficult to get repeatability

Demonstration

Use the worksheet provided to make comments during the demonstration

- Test Preparation
- Test instructions
- Test Performance
- Corrective Feedback
- Have acceptability and reproducibility criteria been met?

Test Instruction

- ① Simplify the instructions
- ① Demonstrate test - can't be emphasized enough
- ① Evaluate each patient individually
- ① Decide on an appropriate teaching method

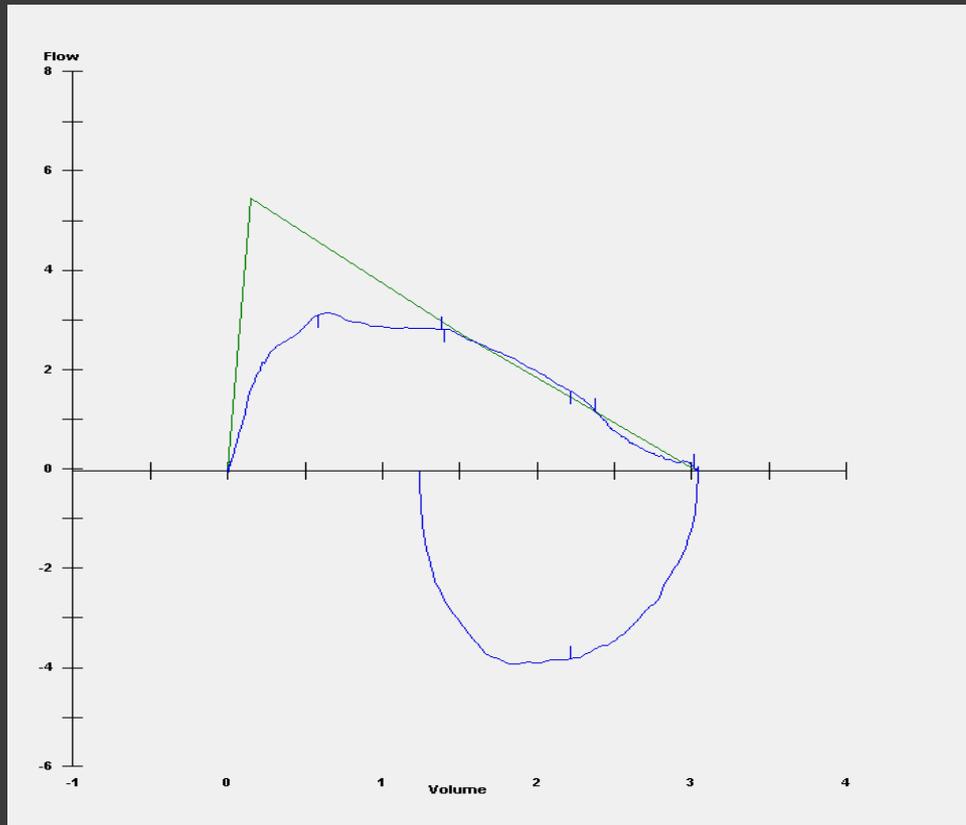
Test Performance and Feedback

- Evaluate each attempt during and after – Focus first on areas not done properly. Corrective feedback
- Positive reinforcement, i.e. let them know what they have done correctly.
- If necessary, stop the test and start again.
- Generally if not able to get good results in 8 attempts it may be time to give up.

