

# **Abdominal Hernia/Pannus Support Device**

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# Project Introduction

## Prospective Consumers:

- Patients with large abdominal hernias
- Obese patients with large pannus

## Current Health Issues:

- Sensitive skin/scarring
- Heavy tissue mass/no support
- Lack of circulation
- Back problems/muscle strain

# Patient Before/After Abdominal Hernia Repair Surgery



*Left:* Front view of patient C.V. 14 months after abdominal exploration for blunt trauma. Note the extreme protrusion of the viscera. *Right:* Front view of patient C.V. 14 months after abdominal wall reconstruction.

# Background of Hernia/Pannus Support Device

## Current Solutions:

- Maternity brace
- Abdominal binders

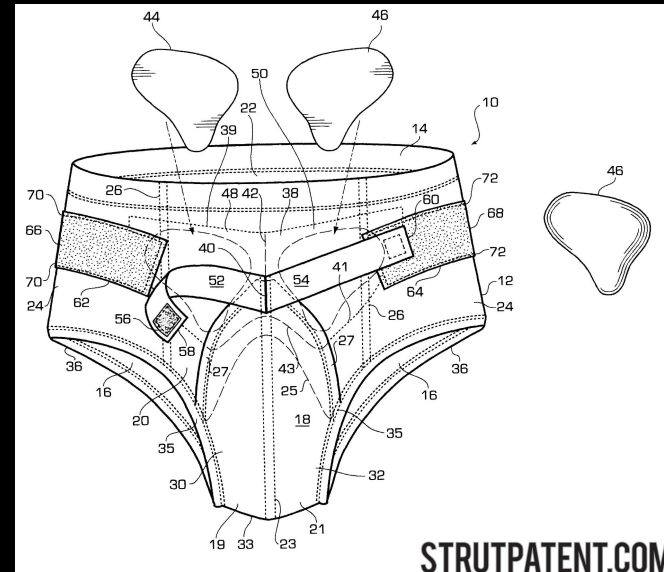
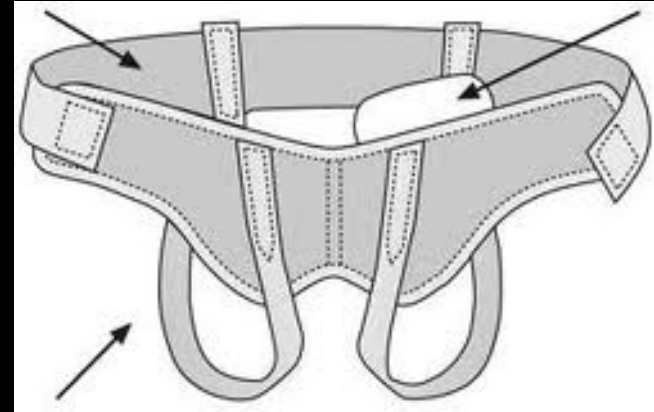
## Existing Ineffective Designs:

- Do not fit all body types
- Lack lifting force
- Tighten around sensitive skin
- Difficult to clean/use

# Current Support Devices



# Past Ineffective Designs



<https://www.strutpatent.com>

STRUTPATENT.COM

# Problem Statement

Develop a prosthetic that will

- Provide a lifting support
  - Pannus
  - Hernia Sac
  - 5-100 lbs
- Materials
  - Washable
  - Breathable
  - Skin-friendly
  - Durable
- Adaptable for market production

# Specifications

- Prototype is specific for Dr. Greenberg's patient
- Awaiting measurements
  - Shoulder width
  - Shoulder to hip
  - Pannus/hernia maximum circumference
  - Waist circumference under pannus/hernia
  - Length of pannus/hernia
  - Width of back
  - Weight
  - Height

# Design Components

- Straps over shoulder
- Support belt
- Lifting of hernia/pannus
- Side abdominal support



Side View

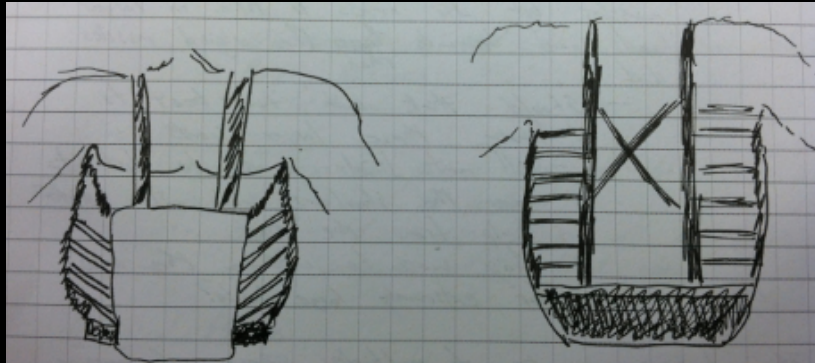
Drawn by Cody Williams



# Materials - Rubber Band

- Would create lifting force
  - More bands, more distribution
  - Different bands for different lifts
  - Could incorporate into material
- 
- Foreseen difficulties putting on
  - Not breathable

