Magnetic Resonance Imaging under General Anesthesia versus Feed-and-Sleep Technique in Infants Ages 0-6 Months Old: A Time-Driven Activity-Based Costing Analysis

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INTRODUCTION:
Magnetic Resonance Imaging (MRI) studies have slowly become the preferred diagnostic modality for infants because of the absence of ionizing radiation. Obtaining quality MRI images requires an infant to remain very still. General anesthesia (GA) has conventionally been used to ensure adequate immobility, but can have potential adverse side effects.1,2 Recent literature has suggested successful alternatives to GA, such as the feed-and-sleep technique, however a cost analysis of this method has yet to be studied.3 Time-driven activity-based costing (TDABC) assigns costs to different resources used while delivering a service to a patient over a specific time.4 Here, we used TDABC to compare the cost of MRI under GA vs the feed-and-sleep technique for infants aged 0-6 months to determine which method was more cost-effective.

METHODS
Using WiseOR® (Palo Alto, CA), we acquired the list of pediatric MRI cases from in Jan. 2015 to Aug. 2016 for patients aged 0-6 months. Using a TDABC model, we calculated the cost of performing an MRI using the feed-and-sleep technique and also under GA. In this model, we used the following variables: the cost per clinical hour for staff involved and the amount of time required of each staff member during the MRI. Labor costs were obtained from our Human Resources department and through internal data. Times for each MRI procedure was obtained using McKesson (San Francisco, CA) radiology software. Microsoft Excel (Microsoft Corporation, Redmond, WA) was used to create the TDABC model for which the cost of MRI using feed-and-sleep versus GA was then compared.

REFERENCES:

RESULTS:
The cost of performing MRI on a patient under GA was $178 as compared to $28 for a patient using the feed-and-sleep technique. The absolute cost difference between these two techniques was $150, owning to a percent difference in cost of 84%. The cost analyses are summarized in Table 1.

DISCUSSION:
We calculated that the feed-and-sleep technique costs 84% less than performing MRI under GA. Previous studies have shown similar success rates in obtaining high-quality images while using the feed-and-sleep technique.2 This cost difference should factor into the decision-making process for physicians ordering infant MRIs. TDABC assesses the value of healthcare services by using patient outcome in relation to cost.4 Our institution utilizes shared-decision making processes with our radiologists and proceduralists to ensure that we match the medical appropriateness of the diagnostic study with constraints imposed by the procedure to develop an optimal anesthetic. In short, it’s worth considering the feed-and-sleep technique as a valuable alternative to GA when performing MRI on infants aged 0-6 months from a financial and patient safety perspective.

Table 1. TDABC Analysis of MRI with Sedation Under GA compared to Feed-and-Sleep

<table>
<thead>
<tr>
<th>MRI with GA</th>
<th>MRI with Feed-and-Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>Hourly Cost</td>
</tr>
<tr>
<td>Anesthesiologist</td>
<td>$203.00</td>
</tr>
<tr>
<td>MRI Technician</td>
<td>$38.00</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Staff</th>
<th>Hourly Cost</th>
<th>Avg. MRI time (min)</th>
<th>Staffing Cost during MRI</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI Technician</td>
<td>$38.00</td>
<td>44.33</td>
<td>$28.14</td>
<td>$28.14</td>
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</tbody>
</table>