Redesign of a Medical Crash Cart

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Problem Statement:
The College of Health Science at Boise State University has requested the redesign of a medical crash cart to improve functionality, efficiency, and safety.

Introduction:
A crash cart is a set of trays, drawers, and shelves on wheels used in hospital emergency rooms for the transportation and dispensing of emergency supplies and equipment for use in cardiac emergencies.

The current crash cart design is top heavy, unstable, inefficient, unorganized, and unsafe. To increase functionality, efficiency, and safety, a new design was developed.

Objectives:
- Cart is easily accessible for all specialists
- Cart accommodates the Advanced Cardiac Life Support (ACLS) Standards
- Cart is stable and easy to maneuver
- Cart is safe for users verified through a Safety Checklist

Design:
Primary Features of New Design:
- Separable stand for defibrillator and oxygen tank to be positioned near the patient’s head
- Cardiac board secures defibrillator cart to main cart through a series of J-channels
- Handle available on each cart for mobility

Testing:
Two main tests were conducted on the combined crash cart, main cart, and defibrillator cart:
- Force required to push and pull the cart
- Force required to tip the cart

Future Work:
- Integrated lock mechanism for all drawers
- Changing location of support post on defibrillator cart to greater improve stability

Testing Results:

<table>
<thead>
<tr>
<th>Test Performed</th>
<th>Combined Cart</th>
<th>Main Cart</th>
<th>Defibrillator Cart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friction Force – pushing (lb)</td>
<td>16.19</td>
<td>15.44</td>
<td>7.73</td>
</tr>
<tr>
<td>Friction Force – pulling (lb)</td>
<td>16.03</td>
<td>15.22</td>
<td>6.42</td>
</tr>
<tr>
<td>Steady State Force – pushing (lb)</td>
<td>13.67</td>
<td>9.69</td>
<td>4.47</td>
</tr>
<tr>
<td>Steady State Force – pulling (lb)</td>
<td>13.57</td>
<td>9.54</td>
<td>3.86</td>
</tr>
<tr>
<td>Tipping Force – pushing (lb)</td>
<td>21.96</td>
<td>17.94</td>
<td>12.36</td>
</tr>
<tr>
<td>Tipping Force – pulling (lb)</td>
<td>21.88</td>
<td>18.32</td>
<td>10.78</td>
</tr>
</tbody>
</table>

Conclusion:
Testing results demonstrate safety, stability, and maneuverability. The new design accommodates the ACLS standards. Greater accessibility is provided by the separable cart.

This design will help to facilitate the many simultaneous activities occurring during a cardiac emergency with minimal tripping hazards and bottlenecking.

Figure 1: Combined Crash Cart and Defibrillator Cart Separated

Figure 2: Combined Crash Cart and Defibrillator Cart Separated

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