Acceptable and Repeatable

- ⦿ Was this achieved?
- ⦿ 3 acceptable efforts
- ⦿ 2 within 150ml

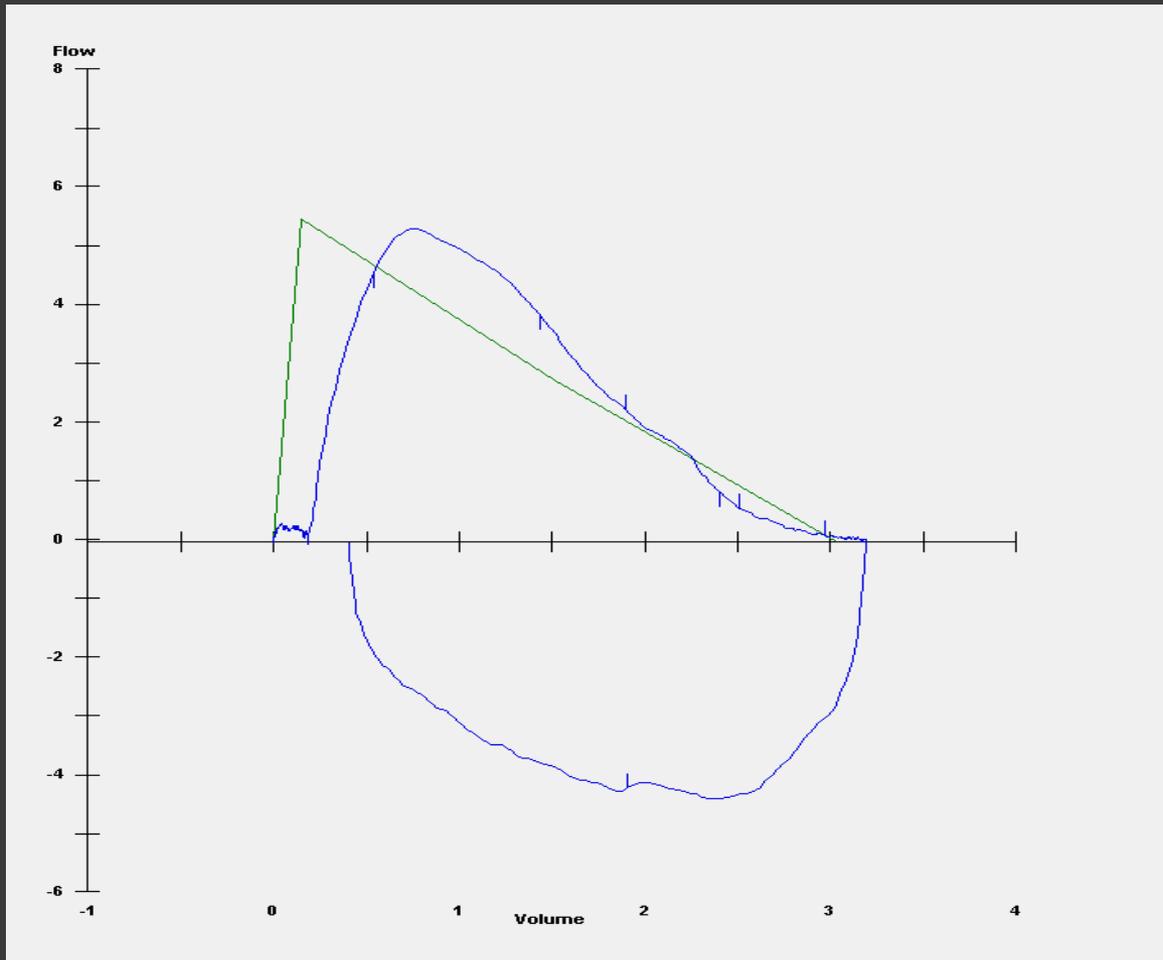
Problem 1



Submaximal Effort

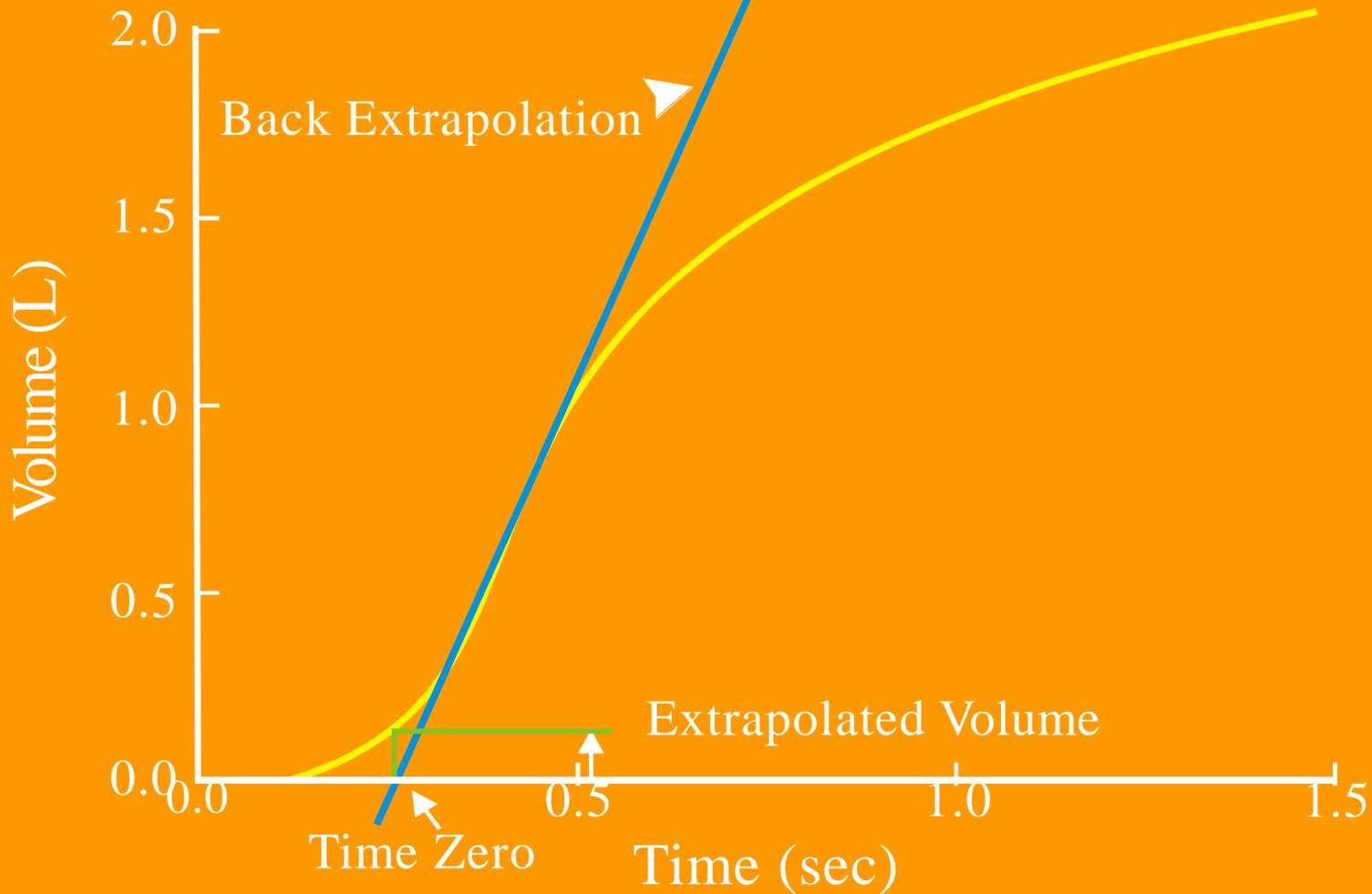
- With adults you can explain that they need to blow out hard, i.e. use chest muscles rather than throat as soon as they are “full”.
- It is imperative that you demonstrate before the test
- Doing the test with them, ie. “yell” blow or even stomp your foot. You can not sit “passively” while they blow out. Sometimes scaring them works.
- Often they still use their throats to try to get maximal effort. You can say it is “like a punch in the stomach”. This works well with kids.
- Candle animation works well if all else fails.
- Watch patient - Do they look like they are blowing out hard?
- Submaximal efforts are acceptable for the computer.

Problem 2

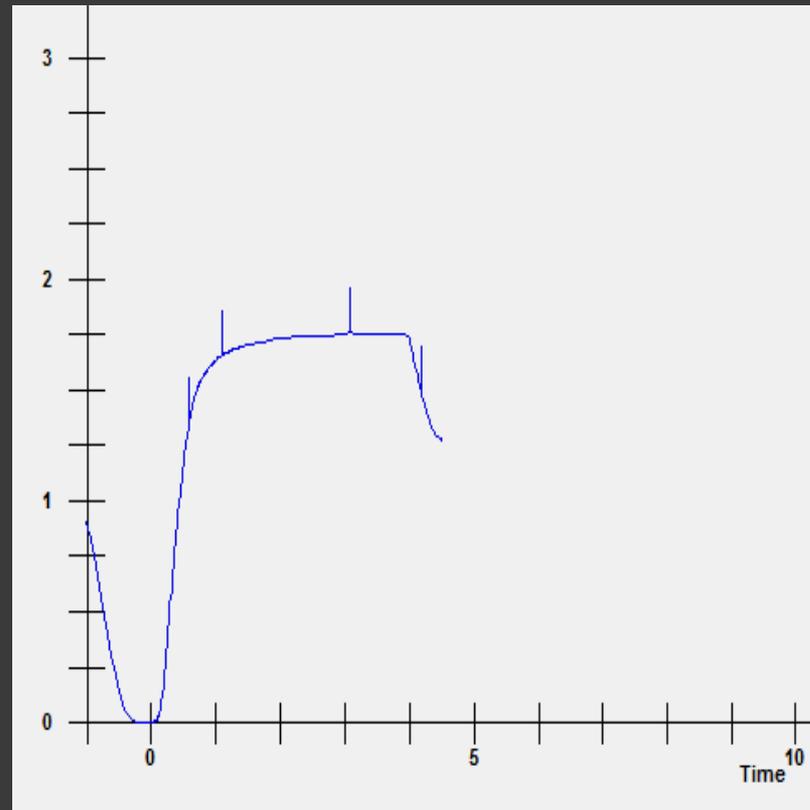
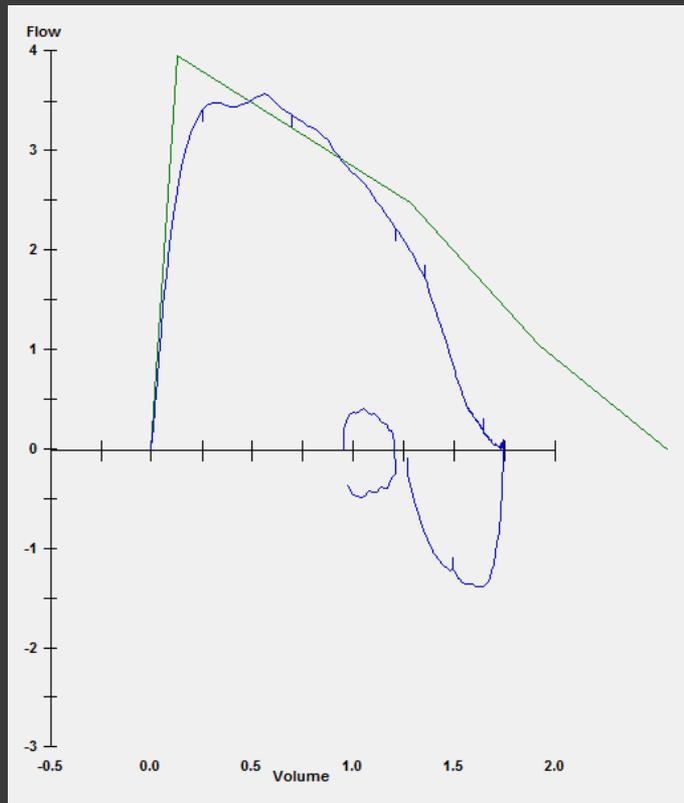


