

COMPARISON OF TRIGGERING SENSITIVITY IN DEMAND OXYGEN DELIVERY SYSTEMS (DODS)

Bliss PL, McCoy RW

**presented at the
American Association for Respiratory Care
International Congress 1999
Las Vegas, NV**

Background

DODS have gained popularity as a mode of oxygen delivery in recent years, yet previous studies disagree on the efficacy of the therapy. One possible variable affecting DODS performance is triggering sensitivity, or trigger threshold. Higher trigger threshold (greater effort required) may result in missed breaths or late oxygen delivery. In addition, the response time (delay) associated with different devices may affect the therapy.

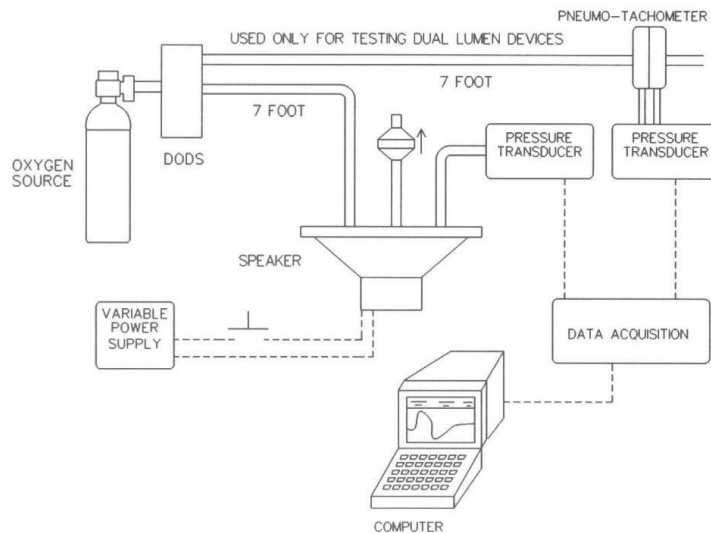
To determine whether triggering sensitivity and delay might vary between DOS models, we constructed a mechanical model and evaluated 12 commercially available devices. We also evaluated the effect of a 25 foot extension tubing on delay.

Methods

A pressure simulator was constructed using a variable power supply driving a small audio speaker. A pressure transducer was connected to the simulator, and monitored by a data acquisition system. A seven foot supply tube was used to couple the simulator to the outlet of each DODS. The simulator was also fitted with a check valve to allow delivered oxygen gas to escape.

By monitoring pressure while simulating breathing effort, it was determined the minimum pressure required to "trigger" each DODS model. A standard, larger signal was applied to determine what the response time or "delay" of each model was.

A modification of the setup was made to include a flow transducer for evaluating models utilizing a dual lumen cannula.



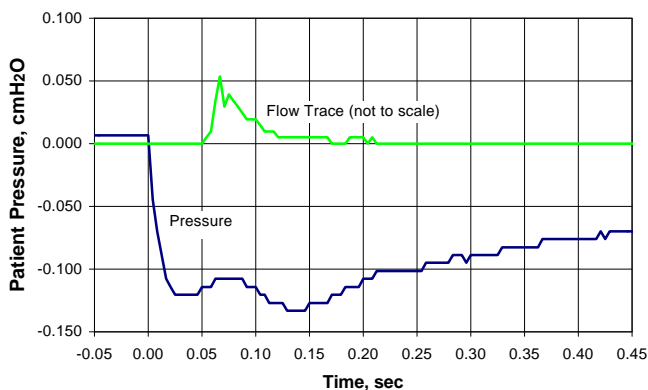
Units Tested

Impulse Select	Airsep Corporation	Buffalo, NY
Oxymatic 2400	Chad Therapeutics	Chatsworth, CA
Oxymatic 301	Chad Therapeutics	Chatsworth, CA
OxyClip PC20	Mallinckrodt, Inc.	St. Louis, MO
CR-50	Mallinckrodt, Inc.	St. Louis, MO
EX 2000	Sunrise Medical	Somerset, PA
EX 3000	Sunrise Medical	Somerset, PA
Extend 2000	Caire Inc.	Burnsville, MN
Venture	Invacare Corporation	Elyria, OH
DOC 2000	Transtracheal Systems	Englewood, CO
DOC 3000	Transtracheal Systems	Englewood, CO
O2Advantage	Western Medica	Westlake, OH

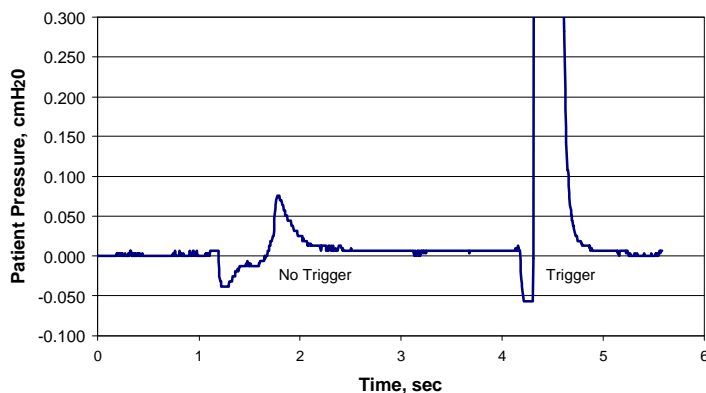
Results

- Average sensitivity .108 cmH₂O (\pm .043)
- Average delay 51.8 ms (\pm 20.2)
- 25 foot extension tubing added 70 ms to delay

