

Delivery of Aerosol Drugs through Continuous Airway Positive Pressure (CPAP) Progress Report 02/11/2010-02/17/2010

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

- Construct (and test) new, fully functional prototype
- Determine albuterol delivery timing and design efficiency by mathematical calculation
- 02/12/2010 Meeting with advisor scheduled for 12:00-12:30 PM
- 02/12/2010 Team meeting to discuss flow calculations and construct new prototype
- 02/16/2010 Electrical/programming team meeting
- 02/17/2010 Mechanical sub-team meeting to construct/test new prototype

Summary of Accomplishments

- New prototype construction
- Theoretical albuterol delivery efficiency calculated mathematically
- Mechanical sub-team discussion of flow parameters, albuterol sulfate dosage, toxicology, and efficiency
- Research to obtain biocompatible adhesive materials
- Electrical/programming sub-team completion of program for delivery timing
- Obtained protocols for continuous delivery of aerosolized albuterol

This Week's Goals / Schedule

- Test new prototype
- Obtain medical adhesives for final prototype construction
- Construct pressure sensor system and test with written program code
- 02/19/2010 Meeting with advisor scheduled for 12:00-12:30 PM
- 02/19/2010 Team meeting to test new prototype
- 02/23/2010 Electrical/programming team meeting
- 02/24/2010 Mechanical sub-team meeting

Project Difficulties/ Reason for Missing Goals

- Goals were met.
- Still need biocompatible adhesives for future goals

Activities

Team

- 02/12/10 Team meeting and advisor-team meeting (All team)
02/16/10 Electrical/programming sub-team meeting (Steve and Patrick)
02/17/10 Mechanical meeting and construction (All team)

Patrick

- Attend circuitry/programming meeting and mechanical meeting
- Mechanical design planning, construction and machining of nebulizer reservoir
- Design “table” to keep nebulizer level during use
- Team correspondence and planning

Annie

- Wrote progress report
- Research biocompatible adhesives and sealants approved for medical devices
- Attend mechanical meeting
- Team correspondence and planning

Joe

- Calculations and mathematical modeling of air-aerosol flow through nebulizer system
- Attend mechanical meeting
- Team correspondence and planning
- Attend BSAC meeting

Ryan

- Attend mechanical meeting
- Mechanical design planning, construction and machining of nebulizer reservoir
- Team correspondence and planning
- Update project website

Steve

- Circuitry/programming work and meeting, including completion of program
- Planning and research for pressure sensor/pneumotachometer
- Team correspondence and planning
- Attend mechanical meeting

Budget

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

Costs

- Total carried over from Fall 2009: Semester \$260
- HDPE plastic solid for nebulizer reservoir (McMaster.com) \$11.50
- Parking at UW- Hospital during meeting with Pulmonary Specialist \$4.00

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	
Deliverables (Date Due)																
Website																
PDS		Red					Red								Red	
Formal Progress Report		Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow		Yellow	Yellow	Yellow	Yellow	Yellow	
Informal Week Summary		Cyan	Cyan	Cyan	Cyan	Cyan	Cyan	Cyan	Cyan		Cyan	Cyan	Cyan	Cyan	Cyan	
Notebook							Red								Red	
Midsemester Presentation						Red										
Final Presentation															Red	
Final Poster														Red		
Final Report															Red	
Client Evaluation															Red	
Peer and Self Evaluations															Red	
Meetings																
BSAC		Black		Black		Black		Black			Black		Black			
Team (Other than w/ client or advisor)					Red	Red							Red	Red	Red	
Electrical Team (When meeting separately)		Grid	Grid	Grid		Grid	Grid	Grid	Grid		Grid	Grid	Grid	Grid	Grid	
Mechanical Team (When meeting separately)		Grid	Grid	Grid		Grid	Grid	Grid	Grid		Grid	Grid	Grid	Grid	Grid	
Client		Red		Red		Red		Red		Red		Red		Red		
Advisor (in class)		Red	Red	Red	Red	Red	Red	Red	Red		Red	Red	Red	Red	Red	
Dist. Entrepreneur Lec.								Red								
Project Research*																
Brainstorm Reservoir Options		Grid	Grid	Grid												
Programming Options		Grid	Grid	Grid												
Albuterol Delivery Rate		Grid	Grid	Grid												
Project Development																
Order Parts Necessary For Improved Reservoir		Grid	Grid	Grid												
Work On Reservoir / Mechanical Portion		Grid	Grid	Grid												
Finish Mechanical Portion of Design				Grid	Grid	Grid	Grid	Grid	Grid							
Test, Modify and Improve Mechanical Portion				Grid	Grid	Grid	Grid	Grid	Grid							
Test Albuterol Delivery Rate to Mask								Grid	Grid	Grid	Grid	Grid	Grid	Grid	Grid	
Test Entire Assembly												Red	Red	Red	Red	
Brainstorm Programming Options		Grid	Grid	Grid												
Order Parts Necessary for program		Grid	Grid	Grid												
Work on Program		Grid	Grid	Grid	Grid	Grid	Grid	Grid	Grid		Grid	Grid	Grid	Grid	Grid	
Refine Circuitry		Grid	Grid	Grid	Grid	Grid	Grid	Grid	Grid							

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

KEY	
Full Team	Patrick
Electrical Team	Annie
Mechanical Team	Joe
	Ryan