Neurology Telemedicine as Virtual Learning for Regional Medical Campuses

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Abstract

Small rural regional medical school campuses can be challenged to provide the breadth of learning opportunities required in some specialties. Here we report our initial experience with a telemedicine stroke consultation service that addressed one of our concerns. We share an essay from the student perspective as well as those of the regional dean and remote neurology faculty and encourage others to try this technology and report their findings. The authors have no conflict of interest to report and this study was found to be exempt by the Baptist Health Madisonville Internal Review Board.

Regional Dean Reflection:

Small rural regional medical school campuses have advantages and challenges. In this environment, students are often in an apprenticeship model, getting a lot of hands-on frontline experience. Their confidence builds quickly in the setting of frequent feedback in this one on one relationship with experienced clinicians as their faculty.

When the medical school curriculum includes rotations for specialties that are in short supply, this creates a significant issue for campuses in small towns. Neurology is one of the specialties that is truly scarce in small and medium sized towns across America. Our campus is based in a town of 20 000, and when one of our neurologists died suddenly and the other moved her practice to a larger town an hour away, this presented a significant problem for us.

Although the number of available spots on the neurology rotation at the urban main campus was limited, they could accommodate our small number of students. However, sending our students 160 miles away for a 4-week rotation created several obstacles. First, there was the cost of lodging for which we felt responsible. Second, there was the issue of "urban disruption" that can sometimes make a student rethink their commitment to small town practice.[1] Lastly, the students missed longitudinal experiences for these 4 weeks. These longitudinal experiences include providing care for their longitudinal patients at our free clinic[2] and our "Dean's Hour" meetings every other week where we address clinical reasoning skills through case presentations, as well as complete careful chart review of our free clinic care.

While our host hospital organization aggressively recruited another neurologist, we developed a curriculum where students commuted to our former faculty's practice an hour away. When she was not at that practice, we supplemented with a strong sleep medicine experience locally, as well as inpatient geriatric psychiatry on our campus that presented opportunities to learn about chronic neurological diseases.

Student feedback and performance on shelf exams using this curriculum were comparable to those students based at the urban campus, and we were able to meet all stated objectives of the rotation. However, there was a significant gap in acute care that centered largely around strokes. If a patient presented to our Emergency Department (ED) with stroke syndrome, or a stroke occurred during hospitalization, referral to a hospital an hour away was the only option. Given the tight time window for aggressive intervention in acute strokes, this could be a problem in terms of clinical care, and obviously created a gap in our students' education. It was also a significant loss in revenue for our local hospital.

When our urban campus proposed telemedicine for stroke consultation, there were understandably many questions as to how patients and clinicians at our hospital would respond. When I proposed this approach as a solution to address the educational needs of our students, there were also understandably many reservations as to whether this could provide a quality learning experience. My own experience with telemedicine almost 30 years ago gave me the confidence that this would work well.[3] During my time in Texas, in my role as a NASA contractor, I was able to watch as my family medicine residents were directed in performing flexible nasopharyngoscopy by a remote otolaryngologist.[4] I also experienced effective telemedicine personally while providing remote support to an offshore oil platform as a test of lower bandwidth technology.[5] In one case, a worker had a high fever and rash that was thought by the on-site medic to be petechial. We were able to demonstrate that the rash did, in fact, blanch and the worker had only acute pharyngitis and

Anne-Taylor Beck, B.S., M-3 Medical Student, University of Louisville School of Medicine Trover Campus, Madisonville, KY

William J. Crump, M.D., Associate Dean, University of Louisville School of Medicine Trover Campus at Baptist Health, Madisonville, KY

Jignesh J Shah, M.D., Director, Tele-Neurology Services, University of Louisville School of Medicine, Louisville, KY

an unrelated contact dermatitis. This avoided a helicopter medivac run that would not only have been quite expensive, but can be very dangerous in some weather conditions. As such, I was already convinced of telemedicine's value. Furthermore, during my time in Texas we studied the process of faculty teaching remotely, finding that a strong "screen presence" was a key to success.[6]

The energy and enthusiasm of a few stroke neurologists at our urban campus and careful training and process preparation among staff and physicians at our hospital resulted in an effective Tele-neurology service. Allowing 3 months of baseline function before we added a learner was important. We are currently collecting detailed case information as well as evaluations from students and will share this data after several rotations have been completed. The first student on this new rotation expresses her impressions as an essay. Her narrative suggests that not only were educational goals met, but she acquired confidence in an area that is sometimes challenging even for experienced clinicians. Her perspective is shared so others are encouraged to study the effectiveness of remote faculty interaction and report their experience with telemedicine learning as well.

Student Reflection:

The third year of medical school training is defined by shifting inconsistency of schedule, confidence, and comfort level. One month you are scrubbing into the operating room, practicing suture technique, and completing pre- and post-operative checks. By the time you get comfortable doing these tasks, you are off to the next month, where you are treating acute kidney injury in the intensive care unit with nephrology and then presenting your patient to the hospitalists on wards. Every day is different. Every rotation comes with new challenges to overcome, management protocols to learn, faces and names to remember, and expectations to uphold, all while trying to learn as much as possible about the practice of medicine. At first this new world can be overwhelming, but it is this environment that yields resilience and flexibility and teaches what cannot be extracted from a textbook.

As a third-year student, I was pre-rounding on stroke patients at our regional rural hospital. I had planned to see a few patients before rounding with the neurology team at 8 am, and I was feeling nervous. This was partly because it was my first day on Neurology, but also because I would be meeting a new attending, a new team, and a new set of expectations. This part was a bit different from my 2 previous rotations (Internal Medicine and Surgery), because I would not be shaking hands with my new attending. Instead, he would be displayed on a computer screen within a device fashioned to look like a robot, with two cameras for eyes. I was the first

medical student in my class to rotate with Tele-neurology as part of my curriculum.

