The July Effect and its Impact on External Ventricular Drain Placement by Neurosurgical Trainees

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Disclosures

• None
Introduction

• The "July Effect": impact on patient care of new interns and promoted residents with new roles and responsibilities

• External ventricular drain (EVD) placement
  • One of the most frequently performed procedures in neurosurgery
  • Life saving
  • Core competency of any junior resident on call
  • Performed by residents more frequently than attendings
  • Often the first neurosurgical procedure that trainees learn and do independently
  • Sometimes placed in chaotic situations, in the middle of the night, frequently in patients on antiplatelet or anticoagulant medications

• Complications
  • Infection
  • Hemorrhage
  • Misplacement requiring repeat procedure
  • Damage to surrounding structures resulting in neurological injury
Methods

• Used Healthcare Cost and Utilization Project National Inpatient Sample
• All discharges from the NIS between the years 2012-2015 with ICD-9 procedure code for EVD placement who were age 18 years or older, non-elective, and performed at teaching hospitals
• Discharges divided into July and May admissions
• Outcomes analyzed included number of EVD procedure codes, hemorrhagic complication codes, iatrogenic wound/infectious complication codes, discharge disposition, length of stay, cost of stay, death
• Study variables included year, age, gender, race, income quartile by ZIP code, primary expected payer of hospitalization, number of comorbidities, and hospital bed size
• Statistical analysis performed using generalized linear mixed models and logistic regression in SAS
## Results

<table>
<thead>
<tr>
<th>ICD-9 Dx Code</th>
<th>May (n=1348)</th>
<th>July (n=1410)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>430</td>
<td>Subarachnoid Hemorrhage</td>
<td>379</td>
</tr>
<tr>
<td>431</td>
<td>Intracerebral Hemorrhage</td>
<td>244</td>
</tr>
<tr>
<td>99663</td>
<td>Infection and inflammatory reaction due to nervous system device, implant, and graft</td>
<td>40</td>
</tr>
<tr>
<td>4321</td>
<td>Subdural hemorrhage</td>
<td>30</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th></th>
<th>$\beta$ (July)</th>
<th>95% CI</th>
<th>$P$ - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Charge of Hospitalization</td>
<td>+ 3%</td>
<td>+0.9% - +5.3%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Number of EVD Codes</td>
<td>-0.0013 procedures</td>
<td>-0.0702 - +0.0728 procedures</td>
<td>0.9720</td>
</tr>
<tr>
<td>Length of Stay</td>
<td>+0.0310 days</td>
<td>+0.0090 - +0.0534 days</td>
<td>0.0055</td>
</tr>
</tbody>
</table>
# Results

<table>
<thead>
<tr>
<th></th>
<th>May (n = 1348)</th>
<th>July (n = 1410)</th>
<th>Adjusted Odds Ratio</th>
<th>95% CI</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Hemorrhagic Complications</td>
<td>42</td>
<td>3.12</td>
<td>43</td>
<td>3.05</td>
<td>0.94</td>
</tr>
<tr>
<td>Wound and Infectious Complications</td>
<td>36</td>
<td>2.57</td>
<td>19</td>
<td>1.35</td>
<td>0.47</td>
</tr>
<tr>
<td>Mortality</td>
<td>316</td>
<td>23.48</td>
<td>363</td>
<td>25.76</td>
<td>1.14</td>
</tr>
<tr>
<td>Long Term Care Disposition</td>
<td>614</td>
<td>45.62</td>
<td>641</td>
<td>45.49</td>
<td>1.01</td>
</tr>
</tbody>
</table>
Discussion

- Patient safety and outcomes increasingly scrutinized
- The impact of resident involvement in patient care has followed suit
- May and July patients had similar discharge dispositions, mortality, and rates of additional hemorrhage
- Length of stay and cost of hospitalization were higher in the July group
  - 3% increase in total charge
  - Marginal but statistically significant increase in LOS
- Possibly reflects decreased efficiency of new interns and the challenges of learning to work in a new hospital system
- Infectious complications were significantly reduced in the July group compared to May
  - Odds Ratio July vs May = 0.47
- Possible combination of increased supervision in early academic months vs decreased supervision towards the end of the year
- Limitations: lack of follow-up data, issues with large anonymous databases
Summary Points

• EVD placement at urban teaching hospitals in the month of July versus May is not associated with higher complication rates
• In fact, there is a reduced risk of complications
• This comes at the cost of a slight increase in hospital charge and length of stay
• This is consistent with current literature on this topic in other fields as well as within the neurosurgical literature, providing evidence for the quality of neurosurgical trainee education with appropriate supervision at teaching hospitals around the United States