Tracheoesophageal Prosthesis Insufflator

Computer Integrated Surgery II, Project 13

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Overview

-- Background
-- Goals
-- Approach
-- Deliverables
-- Schedule
-- Milestones
-- Dependencies
-- Bibliography
Background: Laryngectomy

- Removal of larynx
- No vocal chords
- Mouth, Nose replaced by stoma for breathing functions
Background: Restoring speech with TEP

- TEP is one-way valve between esophagus and trachea
- Speak by vibrating esophagus
Background: Current problems

- Difficulties blocking stoma
- Inconvenient
- Physical demands
Goals

-- Construct an insufflator that will connect to TEP

- Portable
- Easy to use
- Reliable on a daily basis
Approach: Pressure Source

-- Air canisters
- Compact
- Easy to replace
- Inexpensive
- Potentially dangerous
- Long-term costs

-- Air compressors
- Rechargeable
- One-time cost (ideally)
- Could be heavy/bulky/noisy
- May have to design one
Approach: Delivery

-- Must control output pressure

- Canister/Compressor pressure likely too high
- Output pressure should be user-adjustable

- Initial design: Bladder, valve, and pipe radius
Approach: Other Considerations

-- Does it have to be air?
  - Helium increases voice pitch, ideal for women

-- Emergency/quick-detach
  - In case of malfunction
  - Prevent user injury

-- Better than a normal person?
  - No need to exert air from lungs
## Deliverables

<table>
<thead>
<tr>
<th>CAD/Pad sketch of components</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough prototype of insufflator</td>
<td></td>
</tr>
<tr>
<td>Improved prototype with custom-built parts</td>
<td>Expected</td>
</tr>
<tr>
<td>Tested on voluntary patients</td>
<td></td>
</tr>
<tr>
<td>Portable, belt-worn</td>
<td></td>
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<tr>
<td>Polish into sell-able condition</td>
<td></td>
</tr>
<tr>
<td>World domination</td>
<td>Maximum</td>
</tr>
<tr>
<td>Activity</td>
<td>Date Range</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Design Sketch</td>
<td>28-Feb - 7-Mar</td>
</tr>
<tr>
<td>Material Acquisition</td>
<td>28-Mar - 4-Apr</td>
</tr>
<tr>
<td>Initial Prototype</td>
<td>18-Apr - 25-Apr</td>
</tr>
<tr>
<td>Rapid Prototyping</td>
<td>28-Mar - 4-Apr</td>
</tr>
<tr>
<td>Testing</td>
<td>7-Mar - 11-Apr</td>
</tr>
<tr>
<td>Revisions</td>
<td>28-Feb - 2-May</td>
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</tbody>
</table>
Milestones

-- March 8: Completion of design sketch and CAD

-- March 13: Acquisition of materials

-- March 28: Initial prototype of insufflator

-- April 8: Proceed to develop RP parts

-- April 15: Begin testing on voluntary patients, revise based on feedback
### Dependencies

<table>
<thead>
<tr>
<th>Dependency</th>
<th>Reason for dependency</th>
<th>Impact</th>
<th>Resolution</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEP device</td>
<td>Output tubing interface</td>
<td>No interface</td>
<td>Will acquire</td>
<td>N/A</td>
</tr>
<tr>
<td>Rapid Prototyping</td>
<td>Costs, qualifications</td>
<td>Less streamlined design</td>
<td>Contacts in MechE Dept.</td>
<td>Do without</td>
</tr>
<tr>
<td>Voluntary Patient testing</td>
<td>Ethics</td>
<td>Cannot test device</td>
<td>Will acquire, according to Dr. Richmon</td>
<td>Perform on realistic model</td>
</tr>
</tbody>
</table>


Questions?

Be gentle.