Hesitation

- ⦿ This is the start of test criteria where extrapolated volume is less than 150ml of the VC (or 5% whichever is greater)
- ⦿ Don't hold breath when full, must blow out as soon as instructed.
- ⦿ This is often corrected with submaximal blows.
- ⦿ Must be careful not to ask patient to blow out before they are full. Need to look at screen and patient almost at the same time.
- ⦿ Remember if there is a little hesitation it still may be acceptable



Problem 3

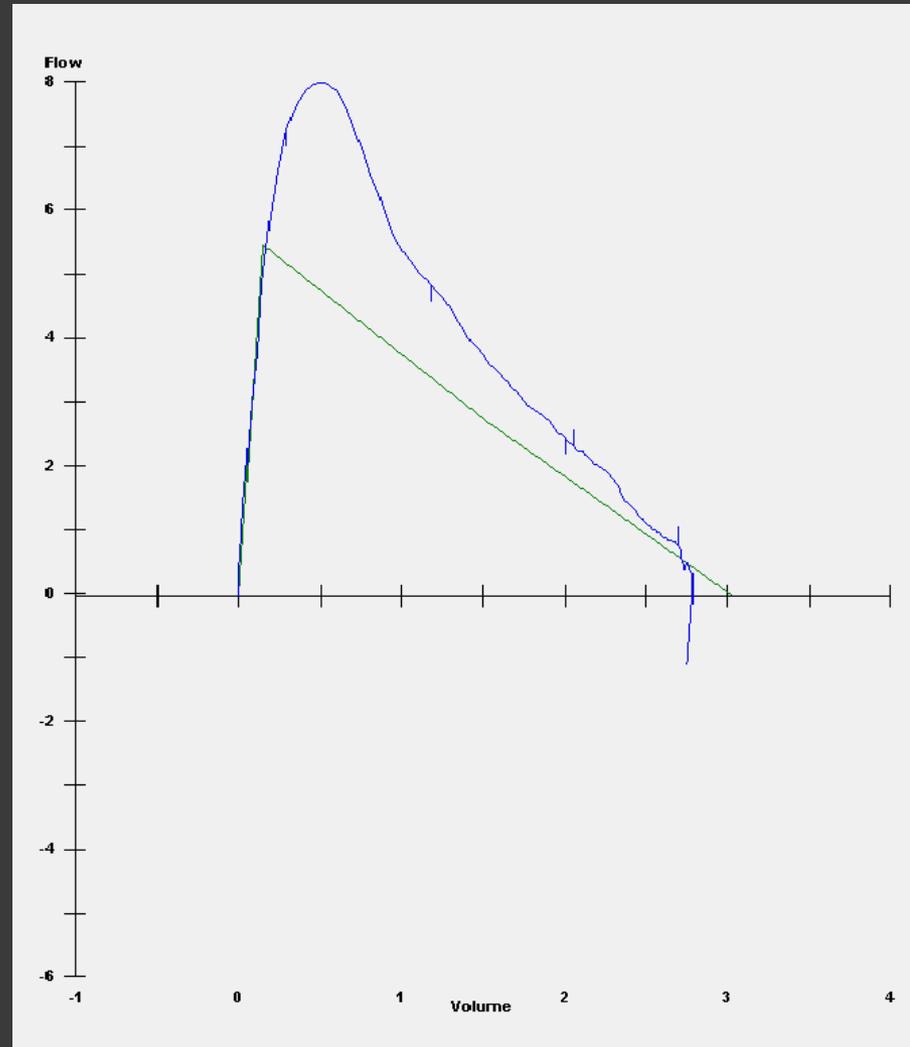


Does not blow out for 3-6 seconds

- ⦿ Most normal adults obtain the End Expiratory (no flow) at about 2-3 seconds.
- ⦿ Patient is really holding their breath until get to 6 seconds. They need verbal feedback that you know they are empty but you need them to continue blowing a little longer
- ⦿ Keep talking to them as they blow out
 - I know you are empty but just try to keep pushing
 - Keep going, just a little longer
 - Instructions for children 10 and under really no different- Candles on cake works well here and also “racing” or performing the test with them
- ⦿ Bowling animation also works well

- If patient has a Restrictive Pattern they may have trouble blowing for the full 6 seconds.
- If patient has an obstructive pattern they may not plateau or take as long as 15 seconds to blow out.

