Device to Measure Jugular Venous Pressure

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UW BME Design

Overview

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Client

- Dr. Steven H. Yale, MD
- Marshfield Clinic
- Clinical Associate Professor at UW-Madison School of Medicine and Public Health
- Specializes in Internal Medicine
- Trains residents

http://www.marshfieldclinic.org/

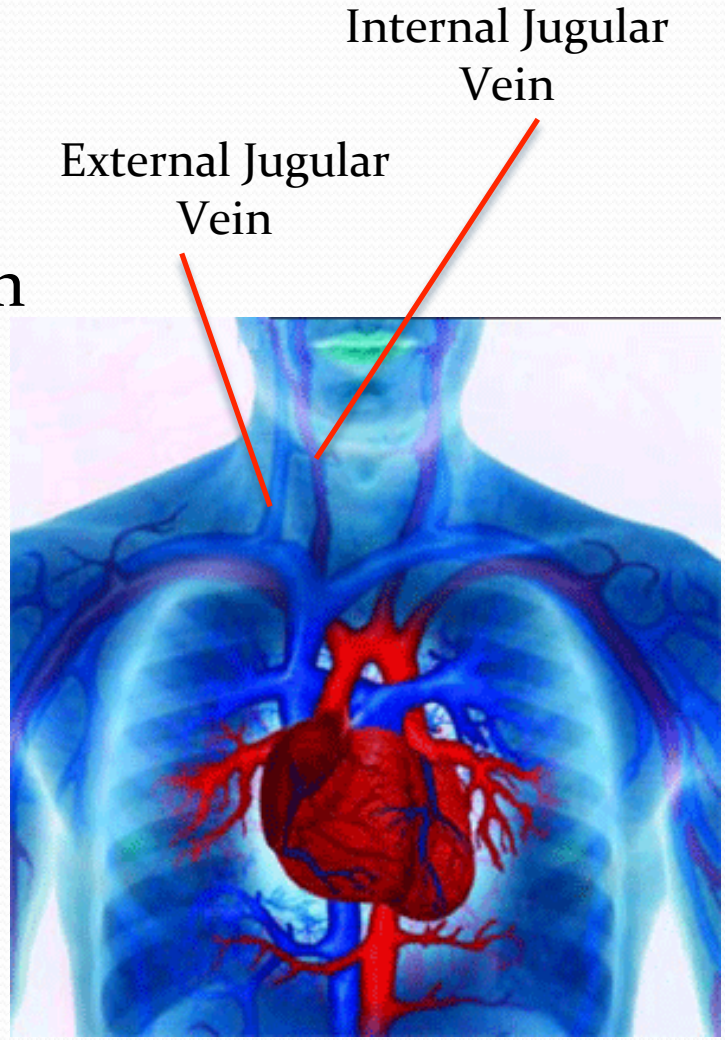
Problem Statement

- A device is needed to measure the jugular venous pressure in a more accurate and consistent manner and display this measurement on a monitor.

http://en.wikipedia.org/wiki/Jugular_venous_pressure

Background

- Diagnose heart failure - leading cause of death in US [1]
- Measures pressure in right atrium
- Internal Jugular Vein (IJV) and External Jugular Vein (EJV)
- Monitors progress
- Part of standard physical examination

