Introduction

- Intracerebral Hemorrhage
  - 1 in 50
  - 40% die within first month
    [1]
- Hemorrhage must be removed to preserve patient’s chance of living a normal life
Current Device

• Large skull incision needed
• Stiff, straight needle (cannula)
• Extremely limited movement
• Oftentimes doctors forgo surgery because it may create more problems than benefits
  • Choose to just treat swelling with medication
Active Cannula

- Vanderbilt-engineered robotic device
- Motorized robot able to extend and retract its needles
- Concentric tube design
  - Rigid outer tube, less than 1/20” thick
  - Flexible inner tube able to rotate
  [2]
Procedure

- CT scan of the brain
- Robot maps out the entry location and route
- Device is set up and locked onto patient’s head
- Robot automatically removes blood clot using its planned path [2]
Effectiveness

- Minimum of 92% total evacuation rate of hemorrhage with optimal entry path
- Non-optimal entry paths result in lessened removal rates
- Benefits of removal begin between 25-50% of hemorrhage evacuation

**TABLE 4**

<table>
<thead>
<tr>
<th>Case</th>
<th>Optimal Entry Path</th>
<th>Perturbed Entry Paths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>92%</td>
<td>60%</td>
</tr>
<tr>
<td>2</td>
<td>94%</td>
<td>85%</td>
</tr>
<tr>
<td>3</td>
<td>98%</td>
<td>97%</td>
</tr>
<tr>
<td>4</td>
<td>96%</td>
<td>57%</td>
</tr>
<tr>
<td>5</td>
<td>100%</td>
<td>95%</td>
</tr>
<tr>
<td>6</td>
<td>92%</td>
<td>32%</td>
</tr>
<tr>
<td>7</td>
<td>95%</td>
<td>95%</td>
</tr>
</tbody>
</table>
Future of Technology

- Other applications in tumor and blood removal, small scale surgeries using different tube tips
- Greatly decrease risk of death with hemorrhage cases
- Only one prototype of this device still undergoing research and testing
Thank You!
References


[3] Swaney, Philip J.; Lathrop, Ray; Burgner, Jessica; Weaver, Kyle; Gilbert, Hunter B.; Webster, Robert J.; and Comber, David B. “System, method, and apparatus for configuration, design, and operation of an active cannula robot.” Vanderbilt University. 3 August, 2015.