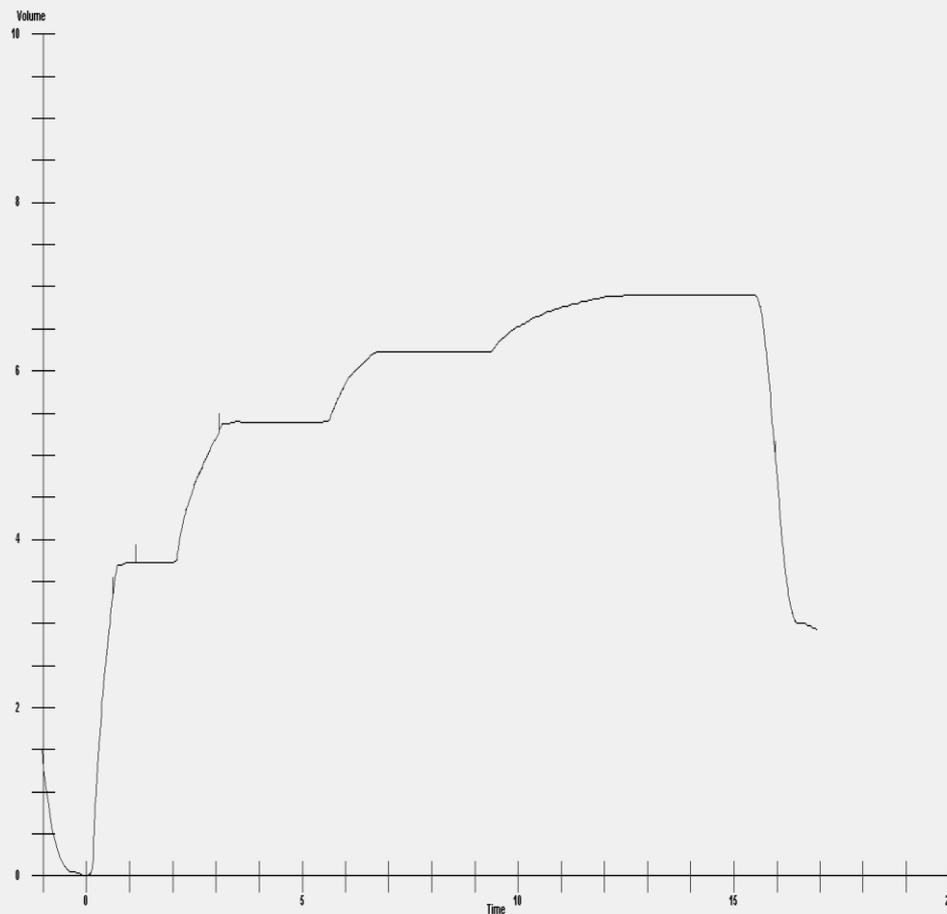
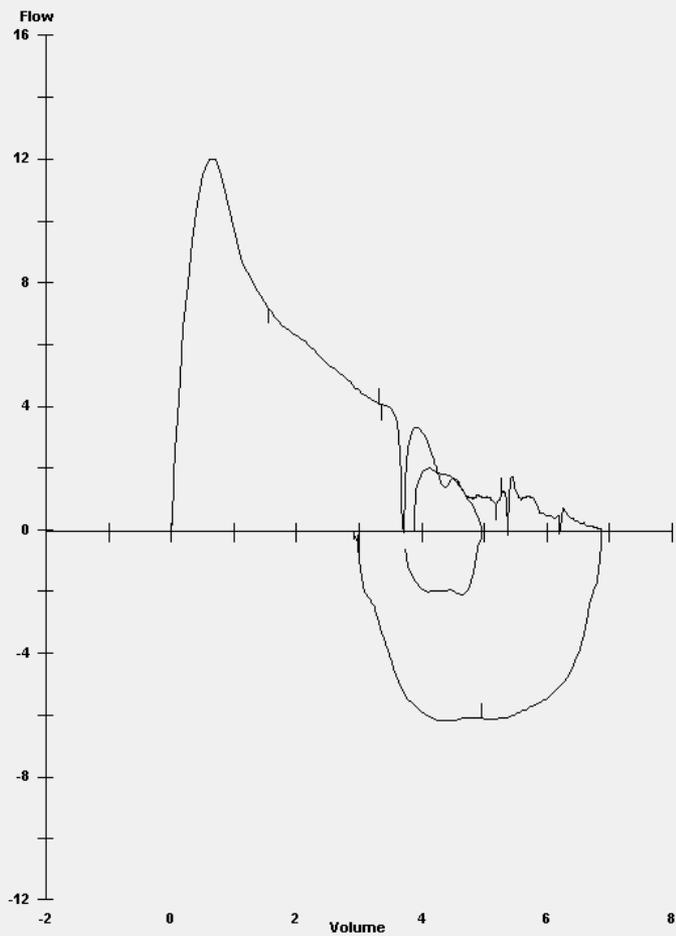
Problem 4



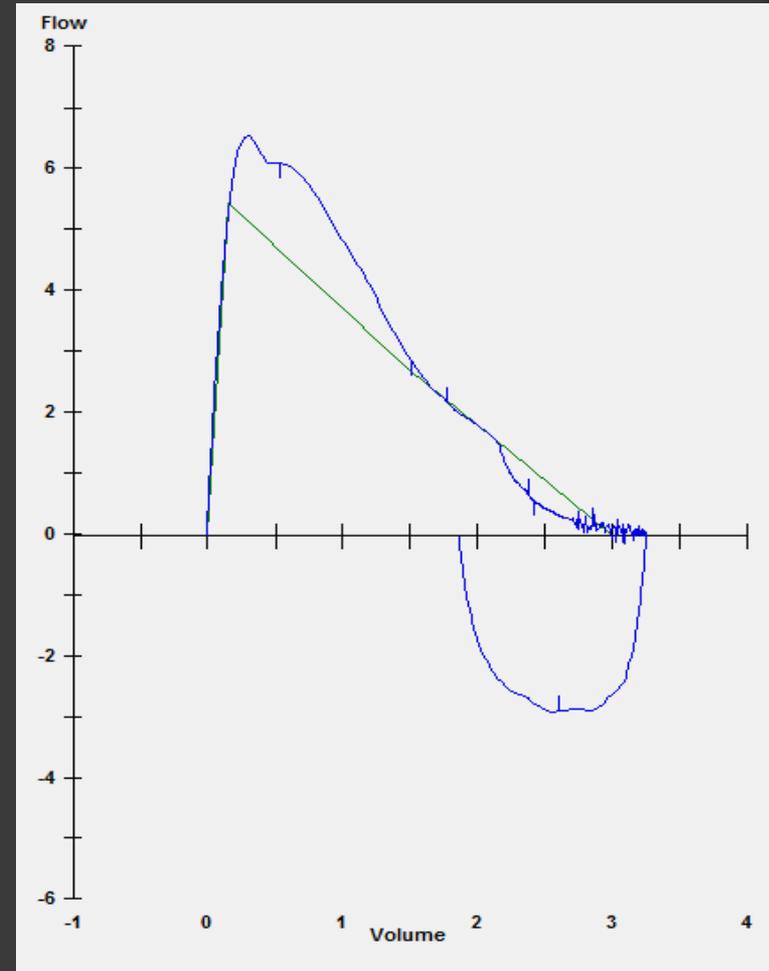
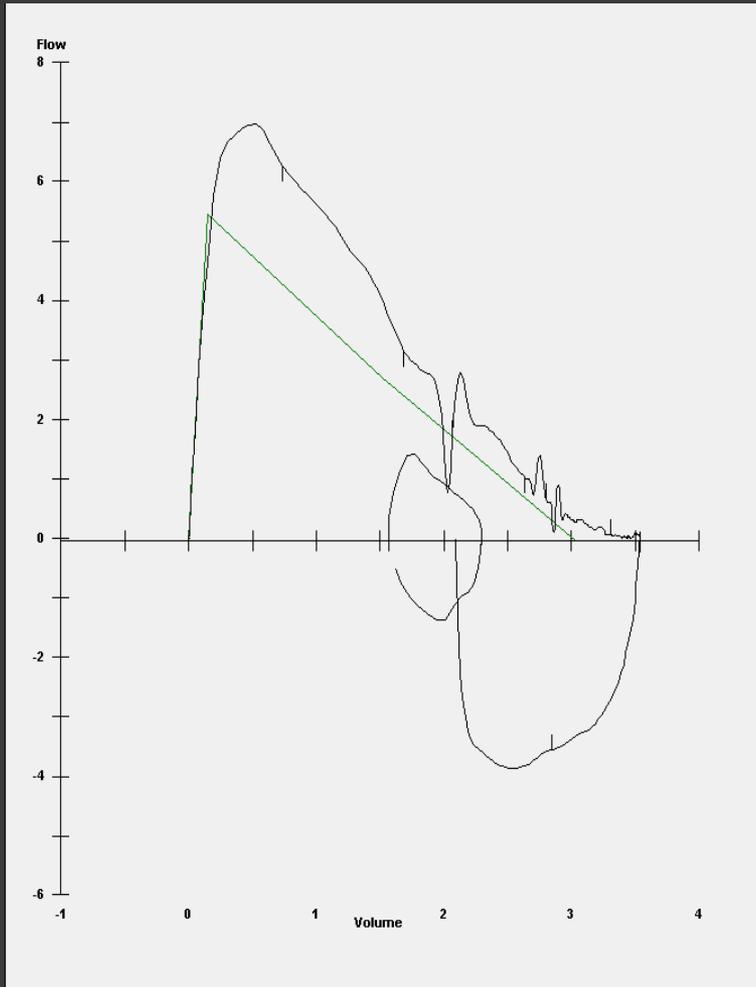
Premature Closure/No Plateau