Promptly at 8 am, the robot was rolled into the tiny room designated for the Neurology team. My faculty's face appeared clearly on the screen. He said hello to familiar nurses and physical therapy staff. I could tell this was routine for the group. They were comfortable with one another and had gotten to know each other well over the last few months. As they chatted, I found an out of the way spot to finish scribbling a few neurologic exam findings on Ms. F, when suddenly I heard, "Hello medical student. My name is Dr. Shah. What is your name and how long will you be with us?" I quickly introduced myself and said I would be rounding a few days a week for 4 weeks. He discussed expectations for me as a part of the team and the learning objectives he hoped to cover while I was with them. I instantly felt a sense of relief from his apparent interest in my learning and his passion for teaching. His enthusiasm about patient care was contagious and helped to dispel my worry about having a teacher who was 160 miles away.

We quickly went through each patient and discussed improvement, decline, medications, and overall status. Now it was time to round. To be honest, I was a little skeptical of how patients and families would respond to seeing their neurologist on a screen instead of in-person. By the end of the morning, all my doubts had dissipated as I watched the interactions between Dr. Shah and his patients. It was almost as if he was sitting in a chair next to the patient's bed. He went through a full history and physical exam. When we reached parts of the physical exam that he was unable to complete, he instructed me. My body temperature rose a few degrees and my palms collected moisture when he explained how I should elicit reflexes from Mr. B. I had done these maneuvers many times on both standardized and actual patients but doing so in front of an entire team made me anxious. I was so afraid of failure. By day 4 on the rotation, Dr. Shah was asking me to do more and more of the physical exam as he observed and constructively critiqued my examination.

It was about 2 weeks into the rotation when I walked into our tiny meeting room for rounds, and Dr. Shah and the team were discussing our only patient for the day. He asked me to pull up the patient's head imaging (MRI and CT) onto the desktop. He proceeded to explain which views and settings were best when looking for various pathology, and how to look at multiple images at one time so that I could have a better perspective of what I was seeing. When I turned around to ask him a question, I noticed that everyone in the room was watching our encounter. The eagerness for learning among the group was tangible and no doubt would result in better care for all of our patients. It occurred to me that had this interaction occurred in person, it would not

have included all the staff, another unexpected benefit of telemedicine.

I began to feel more confident in my abilities after days of practice, but it was sometime during this rotation when I started to realize that failure is an inevitable part of "practicing" medicine. There were days when my assessment of the patient was totally wrong and it took me multiple attempts to complete a physical exam step properly, but I learned something new and moved on. A new mantra materialized in my mind: "You miss every shot you don't take." This was one of those pivotal moments that defines the third year of medical training.

Moments like these occur repeatedly in medical school and throughout one's career. A new challenge or obstacle appears, and we have the choice to face it knowing that we could fail or ignore it and lose out on the potential learning experience that it offers. Telemedicine comes with numerous obstacles, but it also comes with tremendous potential to impact millions of rural families and medical students. When we decide to face the hard challenges head on, our perspective shifts and the fear of failure fades. The moments that define our training and career have little to do with us, but instead occur when we walk (or roll) into our patient's room and she waves at us for the first time with the hand that she could not lift from the bed just days prior. These moments will remind us why we prayed for this mountain to climb. And with every new challenge that we tackle, we grow stronger and more resilient. With every fear that we face comes an encounter with a grandmother or grandfather, mother or dad, brother or sister, daughter or son who is in desperate need of a caring physician, one who once failed so that today she would succeed on their behalf.

Remote Neurologist Perspective:

With the advancing technology all around us, we knew health care would eventually catch up. Telemedicine technology, which incorporates audio and video communication, brings the patient in a rural site to the physician sitting at their office in an urban referral hospital as if they are present in-person. Telemedicine is a win-win situation for both rural and referral hospitals, for patients and physicians, and for both caregivers and administrators. We started doing telemedicine with surrounding hospitals in 2008, but it was in 2015 that the program was revamped to improve the structure. We now have 5 sites where Tele-neurology services are provided. In 2019, our Tele-neurology service saw almost 900 patients, nearly reaching the number of traditional consults seen at University hospitals.

We collaborated with Baptist Health Madisonville in August 2019 to start providing stroke care for patients coming to the ED. The telemedicine structure we provide is comprehensive, with the telemedicine team seeing stroke patients in the ED and also responding to strokes occurring in the hospital, both within a response time of 30 minutes. As appropriate, stroke patients are admitted to a hospitalist service, and we make daily "robot" rounds on these patients. Only patients who may need potential mechanical thrombectomy or hemicraniectomy are transferred out. Patients receiving tissue plasminogen activator (TPA) who don't need these infrequent advanced services are able to stay at the local hospital, cared for by physicians they know and visited by local family members. Our Madisonville site turned out to be unique in another way, as there was involvement of medical students. As I visited Madisonville to brief the medical staff just prior to beginning our services, a meeting with the regional dean was all it took to see that we had a common goal. When we round at our main hospital, we have medical students join us routinely, but at telemedicine sites, this was a first. We did realize that in spite of some limitations, teaching can be very effective via telemedicine. Our first medical student has summarized her experience very well here, and we appreciate the positive feedback. This shows how effective telemedicine services can be not only for patient care, but also the entire team at a rural site. We look forward to continuing this win-win arrangement and will look for ways to improve our process even further.

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