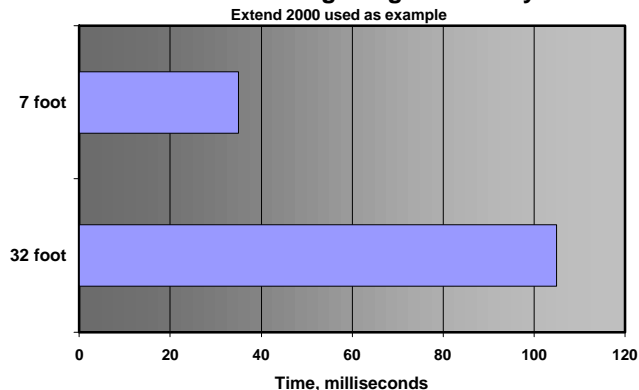
Sensitivity Measurement- Dual Lumen



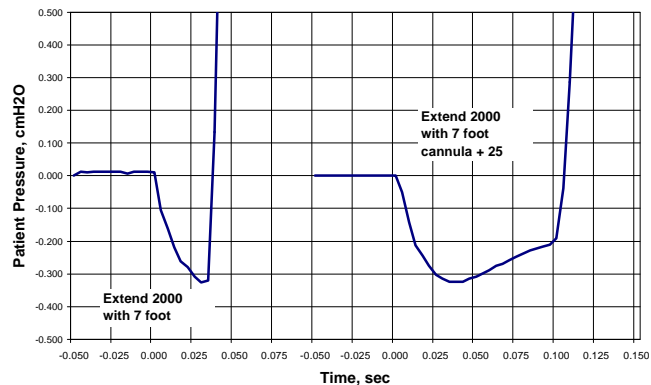
Sensitivity Measurement - Single Lumen



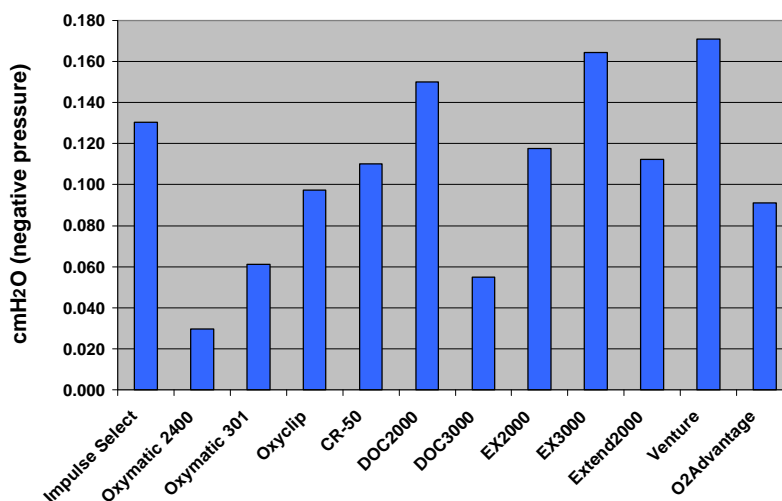
Effect of Tubing Length on Delay



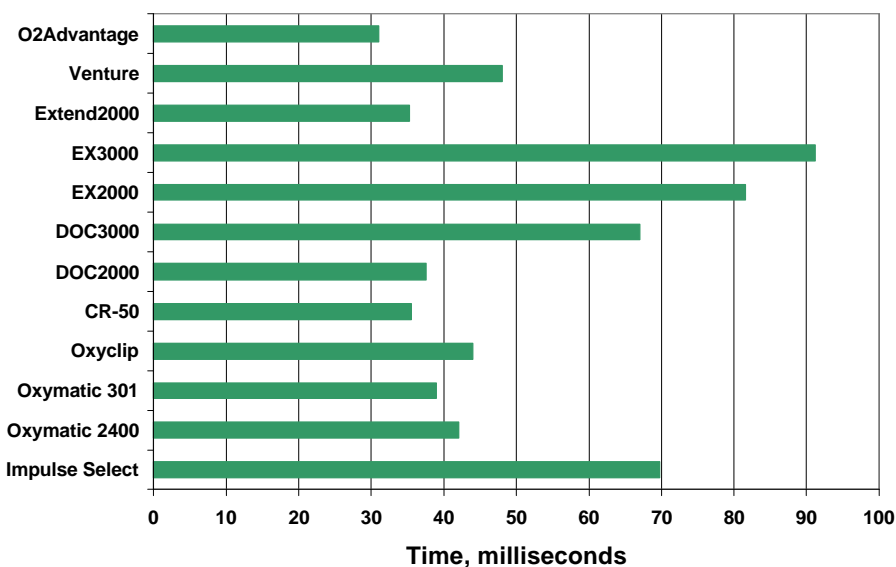
Delay Measurement - Single Lumen



DODS Trigger Sensitivity



DODS Delay Times



Conclusions

- Variability may exist with the use of different devices.
- Reduced oxygen delivery may exist due to missed breaths or late delivery, particularly in the following conditions:
 - shallow breathing patterns
 - mouth breathing
 - sleep
- Use of long extension tubing may result in reduced oxygen delivery, particularly if the device delivers throughout inspiration.
- Patients should be evaluated on the individual DODS model.