- ⦿ Blowing out to RV is the most difficult concept for children and some adults.
- ⦿ It is instinct to breathe in at the end of a normal breath out. Patient must be reminded that there is still more air left in the lungs.
- ⦿ They must be encouraged to relax at the end of the blow and continue. “Bearing down” does contribute to closing of the glottis.
- ⦿ Do a slow maneuver
- ⦿ Practice off of the mouthpiece
- ⦿ Verbal cues
 - Blow out all of mommy’s candles on her birthday cake
 - Blow up a balloon

Glottic Closure



Problem 5

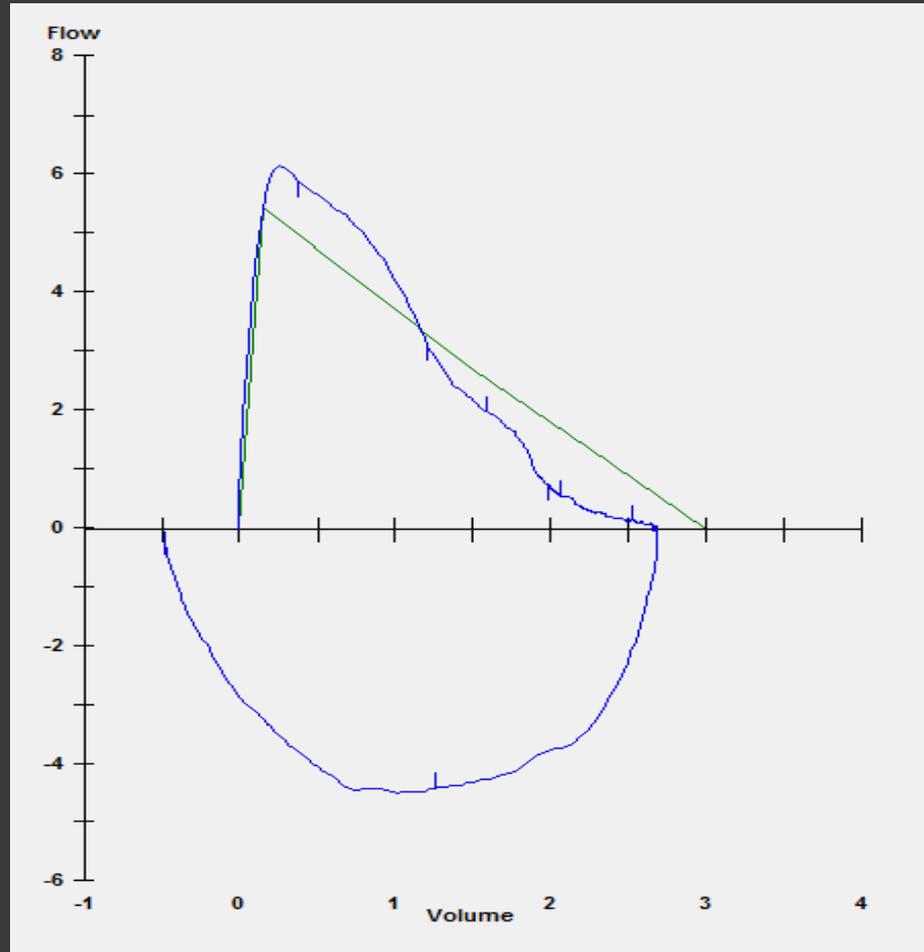


Coughing

- ① When blow with “throat” rather than “chest muscles” coughing can occur. If cough too early in the maneuver the FEV1 may be affected. Usually if it is only one cough, the patient can be encouraged to “hold” off on the cough until finished.
- ② If the coughing “fit” occurs towards the very end, this may not be so bad, i.e FEV1 will still be good. Some patients can continue to blow out as they cough and need to be coached to do so. Can also demonstrate.
- ③ The problem is with those who cough throughout the test. Maybe a drink helps??

- If patient has a Restrictive Pattern they will tend to cough at the very beginning of the maneuver to the point that they will not be able to do test. Can try coaching to withhold cough until after the first second.
- If patient has an obstructive pattern they will tend to cough at the end of the maneuver. May not fully breath out to RV.

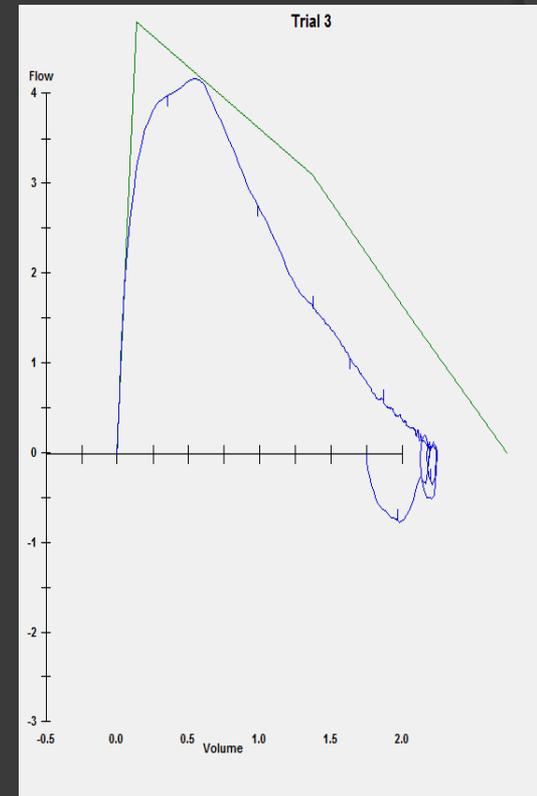
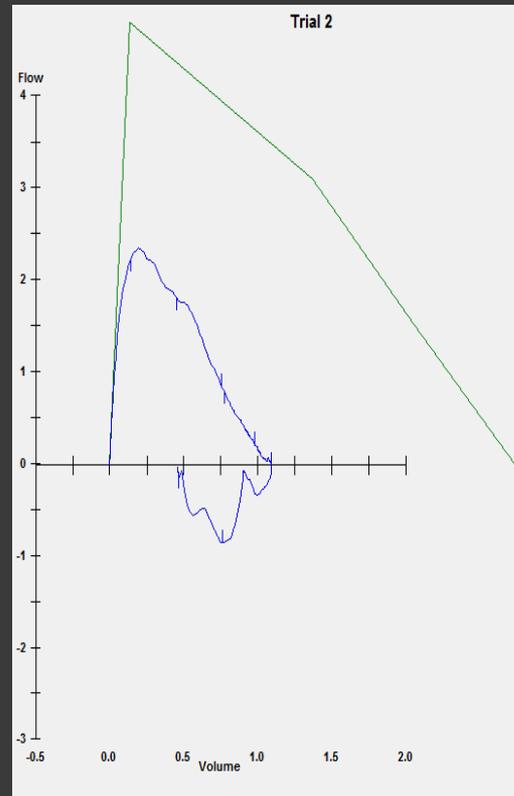
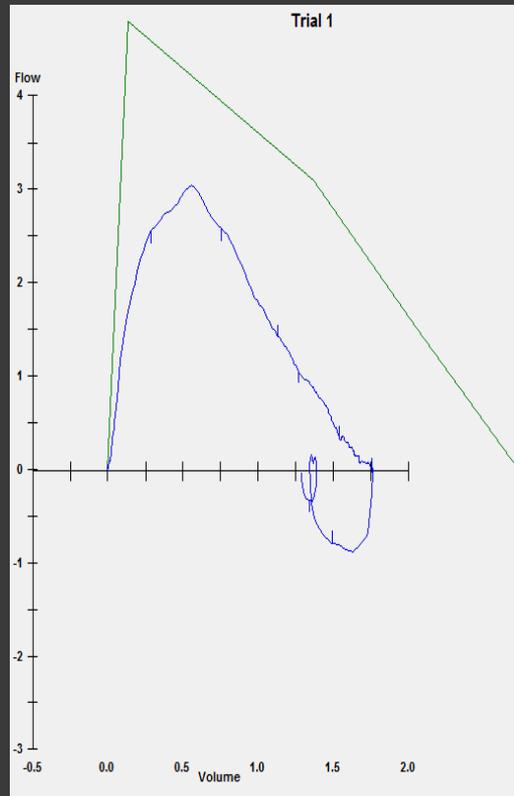
Problem 6