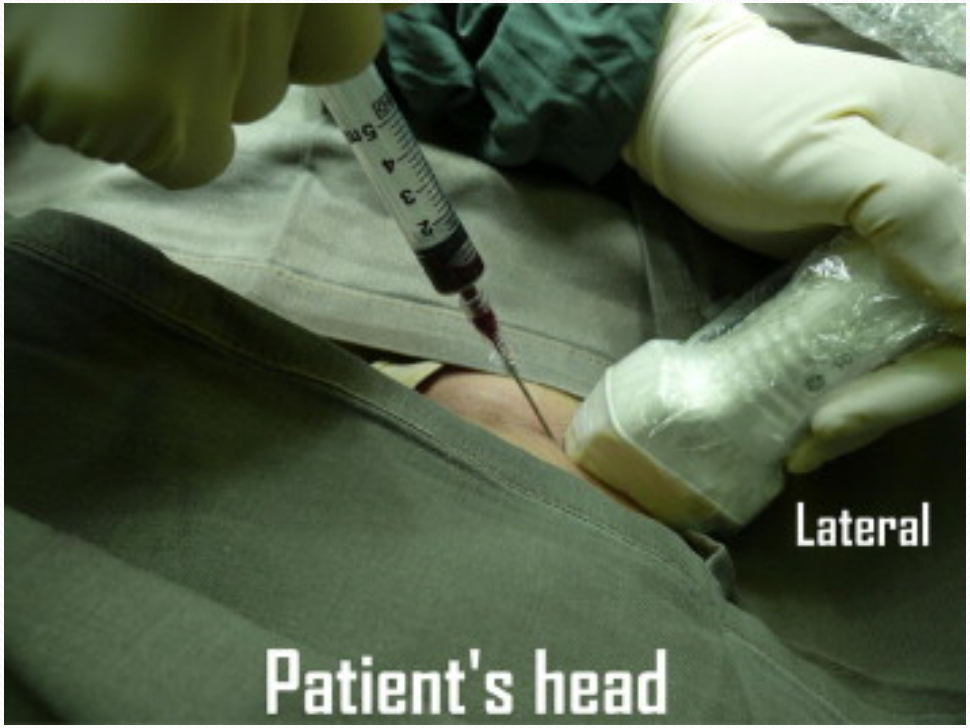


http://www.uclahealth.org

[1] http://www.medical.theclinics.com/article/S0025-7125(11)00006-X/abstract

Current Methods

- Invasive



http://www.sciencedirect.com

- Non-Invasive

http://myhow.wordpress.com

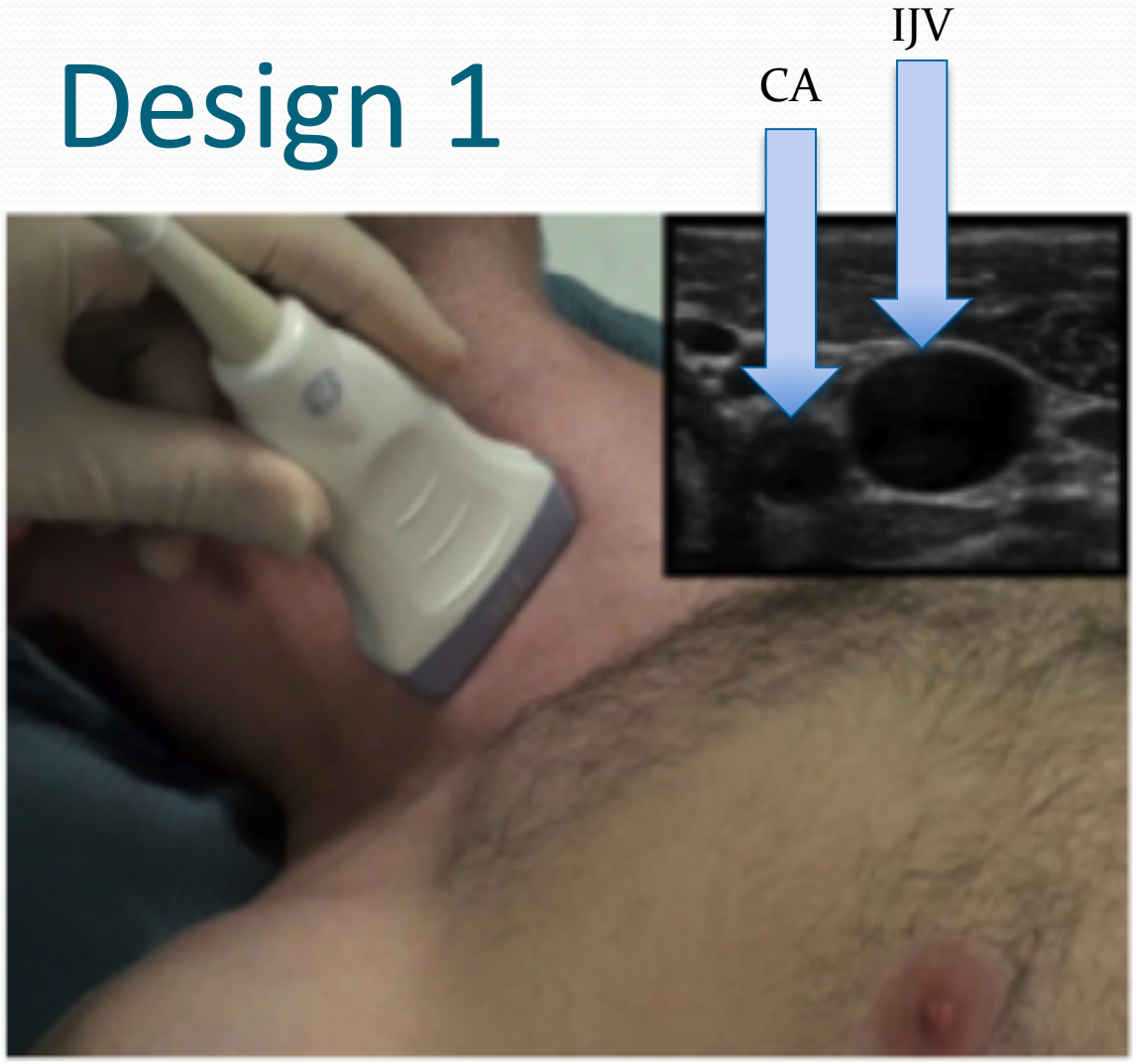
Motivations

- Standardized procedure
- Accurate results
- Cost efficient
- Simplistic and easily administered
- Diagnose and monitor heart failure

Design Requirements

- Non-invasive
- Precise and accurate
- Daily use at clinics
- Small, lightweight, and easily stored
- Electronic readout
- Around $500

Design 1



http://www.nejm.org/multimedia/medical-videos

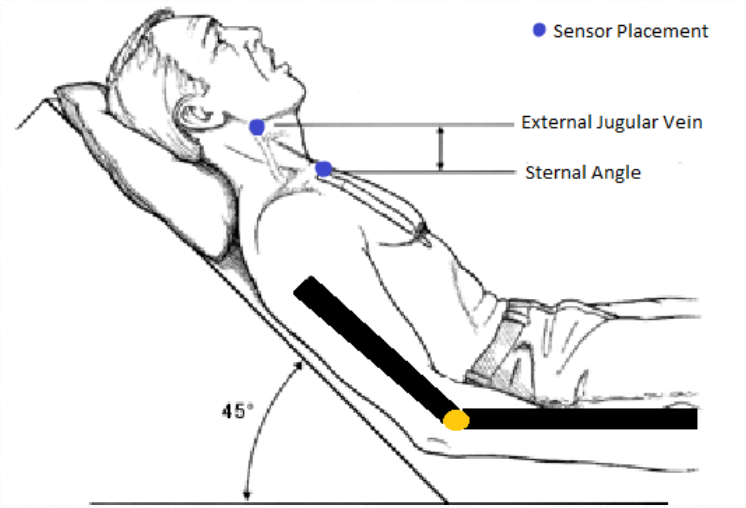
- Poor picture quality
- Only licensed professionals
- $12,000 - $40,000
- Most accurate reading

Design 2

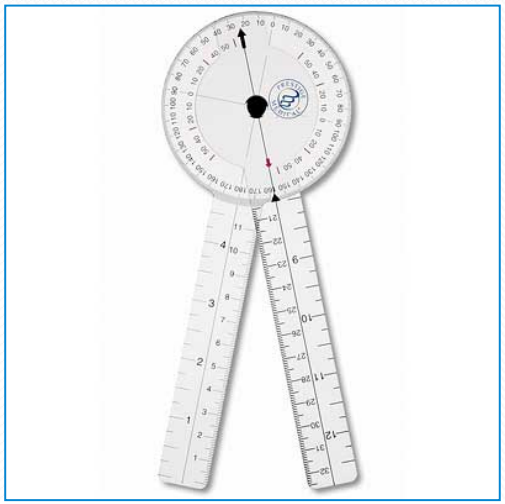
- Use angles to find vertical distance
- Use angle measurement device-including protractor
- Inexpensive
- No training necessary
- Possible in-home use

Design 3 – Final Design

- Angle measuring device
- Measure chest circumference
- Displacement sensors
- Program outputs JVP
- Reusable



http://emsbasics.com



Matrix

Category	Weight	Design 1 - Ultrasound	Design 2 – Manual Measurement	Design 3 - Sensors
Ease of Use	0.40	1	4	5
Cost	0.10	1	5	4
Accuracy	0.15	4	1	3
Precision	0.25	3	1	4
Size	0.10	2	5	4
Total	**1**	**2.05**	**3.00**	**4.25**

Future Work

- Purchase sensors
- Manufacture measurement devices
- Program to output JVP
- Design a phone application
- Standard physical procedure

Special Thanks

- Dr. Steven Yale
- Professor Chris Brace
- Dr. Walter Kao, MD - Associate Professor of Medicine
- Professor Amit Nimunkar