

## **Delivery of Aerosol Drugs through Continuous Airway Positive Pressure (CPAP) Progress Report 02/25/2010-03/03/2010**

### **Names**

Patrick Kurkiewicz, Co-leader  
Anne Loevinger, Co-leader  
Joe Decker, BSAC  
Ryan Kimmel, BWIG  
Steve Welch, Communications

### **Client**

Dr. Mihai Teodorescu

### **Problem Statement**

The CPAP system is most commonly used nightly in the homes by patients who struggle with sleep apnea. A method is needed for automated delivery of respiratory anti-inflammatory drugs, like albuterol, while using the CPAP device. Delivery of the necessary dose of such drugs should either be continuous or at timed intervals over a patient's sleep cycle.  
Side Project Suggested by Dr. Teodorescu: Create an ultrasonic nebulizer from an ultrasonic humidifier.

### **Last Week's Goals**

- Test new prototype efficacy of aerosol delivery
- Obtain medical adhesives for final prototype construction
- Construct pressure sensor system and test with written program code
- Prepare for Mid-Semester Presentation (To be delivered 03/05/10)
- 02/26/2010 Meeting with advisor scheduled for 12:00-12:30 PM
- 02/26/2010 Team meeting to test new prototype
- 03/02/2010 Electrical/programming team meeting
- 03/03/2010 Mechanical sub-team meeting

### **Summary of Accomplishments**

- Qualitatively tested and observed new nebulizer reservoir working with CPAP
- Constructed removable nebulizer system
- Constructed "table" to hold nebulizer in upright position during use
- Powerpoint for midsemester presentation made and checked by advisor
- Team practice for midsemester presentation

### **This Week's Goals / Schedule**

- Test new prototype efficacy of aerosol delivery
- Obtain medical adhesives for final prototype construction
- Construct pressure sensor system and test with written program code
- Determine location and time of K-12 Outreach activity
- Schedule meeting with client for sometime this week
- 03/05/2010 Mid-semester presentations scheduled for 12:05-2:05 PM
- 03/09/2010 Electrical/programming team meeting
- 03/10/2010 Mechanical sub-team meeting

## **Project Difficulties/ Reason for Missing Goals**

- Mid-semester presentation took precedence this week
- Pressure sensor system is more challenging than anticipated
- Machining and assembly of prototype took more time than estimated

## **Activities**

### **Team**

02/26/10      Advisor-team meeting (Annie, Patrick, Ryan, and Steve)  
02/26/10      Team meeting to test nebulizer (Annie and Patrick)  
03/02/10      Electrical/programming sub-team meeting (Steve and Patrick)  
03/03/10      Mechanical meeting and presentation preparation (All team)

### **Patrick**

- Attend circuitry/programming meeting and advisor meeting
- Attend team meeting to test nebulizer and start presentation preparation
- Send weekly meeting summary email
- Designed and planned construction of table for nebulizer reservoir
- Experimentation with new nebulizer reservoir and CPAP
- Mid-semester powerpoint work and presentation preparation
- Team correspondence and planning

### **Annie**

- Attend advisor meeting
- Attend team meeting to test nebulizer and start presentation preparation
- Wrote weekly progress report
- Experimentation with new nebulizer reservoir and CPAP
- Updated budget and calculated unit cost for prototype
- Mid-semester powerpoint work and presentation preparation
- Assembled and edited presentation slides and corresponded with advisor regarding same
- Team correspondence and planning

### **Joe**

- Mid-semester powerpoint work and presentation preparation
- Experimentation with new nebulizer reservoir and CPAP

### **Ryan**

- Attend advisor meeting
- Constructed table for nebulizer reservoir
- Mid-semester powerpoint work and presentation preparation
- Experimentation with new nebulizer reservoir and CPAP
- Update project website

### **Steve**

- Programming work and meeting (work on program with delay)
- Attend advisor meeting
- Mid-semester powerpoint work and presentation preparation
- Experimentation with new nebulizer reservoir and CPAP

## **Budget**

- Ideally, final prototype should cost less than about \$400.

## **Expenses**

- Total carried over from Fall 2009 Semester: \$260
- Total from Spring 2010 Semester so far: \$52.85
  - HDPE plastic solid for nebulizer reservoir (McMaster.com) \$12.00
  - Parking at UW- Hospital during meeting with Pulmonary Specialist \$5.00
  - Fittings for prototype including tubing and tubing adaptors (ACE) \$13.06
  - Polycarbonate tubing for nebulizer reservoir lid and base (McMaster.com) \$17.53
  - Plumbing kit (Polypropylene) for removable nebulizer design (ACE) \$5.26
- Unit cost of current prototype: \$183.12

# Project Schedule

Task	J.	February					March				April					M.
Week of:	29	5	12	19	26	5	12	19	26	2	9	16	23	30	7	
<b>Deliverables (Date Due)</b>																
Website																
PDS		Patrick					Patrick								Patrick	
Formal Progress Report	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick		Patrick	Patrick	Patrick	Patrick	Patrick	
Informal Week Summary	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick		Patrick	Patrick	Patrick	Patrick	Patrick	
Notebook							Patrick								Patrick	
Midsemester Presentation						Patrick									Patrick	
Final Presentation															Patrick	
Final Poster														Patrick	Patrick	
Final Report															Patrick	
Client Evaluation															Patrick	
Peer and Self Evaluations															Patrick	
<b>Meetings</b>																
BSAC	Patrick		Patrick		Patrick		Patrick				Patrick		Patrick		Patrick	
Team (Other than w/ client or advisor)					Patrick	Patrick								Patrick	Patrick	
Electrical Team (When meeting separately)	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick		Patrick	Patrick	Patrick	Patrick	Patrick	
Mechanical Team (When meeting separately)	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick		Patrick	Patrick	Patrick	Patrick	Patrick	
Client	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick		Patrick	Patrick	Patrick	Patrick	Patrick	
Advisor (in class)	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick		Patrick	Patrick	Patrick	Patrick	Patrick	
Dist. Entrepreneur Lec.								Patrick								
<b>Project Research*</b>																
Brainstorm Reservoir Options	Patrick	Patrick	Patrick	Patrick	Patrick											
Programming Options	Patrick	Patrick	Patrick	Patrick	Patrick											
Albuterol Delivery Rate	Patrick	Patrick	Patrick	Patrick	Patrick											
<b>Project Development</b>																
Order Parts Necessary For Improved Reservoir	Patrick	Patrick	Patrick	Patrick	Patrick											
Work On Reservoir / Mechanical Portion		Patrick	Patrick	Patrick	Patrick											
Finish Mechanical Portion of Design				Patrick	Patrick	Patrick	Patrick	Patrick	Patrick							
Test, Modify and Improve Mechanical Portion				Patrick	Patrick	Patrick	Patrick	Patrick	Patrick							
Test Albuterol Delivery Rate to Mask								Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	
Test Entire Assembly												Patrick	Patrick	Patrick	Patrick	
Brainstorm Programming Options	Patrick	Patrick	Patrick	Patrick	Patrick											
Order Parts Necessary for program		Patrick	Patrick	Patrick	Patrick											
Work on Program		Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick		Patrick	Patrick	Patrick	Patrick	Patrick	
Refine Circuitry		Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick	Patrick							

\*After this, research will be done on an as-needed basis.

KEY	
Full Team	Patrick
Electrical Team	Annie
Mechanical Team	Joe
	Ryan