Sub Maximal Inspiration

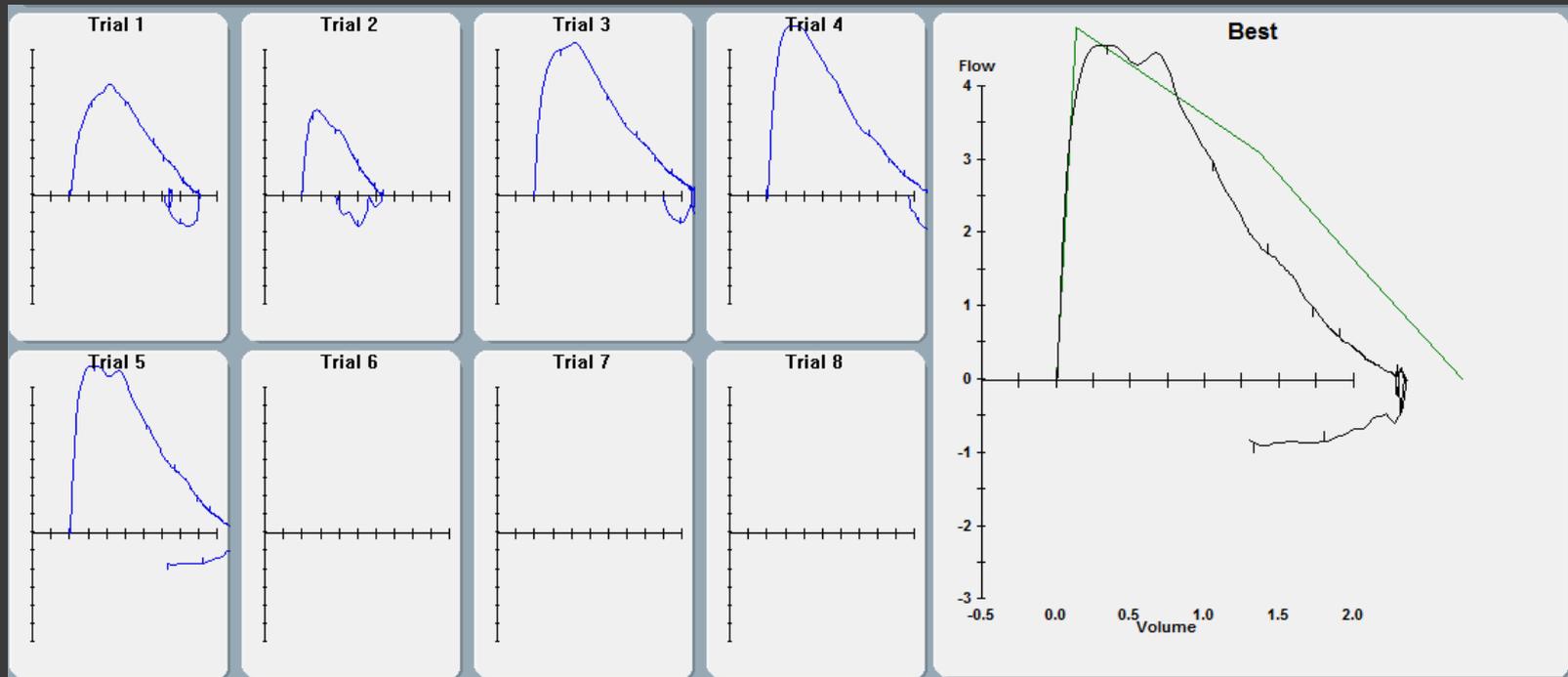
- ⦿ In our attempt to be sure that there is no hesitation at the beginning of the effort we may inadvertently cause patient not to breathe in fully.
- ⦿ Having the patient repeat the maneuver after the first forced expiration can sometimes correct for this if the patient is able.
- ⦿ Have the patient exhale first, then inhale to TLC.
- ⦿ Watch the patient, check for complete chest rise before yelling “blow”

Problem 7



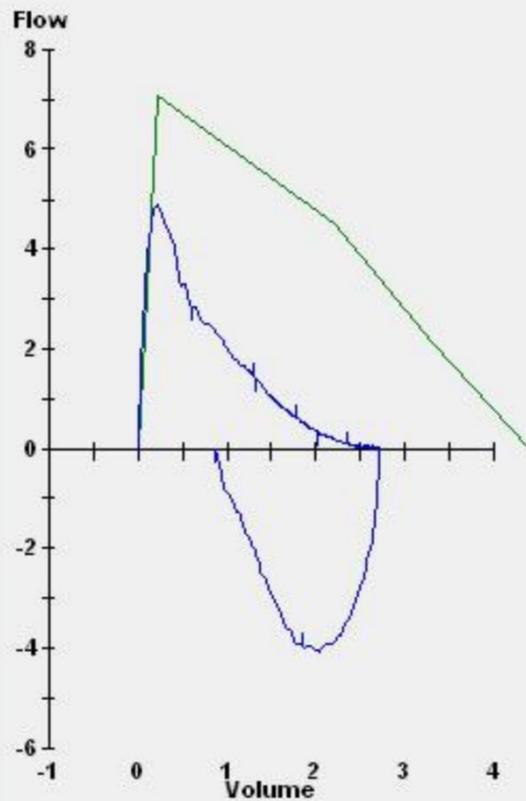
Submax inspiration - Summary

	Ref	Best	% Ref	1	2	3	4	5
FVC	2.75	2.37	86	1.77	1.10	2.26	2.27	2.37
FEV1	2.43	1.94	80	1.56	1.00	1.90	1.89	1.94
FEV1/FVC	89	82		88	91	84	83	82
PEF	4.84	4.60	95	3.08	2.37	4.21	4.69	4.60

