Delivery of Aerosol Drugs through Continuous Airway Positive Pressure (CPAP)
Progress Report 02/18/2010-02/24/2010

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
- 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

Summary of Accomplishments

- Machined and assembled new prototype of ultrasonic nebulizer including new detachable nebulizer reservoir design
- Research to obtain biocompatible adhesive materials and adhesives ordered
- Obtain additional polycarbonate tubing for prototype and pieces for removable nebulizer
- Programming sub-team completion of program for delivery timing with device delay
- Meeting with client to discuss progress

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
- 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

Project Difficulties/ Reason for Missing Goals

- Pressure sensor system is more challenging than anticipated
- Machining and assembly of prototype took more time than estimated

Activities

Team

02/19/10 Team meeting and advisor-team meeting (All team)
02/23/10 Electrical/programming sub-team meeting (Steve and Patrick)
02/24/10 Meeting with client (Steve, Ryan, and Patrick)
02/24/10 Mechanical meeting and construction (Ryan, Annie, and Joe (later), (~Steve))

Patrick

- Attend circuitry/programming meeting and mechanical meeting
- Mechanical design planning, construction and machining of nebulizer reservoir
- Send weekly meeting summary email
- Attend meeting with client to discuss progress
- Team correspondence and planning

Annie

- Wrote weekly progress report
- Research biocompatible adhesives and order samples
- Ordered prototype parts from Mcmaster.com
- Went to ACE Hardware for fittings and tubing for new prototype and again for plumbing fittings for removable reservoir
- Researched and planned design for removable nebulizer reservoir
- Attend mechanical meeting
- Team correspondence and planning

Joe

- Calculations and mathematical modeling of air-aerosol flow through nebulizer system
- Assisted Steve with planning for pressure sensor system
- Attend mechanical meeting
- Team correspondence and planning

Ryan

- Attend mechanical meeting
- Mechanical design planning, construction and machining of nebulizer reservoir
- Team correspondence and planning
- Attend meeting with client to discuss progress
- Update project website

Steve

- Circuitry/programming work and meeting (work on program with delay)
- Planning and research for pressure sensor/pneumotachometer
- Team correspondence and planning
- Correspondence with client to plan meeting
- Attend meeting with client to discuss progress

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

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

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