Continuous Monitoring of Asthma Control

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Overview

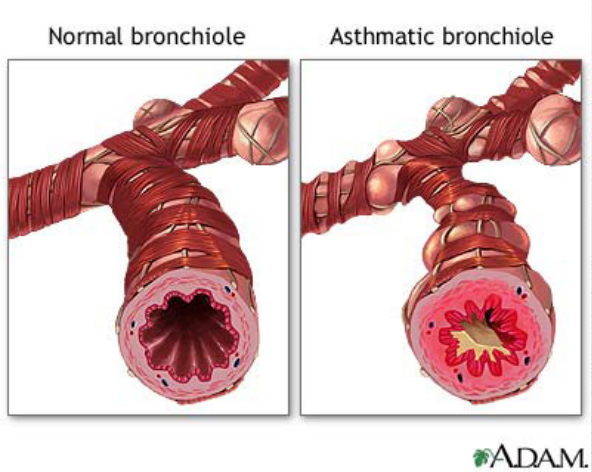
-Problem statement
-Background material
-Product design specification - PDS
-Design features considered
-Design matrix
-Future work
-References and acknowledgements

Problem Statement

- Don’t experience symptoms for two days
- Up to 20% drop in lung efficiency
- Designing a new asthma shirt
- Measures wheezing, coughing, respiratory rate
- Can let patient know in advance of attack

Background: Asthma

- Chronic disease where bronchioles constrict
- Coughing, wheezing, shortness of breath, and chest tightness
- Anti-inflammatory drugs
- Increase in overall Asthma patients
- Severe asthma patients account for a huge proportion of medical cost
- Exacerbation- severe asthma attack



https://www.uichildrens.org/childrens-content.aspx?id=228741

Background: Current Methods

- Spirometer
- Thermistor
- Stethoscopes

Limitations:

- Can not self diagnose
- Must come into hospital/clinic

http://www.woodleyequipment.com/clinical-trials/spirometry/spirometer-86-80-505.php

Client Requirements

- Focus on one aspect of the shirt
- Start with listening to lung sounds
  - Coughing
  - Wheezing
  - Respiratory rate
- Run/collect data for 4hrs

Product Design Specifications

- Performance Requirements
- Accuracy and Reliability
- Operating Environment
- Standards and Specifications

Design Features Considered

Thermistor bands

- Measures lung capacity and breathing rate
- To be incorporated later

Spirometry/FEV1

- Not continuous
- Typically used after symptoms appear

Design matrix

Design Criteria (weight)	Thermistor Mask		Microphone		Electronic Stethoscope	
Patient comfort (25)	2/5	10	4/5	20	4/5	20
Effectiveness (20)	2/5	8	4/5	16	4/5	16
Ease of Use (20)	2/5	8	4/5	16	4/5	16
Cost (15)	5/5	15	5/5	15	1/5	3
Adjustability (10)	3/5	6	4/5	8	3/5	6
Safety (10)	4/5	10	5/5	10	5/5	10
Total	**55**		**85**		**71**	

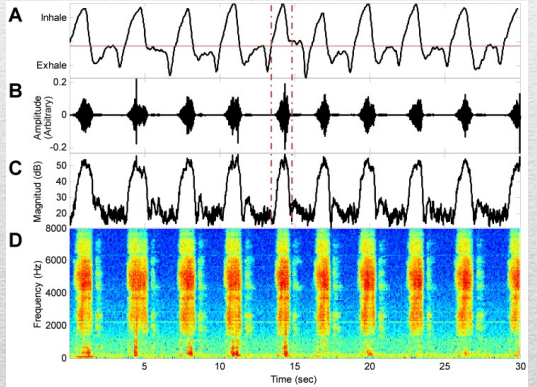
Future Work

For this semester:

- Select casing and circuit for microphone
- Determine thresholds for diagnosis

Beyond this semester:

- Resistor band for tidal volume
- 24/7 application of device



https://www.researchgate.net/figure/259588976_fig4_A-Air-flow-B-Audio-signal-C-Energy-signal-D-Spectrogram-Dashed-vertical-lines

References & Acknowledgements

http://www.aaaai.org/conditions-and-treatments/asthma

http://www.sciencedirect.com/science/article/pii/S014067360669288X

Questions?