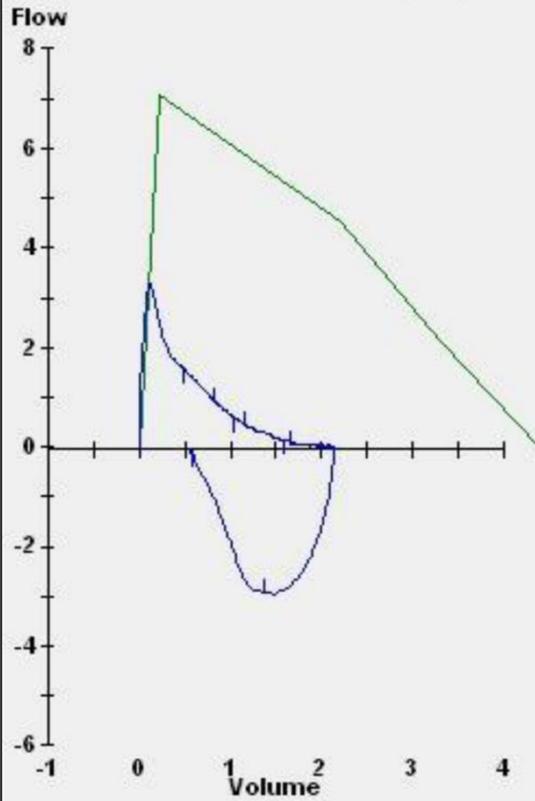


Problem 8

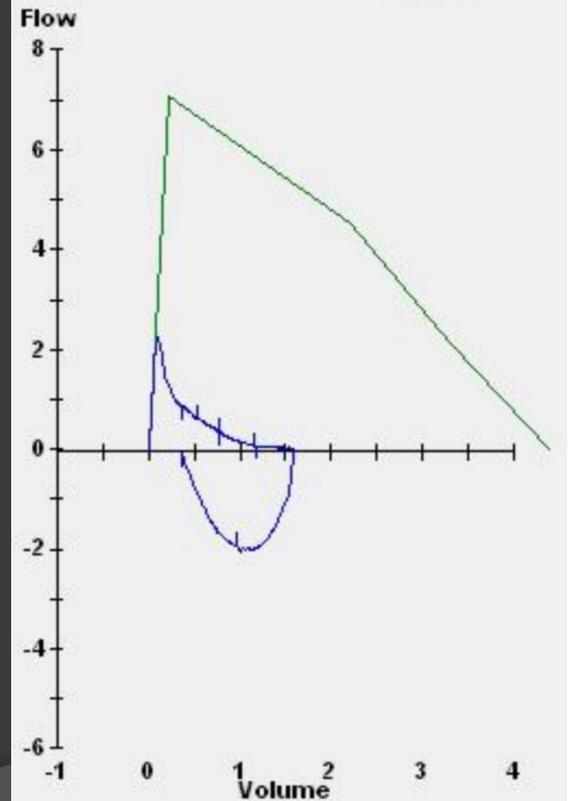
Trial 1

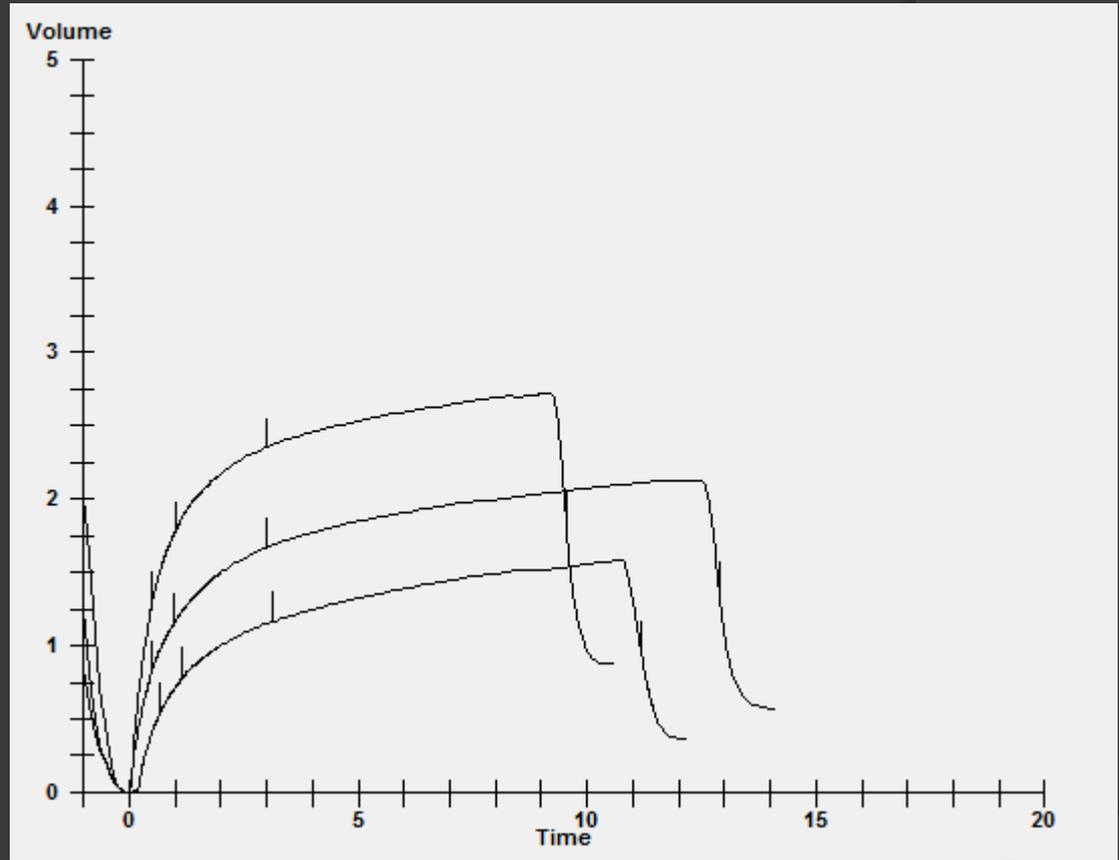
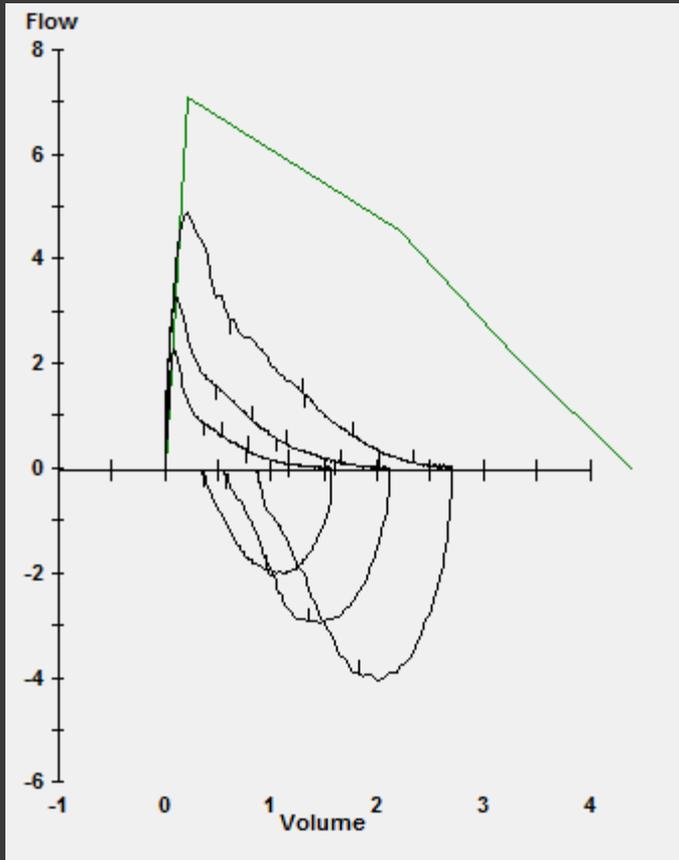


