### **TEST I:** Rate of albuterol sulfate aerosol formation (Nebulization rate)

Purpose: To determine the rate of albuterol sulfate aerosol formation

Set-up: Nebulizer reservoir connected to CPAP. Residual volume of reservoir is full.

Experimental procedure:

- Add 6 mL of solution to nebulizer medication reservoir according to albuterol dilution chart below.
- Start a timer and simultaneously turn on nebulizer power to run on high and turn on CPAP to 5 mmH2O.
- Run CPAP and nebulizer continuously until all medication is gone and record time in chart below.
- Calculate nebulization rate.
- Repeat for at least 3 trials.

Results:

Albuterol Dilution	Time to	nebulize	6 mL		Nebulization Rate (Total Vol/t)					
	Trial 1	Trial 2	Trial 3	Mean	Trial 1	Trial 2	Trial 3	Mean		
6 mL albuterol										
5 mL albuterol, 1 mL water										
4 mL albuterol, 2 mL water										
3 mL albuterol, 3 mL water										
2 mL albuterol, 4 mL water										
1 mL albuterol, 5 mL water										
6 mL DI water										

Calculations:

Using the mean data, the nebulization rate of albuterol is calculated from the overall nebulization rate by dividing the volume of albuterol in the sample (as opposed to total volume) by the time to nebulize.

Albuterol Dilution	Vol. albuterol in sample	Time to nebulize 6 mL	Nebulization rate of albuterol
6 mL albuterol	6 mL albuterol		
5 mL albuterol, 1 mL water	5 mL albuterol		
4 mL albuterol, 2 mL water	4 mL albuterol		
3 mL albuterol, 3 mL water	3 mL albuterol		
2 mL albuterol, 4 mL water	2 mL albuterol		
1 mL albuterol, 5 mL water	1 mL albuterol		
6 mL DI water	0 mL		

# **TEST II: Efficiency of medication delivery**

<u>Purpose:</u> To determine efficiency of aerosolized medication delivery to CPAP mask by first measuring the amount of medication that makes it to the mask.

<u>Set-up:</u> Nebulizer reservoir is connected to CPAP and to a 6' tube that flows through a condenser to collect liquid in a collection flask. UV Spectrophotometer ready to use.

Experimental procedure:

- Add 6 mL of albuterol solution to nebulizer medication reservoir (according to dilution chart).
- Run samples of pure DI water and standard albuterol solution (2.5mg in 3mL) in UV spec and record absorbance to establish standards.
- Start a timer and simultaneously turn on nebulizer power to run on high and turn on CPAP to 5 mmH2O.
- Run CPAP and nebulizer continuously.
- Collect samples of the liquid making it to the collection flask (represents the mask and patient) every Y minutes (1 min, 2 min, 5 min?). Record the volume of the liquid collected in Y time and measure the absorbance.
- Continue sampling until all medication reservoir is empty.
- Repeat for at least 3 trials.

### Results:

DI water standard absorbance:

#### Trial 1:

Albuterol Dilution	Vol <sub>0</sub>	Conc <sub>0</sub>	Vol <sub>1</sub>	Conc <sub>1</sub>	Vol <sub>2</sub>	Conc <sub>2</sub>	Vol <sub>3</sub>	Conc <sub>3</sub>	Vol <sub>4</sub>	Conc <sub>4</sub>
6 mL albuterol										
4 mL albuterol, 2 mL water										
3 mL albuterol, 3 mL water										

#### Trial 2:

Albuterol Dilution	Vol <sub>0</sub>	Conc <sub>0</sub>	Vol <sub>1</sub>	Conc <sub>1</sub>	Vol <sub>2</sub>	Conc <sub>2</sub>	Vol <sub>3</sub>	Conc <sub>3</sub>	Vol <sub>4</sub>	Conc <sub>4</sub>
6 mL albuterol										
4 mL albuterol, 2 mL water										
3 mL albuterol, 3 mL water										

Trial 3:										
Albuterol Dilution	Vol <sub>0</sub>	Conc <sub>0</sub>	Vol <sub>1</sub>	Conc <sub>1</sub>	Vol <sub>2</sub>	Conc <sub>2</sub>	Vol <sub>3</sub>	Conc <sub>3</sub>	Vol <sub>4</sub>	Conc <sub>4</sub>
6 mL albuterol										
4 mL albuterol, 2 mL water										
3 mL albuterol, 3 mL water										

#### Mean:

Albuterol Dilution	Vol <sub>0</sub>	Conc <sub>0</sub>	Vol <sub>1</sub>	Conc <sub>1</sub>	Vol <sub>2</sub>	Conc <sub>2</sub>	Vol <sub>3</sub>	Conc <sub>3</sub>	Vol <sub>4</sub>	Conc <sub>4</sub>
6 mL albuterol										
4 mL albuterol, 2 mL water										
3 mL albuterol, 3 mL water										

# **Calculations:**

1) Using mean data, plot Vol. vs. Conc.

2) The efficiency of albuterol delivery is calculated by dividing the amount of albuterol delivered in the allotted time to the mask by the amount of albuterol aerosolized over that time.

Efficiency = 100% \* [(Vol<sub>4</sub>)(Conc<sub>4</sub>)]/[(Nebulization rate of albuterol)(time)]

Albuterol Dilution	Vol <sub>4</sub>	Conc <sub>4</sub>	Rate	Time	Efficiency
6 mL albuterol					
4 mL albuterol, 2 mL water					
3 mL albuterol, 3 mL water					