Front



Back

Drawn by Cody Williams

# Materials - Elastic Fabric

- Very customizable, easy to work with
  - Breathable
  - Washable as is
  - Basis of current devices
- 
- Not much lifting force
  - Stretch over time

# Materials - Rigid Fabric

- Allows transfer of forces
- Little to no stretch
- Durable
- Breathable
  
- Needs alternate lifting force

# Materials Design Matrix

| Criteria               | Rubber Band | Elastic Fabric | Rigid Fabric |
|------------------------|-------------|----------------|--------------|
| Effectiveness (30)     | 25          | 15             | 22           |
| Safety(20)             | 10          | 17             | 17           |
| Comfort(15)            | 5           | 13             | 13           |
| Maintenance(15)        | 6           | 13             | 13           |
| Ease of Use (15)       | 6           | 10             | 13           |
| Cost Effectiveness (5) | 1           | 3              | 3            |
| <b>Total (100)</b>     | <b>53</b>   | <b>71</b>      | <b>81</b>    |

# Fastening - Buckle

- Affordable
- Easy to use
- Easy to conceal



<http://www.plasticimpex.com>

- Ineffective at maintaining support
- Easily breakable

# Fastening - Ratchet

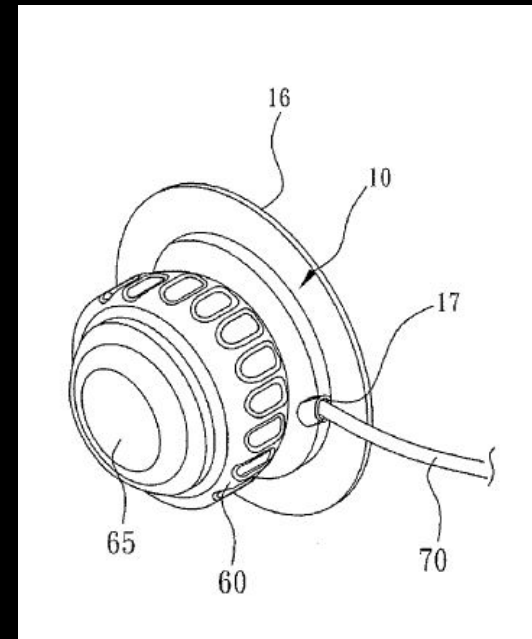
- Effective at maintaining support
- Safe
- Durable
- Heavier



<http://www.cargoequipmentcorp.c>

# Fastening - Winding

- Easily concealable
- Easy to use
- Ineffective at maintaining support
- Difficult to acquire



# Fastening Mechanisms Design Matrix

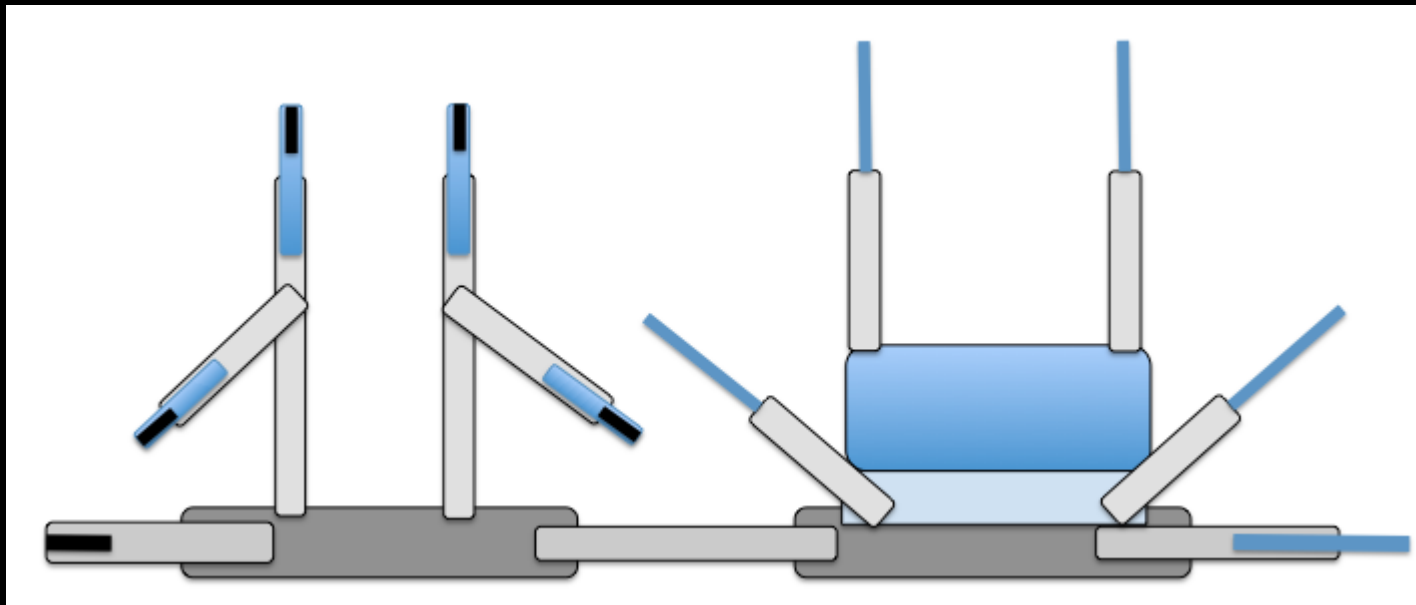
| Criteria               | Buckle    | Ratchet   | Winding   |
|------------------------|-----------|-----------|-----------|
| Effectiveness (30)     | 15        | 28        | 22        |
| Safety(20)             | 10        | 17        | 14        |
| Concealability (15)    | 13        | 8         | 13        |
| Maintenance(15)        | 13        | 13        | 4         |
| Ease of Use (15)       | 13        | 12        | 12        |
| Cost Effectiveness (5) | 4         | 5         | 2         |
| <b>Total (100)</b>     | <b>68</b> | <b>83</b> | <b>67</b> |