Trial 2



Trial 3

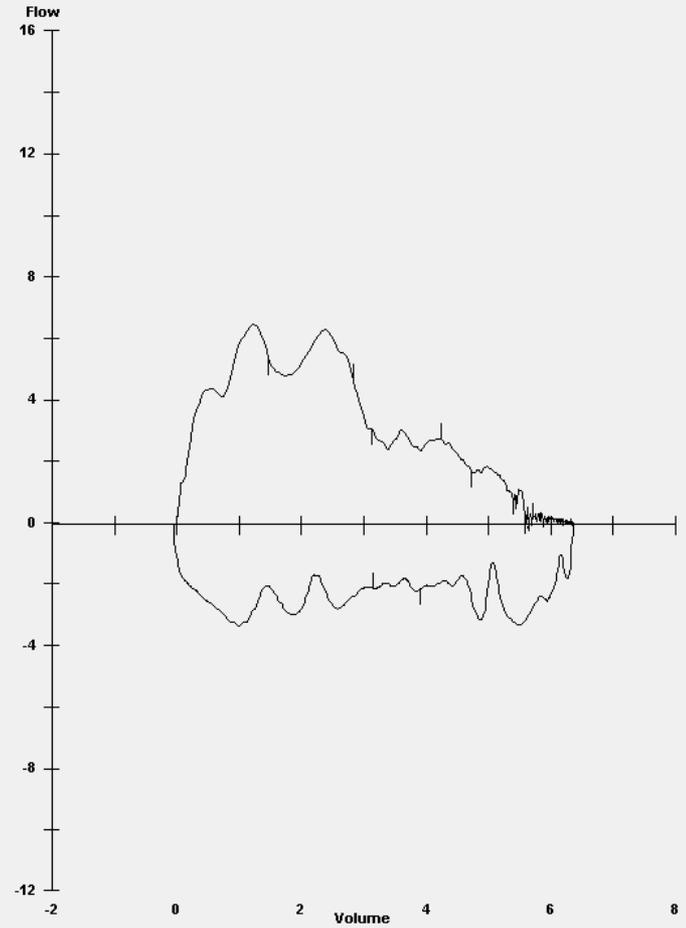
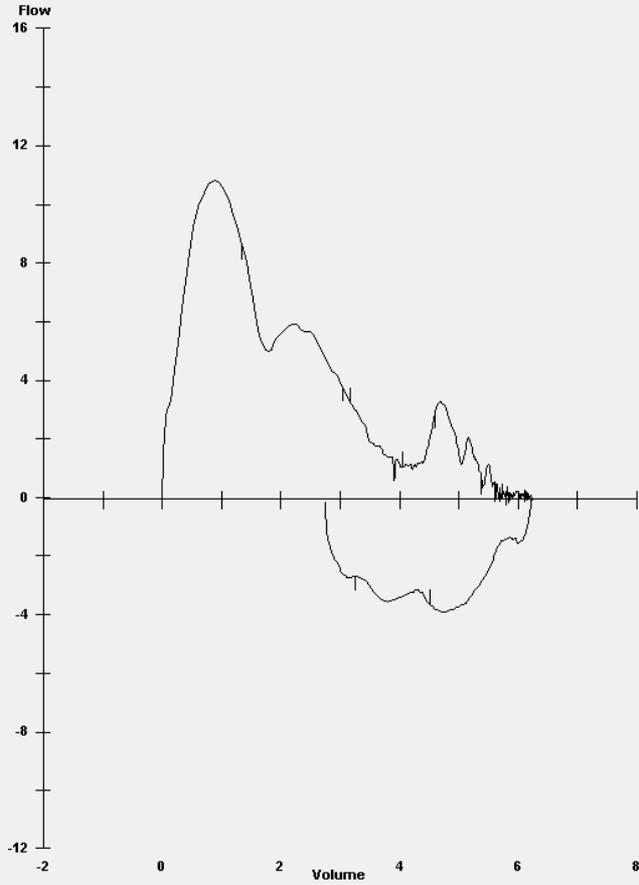




Spiro Induced Bronchospasms

- ⦿ This does occur, but not often. About 1/200 patients with Asthma.
- ⦿ Not always easily noticed. Often think patient not doing test properly.
- ⦿ Will typically see a decrease in the patients FEV1/FVC ratio.
- ⦿ May be a reason for doing SVC first.

Problem 9



Tongue Placement

- ⦿ When the patients tongue is obstructing the mouthpiece or airway. Can be misleading as patient looks as though they are giving great effort. Causes expiratory stridor.
- ⦿ Ensure patient keeps tongue towards the bottom of their mouth.
- ⦿ Explain to patient like blowing candles on cake.
- ⦿ Instruct patient that you want them blowing out so fast they puff out their cheeks.
- ⦿ If available use tongue depressor mouthpiece.

Language Barrier

- ⦿ Throw out your script and verbal feedback.
- ⦿ You can explain the basics to interpreter but make sure that patient knows to follow all your actions. Demonstration is even more important.
- ⦿ Do a few blows, no words are necessary. Work on problem areas one at a time. Simple instructions via interpreter.
- ⦿ If no interpreter the biggest problem will be to get the patient to blow out to RV.

BD administration

- Instruct patient
- Shake MDI
- Use appropriate spacing device
- Use Noseclips
- Observe patient taking a full slow inspiration
- Triggers MDI at the appropriate time
- Instructs patient to hold breath for 10 sec
- Repeats procedure 2-4 times
- Wait appropriate time before repeating Spirometry.

Common Problems

- ⦿ Submaximal efforts
- ⦿ Does not blow out quickly or hesitates too much
- ⦿ Does not blow out for the 3 - 6 seconds
- ⦿ Stops blowing out too soon or closes the glottis.
- ⦿ Coughs, especially at the beginning of the test
- ⦿ Does not breathe in to TLC
- ⦿ Unable to keep a good seal on the mouthpiece
- ⦿ Tongue placement
- ⦿ Language barriers, mental illness, deaf/blind

Spirometry: Flow-Volume Curve and Spirogram

