**DVT & PE Following Brain Injury during Inpatient Rehabilitation**
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**Introduction**
A deep vein thrombosis (DVT) and pulmonary embolism (PE) are known complications for patients with multi-system traumatic injuries in rehabilitation. The incidence of DVT following traumatic brain injury (TBI) has ranged from 7% to 19% and for PE ranged from 0.36% to 20%. Elliot and colleagues identified several risk factors for the development of a DVT with individuals following an acquired brain injury in acute rehabilitation and they include the following: over 40 years of age, history of DVT at acute care, obesity, gross varicose veins, immobility, hormone replacement therapy, surgery, and paralysis of a lower limb. Even though the data regarding the presence of a DVT following a TBI is variable, individuals following a TBI are at risk to develop a DVT because of concomitant risk factors of trauma to the extremities and prolonged period of immobilization. Often times the medical team is reluctant to start thromboprophylaxis to prevent a DVT with individuals who have experienced a TBI because of the increased risk of the extension of the intracranial bleeding sustained during traumatic brain injury. Currently in the literature there is limited information available comparing the rehabilitation outcomes with individuals following a TBI who developed a DVT or PE versus those who did not while participating in inpatient rehabilitation.

**Study Purpose**
The purpose of this study was to examine the incidence of risk factors (DVT/PE at acute care, BMI, lower limb paralysis, anticoagulation therapy and surgery) for development of DVT and DVT/PE for patients following a TBI while participating in inpatient rehabilitation (IPR) and its impact on rehabilitation outcomes.

**Subjects:** This was a retrospective study of all patients who were admitted to Marianjoy Rehabilitation Hospital over 24 months (January 2005-December 2005) with a diagnosis of a traumatic brain injury. Patients were identified using pre-admission impairment codes.

**Data Abstraction Procedure:** Two physical therapists conducted the medical chart reviews under the guidance of a physician (lead investigator). Medical chart reviews included the following information outlined in Figure 1. For data quality/ integrity, at random 25% of the chart reviews were re-evaluated by different reviewers. If a discrepancy was found, a discussion took place between all investigators until a consensus was reached.

**Study Groups:**
- **Group 1:** n=44, consisted of consecutive admissions to the brain injury program who presented with a DVT and/or PE either at time of admission to IPR or developed one during IPR.
- **Group 2:** n=44, consisted of case-matched consecutive admissions for age, gender, injury type, diagnosis, and admission FM mobility and cognitive scores who did not present with a DVT and/or PE during IPR.

**Results**
A total of 766 patients with a diagnosis of a TBI were admitted to IPR over the two years period of time. Of those admissions, 5.7% (44/766) presented with either a DVT or PE during IPR. Table 1 summarizes the significant and non-significant variables examined that were associated with the development of a DVT/PE during IPR. Patients with a DVT/PE during IPR were also more likely to have experienced one at the acute care prior to their IPR admission and to have paralysis of the lower extremity. Significant difference observed for patients receiving anticoagulation therapy. Differences in BMI between the two study groups and for undergoing surgery at the acute care was not significant.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (DVT/PE during IPR)</th>
<th>Group 2 (no DVT/PE during IPR)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVT/PE</td>
<td>73.0%</td>
<td>9%</td>
<td>X^2 = 44.303 p&lt;0.001 (significant)</td>
</tr>
<tr>
<td>Paralysis</td>
<td>45.0%</td>
<td>11.4%</td>
<td>X^2 = 12.071 p&lt;0.001 (significant)</td>
</tr>
<tr>
<td>BMI</td>
<td>27.45</td>
<td>25.55</td>
<td>X^2 = 1.387 p=0.24 (not significant)</td>
</tr>
<tr>
<td>Anticoagulation Therapy</td>
<td>72.7%</td>
<td>20%</td>
<td>X^2 = 26.234 p&lt;0.001 (significant)</td>
</tr>
<tr>
<td>Surgery at Acute Care</td>
<td>61.4%</td>
<td>50%</td>
<td>X^2 = 1.135 p=0.53 (not significant)</td>
</tr>
</tbody>
</table>

Rehabilitation outcomes are summarized in Table 2. Overall FM gain during IPR and FM efficiency (FM gain per day / length of stay) were not statistically significant between the two study groups. Additionally, the difference in rehabilitation LOS was not significant between the two groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (FM gain during IPR)</th>
<th>Group 2 (FM gain during IPR)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM Gain (overall gain)</td>
<td>17.4 (±12.3)</td>
<td>18.8 (±15.5)</td>
<td>t = 2.50 p=0.05 (not significant)</td>
</tr>
<tr>
<td>FM Efficiency (Gain per day)</td>
<td>1.19 (±0.18)</td>
<td>0.86 (±0.26)</td>
<td>p = 0.10 p=0.04 (not significant)</td>
</tr>
</tbody>
</table>

**Discussion/Conclusion**
- A 5.7% incidence rate of DVT/PE during IPR was identified with the brain injury population. Risk factors associated with this complication included a DVT/PE at the acute care and the presence of lower limb paralysis.
- The presence of a DVT/PE during IPR did not significantly impact rehabilitation outcomes for LOS, overall FM gain, FM efficiency, or discharge destination.
- These results may reflect early identification and treatment of the DVT/PE by the IPR treatment team, thereby minimizing any potential negative impact of this complication.

**References**

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