# Proposed Design

Upon further consideration multiple aspects were chosen:

- Rigid fabric for the support below the hernia, the belt, and suspenders
- Elastic fabrics for the hernia containment

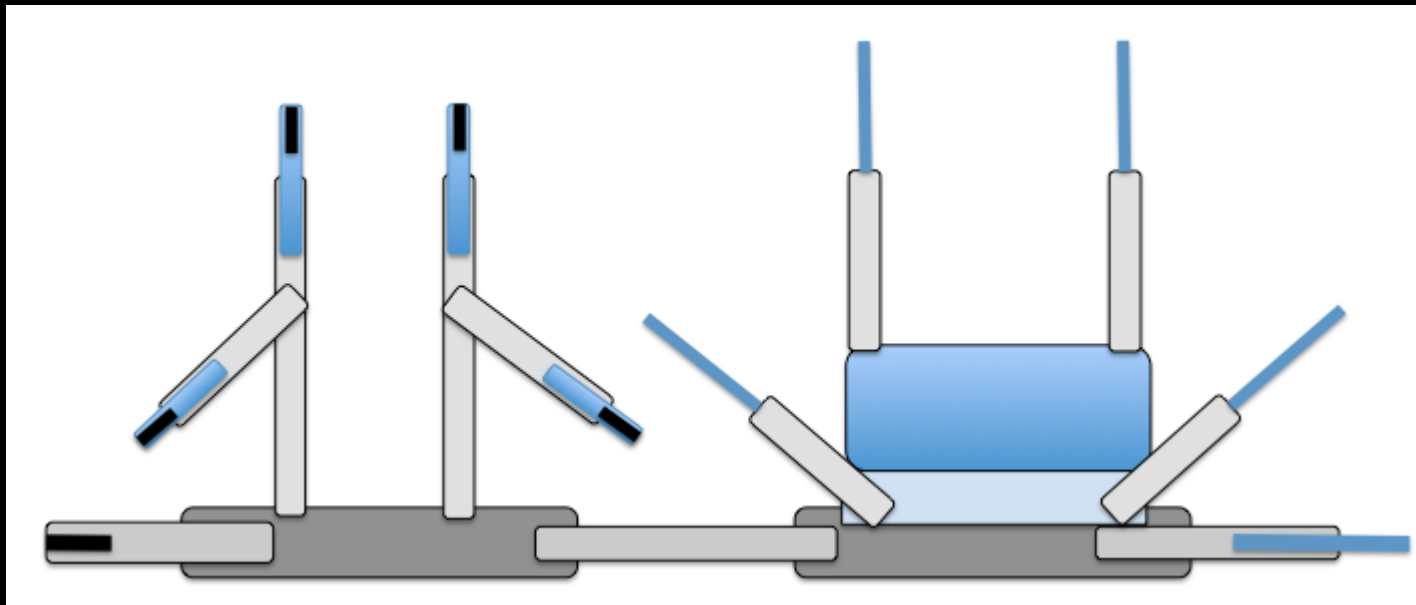


Created by Cody Williams

# Proposed Design

Upon further consideration multiple aspects were chosen:

- Ratchets for fastening the various straps
- Shoulder straps distribute load
- Put belt on below hernia and lift up



Created by Cody Williams

# Conclusions

The proposed design should provide optimal lifting support and weight distribution.

Comfort and ease of use should make it realistic for everyday use until surgery.

Once the materials are finalized, ready to begin prototype development.

# Future Work

- Obtain measurements from Dr. Greenberg
- Prototype proposed design
- Safety testing
- Request clients' approval
- Have Dr. Greenberg deliver device to patient and obtain feedback
- Alter prototype to patient's requests
- Finalize product
- Patent?

# References

1. <http://design42.blogspot.com>
2. <http://www.strutpatent.com>
3. <http://www.plasticimpex.com>
4. <http://www.cargoequipmentcorp.co>
5. <http://www.google.com/patents/US20110303782>