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Teleneurology Consultations for Acute Neurologic Emergencies

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Teleneurology for Acute Neurologic Emergencies
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BACKGROUND
The U.S. Department of Health and Human Services estimates that 22% of Tennesseans reside in a Health Professional Shortage Area (HPSA), regions and populations within the U.S. that are experiencing a shortage of healthcare professionals. Especially notable is the shortage of neurologists. A 2013 American Academy of Neurology Study found that the U.S. would need to increase the current number of physicians practicing this specialty by 11% to meet patient needs. That number is expected to increase to 19% within the next decade, which means the need for neurologists is growing dramatically faster than the supply [1]. Telemedicine programs across the country have proven to be a simple, cost-effective way to address the HPSA crisis [2]. They enable physicians to quickly and efficiently evaluate and treat more patients, particularly those that are medically underserved, resulting in improved clinical outcomes, and reduced costs, travel expenditures, and unnecessary patient transfers [3].

Vanderbilt University Medical Center’s (VUMC) Neurology department and Network Services initiated a teleneurology consultation program for acute neurologic emergencies in February 2014. Using three applications downloaded to low-cost, handheld tablet technology, VUMC neurologists can examine quickly patients in community-based hospitals, view images, and record their recommendations in the patients’ medical records.

METHODS
During a fifteen-month period, VUMC conducted teleneurology services to a total of six community-based hospitals. The healthcare providers at these six hospitals initiated a consult by calling VUMC’s Access Center when a patient presented with an acute neurologic emergency. VUMC’s Access Center then connected community-based hospitals’ physicians with VUMC’s on-call neurologists. VUMC neurologists used iPad tablets to complete the consultation in the following ways:

- **FaceTime**: FaceTime was used for video conferencing during physician-to-patient encounters. Communications are protected using authentication and encryption provided by FaceTime. Systems use password-protected, WPA2 Enterprise wireless sessions to authenticate and encrypt local traffic.

- **Jenesis**: Jenesis is a medical image storage and transfer application that is used to share patient images with VUMC neurologists. This application is hosted at Vanderbilt and receives images from client imaging systems. In addition, it provides temporary storage of images. Images used for teleneurology consulting are imported into patients’ VUMC electronic medical record.

- **StarPanel**: StarPanel is VUMC’s electronic medical record. It is an integrated interface to the VUMC clinical information systems. This application enables secure access to a patient’s medical record where teleneurology consultation notes are written, stored, and forwarded to referring hospitals for entry into their medical records.

To assess the security of these systems, VUMC’s information technology risk assessment personnel conducted a complete analysis of the telemedicine system implementation. The analysis addressed operational use of the system and the security controls that are in place. It included interviews with users, developers, system administrators, and platform support personnel. The HIPAA Security Rule was used as a benchmark, and it was determined that VUMC’s teleneurology program is HIPPA compliant.

VUMC collected data that recorded the time of the initial consult request, the time VUMC access center paged its on-call neurologist, the time the neurologist returned the page, and the time the neurologist and physician at the community-based hospital were connected. Additionally, physicians
from the six community-based hospitals were invited to complete Physician Satisfaction Surveys. These surveys asked referring physicians to rate the timeliness of connecting with a specific VUMC neurologist and receiving clinical documentation at the conclusion of a consult, whether they found a specific VUMC neurologist helpful in managing the care of patients, and their overall satisfaction with the consultation.

RESULTS
For this analysis, VUMC conducted 976 consultations between 02/26/14 – 04/30/15. Remote hospitals treated and discharged 87% of patients, leaving only 13% requiring transfer to another facility. Primary case mix data included 39% stroke, 13% seizure, and 6% headache/migraine. The frequency of consultations being called by referring physicians varied by the time of day, with the majority occurring between 9:00 a.m. and 6:00 p.m. (Figure 1). The average time between a consult being called and the Vanderbilt Access Center connecting the VUMC neurologist and community-based referring physician is 14 minutes (Table 1). Monthly physician satisfaction surveys completed by physicians at the six community-based hospitals showed an overwhelming majority (94%) found the overall service to be satisfactory or excellent while only 6% reported an unsatisfactory rating.

DISCUSSION
Our findings indicate that conducting teleneurology consultations via tablet technology is an outstanding solution for quickly and efficiently evaluating neurologic conditions and emergencies. VUMC Teleneurology is implemented utilizing low-cost technology and is fully HIPPA-compliant. This program is centered on elevating the level and access of subspecialty care in rural community settings, especially to medically underserved populations residing in HPSAs. Tertiary care centers in Tennessee often operate at near capacity and VUMC is the sole Level One Trauma Center in the region; therefore, it is beneficial to treat patients effectively at their local hospitals. Moreover, avoiding unnecessary transfers greatly lessens the burden on patients and their families by reducing travel time and expenditures.

Tablet technology can be introduced as an additional modality to an existing teleneurology network or as a standalone teleneurology solution. Tablet devices offer significant advantages relative to other available teleneurology systems. These advantages include widespread accessibility, portability, low implementation and operating costs, and minimal operational expertise.

This study has several limitations. VUMC utilized iPad technology and, therefore, the video camera automatically focuses, which is not a feature for all types of tablet technology and may impact the speed and clarity of evaluations. In addition, Wi-Fi access must be available for both devices, as the FaceTime application only operates through Wi-Fi connection.

Based on this successful implementation, VUMC intends to expand the teleneurology service to other community hospitals throughout the region and the Vanderbilt Health Affiliated Network rapidly.

References:
Figure 1.
Patient Count by Hour Data

Table 1.
Timestamping Data

<table>
<thead>
<tr>
<th>Teleneurology Timestamping</th>
<th>Time (Minutes)</th>
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<tbody>
<tr>
<td>Average time from initial request until neurologist paged</td>
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</tr>
<tr>
<td>Average time from neurologist paged until connected with Access Center</td>
<td>0:06</td>
</tr>
<tr>
<td>Average time from initial request until neurologist connected with originating site</td>
<td>0:14</td>
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