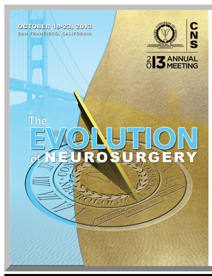


Telemedicine's Significance for Supporting Neurosurgery in Rural Communities

Pennie Susan Seibert PhD; Tiffany Whitmore BS; Tatiana Reddy; Jennifer Valerio; Christian G. Zimmerman MD FACS MBA

Saint Alphonsus Health System & Boise State University

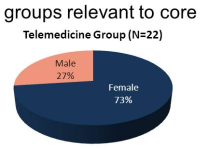
Saint Alphonsus Health System

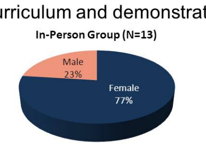
BACKGROUND

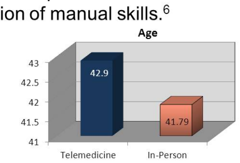
Limitations in providing adequate care for patients in rural areas often result from geographical barriers such as expense, travel time for patient care, educational purposes and the availability of medical experts.[1] While 20-25% of the U.S. population resides in rural areas, most towns with less than 30,000 residents do not have a neurosurgeon, which coincides with higher mortality rates for neurological cases such as stroke, and TBI, along with spinal injury outcomes.[2] Rural surgeons perform a greater variety of surgeries than urban surgeons, who are more likely to specialize.[3] A lack of neurosurgeons in rural areas combined with a growing aging population results in an increased patient load. As a result of these differences, numerous barriers exist for rural surgeons to properly implement techniques and provide best practice standards. Telemedicine offers the potential to close the geographic gap between rural and urban facilities, thereby providing patient care and medical personnel training from a distance via technological systems utilizing interactive video, visual, audio and/or data communication.[1,4] An added benefit of telemedicine is its ability to open a network of communication among medical professionals to share ideas and second opinions for the improvement of patient care. The paucity of neurosurgeons in the presence of increasing demands for their specialty in rural areas has resulted in neurosurgeons traveling to rural hospitals associated with their primary hospital affiliation. This has intensified the need for training for both neurosurgeons and perioperative nurses at rural hospitals. Training available for perioperative nurses in rural areas is often inefficient and presents numerous challenges.[1,4,5,6] The lack of formalized and standardized education paired with existing neurosurgeon/nursing shortages, creates a wide range of problems for hospitals, especially in rural communities.[6]

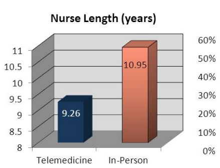
OUR APPROACH

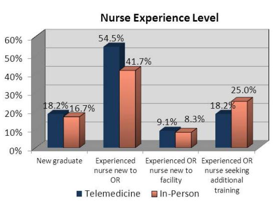
As a way to show the potential for improved support and access for neurosurgery, we highlight a successful telemedicine project and will use this for applications to neurosurgery. To address the deficit in training for perioperative nursing, our research team designed and implemented a distance training program incorporating telemedicine practices in conjunction with educational material from the Association of Perioperative Registered Nurses (AORN)'s perioperative 101 course.[6] We compared performance of 22 nurses in a telemedicine preceptor program with that of 13 nurses in an in-person preceptor program across seven hospitals. We compared data from both groups relevant to core curriculum and demonstration of manual skills.[6]

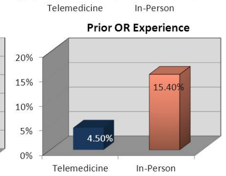




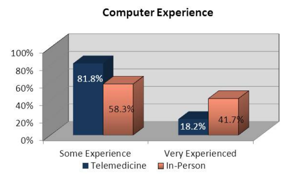


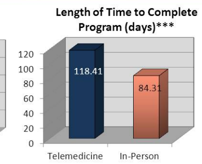


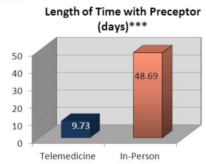




PERIOPERATIVE PROGRAM







The success of the program was assessed by proficiency in skills and knowledge of perioperative nursing. Skills were evaluated by preceptors over the course of the program while knowledge was assessed by exam/final scores.

Sample of Skills Assessment

	Telemedicine	In-Person
Physical & Psychological state	81.8%	84.6%
Nursing diagnosis	86.4%	76.9%
Patient goals	86.4%	76.9%
Emotional support	100%	76.9%
Assist anesthesia	86.4%	69.2%
Monitor patient	77.3%	69.2%
Surgical conscience	66.7%	61.5%
Drug dose	95.5%	84.6%
Surgeon's post-op note	63.6%	61.5%
Accept constructive criticism	100%	84.6%
Seek learning opportunities	100%	84.6%
Exercise safe judgment	95.2%	84.6%

AORN Scores

	Telemedicine	In-Person
Evaluation Score	100%	100 %
AORN total final exam	88.1%	90.9%
AORN average course score	92.7%	94.4%

Upon completion of the study, each participant (both preceptors and preceptees) completed an evaluation of the study. Participants indicated that the program allowed for prompt education with direct interactions between students and staff in remote areas.[6]

Program Evaluations

		Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Consistent w/In-person	Telemedicine	4.8%	4.8%	0%	47.6%	42.9%
	In-Person	NA	NA	NA	NA	NA
	Preceptor	0%	16.7%	0%	50%	33%
Comfortable w/robot	Telemedicine	4.5%	9.1%	0%	18.2%	68.2%
	In-Person	NA	NA	NA	NA	NA
	Preceptor	0%	0%	0%	0%	100%
Able to see/hear	Telemedicine	4.5%	9.1%	9.1%	36.4%	40.9%
	In-Person	NA	NA	NA	NA	NA
	Preceptor	0%	16.7%	0%	16.7%	66.7%
Program expanded knowledge	Telemedicine	4.5%	4.5%	0%	4.5%	86.4%
	In-Person	7.7%	0%	0%	7.7%	84.6%
	Preceptor	0%	0%	0%	40%	60%
Program met expectations	Telemedicine	9.1%	4.5%	4.5%	9.1%	72.7%
	In-Person	0%	0%	23.1%	15.4%	61.5%
	Preceptor	0%	0%	0%	50%	50%
Satisfied	Telemedicine	4.5%	4.5%	0%	13.6%	77.3%
	In-Person	0%	0%	15.4%	23.1%	61.5%
	Preceptor	0%	0%	10%	40%	50%
Recommend program	Telemedicine	9.1%	0%	4.5%	0%	86.4%
	In-Person	0%	0%	7.7%	15.4%	76.9%
	Preceptor	0%	0%	10%	50%	40%

EVALUATING THE PERIOPERATIVE PROGRAM

Program Evaluations

		Yes	No
Program changed practice	Telemedicine	90.5%	9.5%
	In-Person	91.7%	8.3%
	Preceptor	NA	NA
Program successful	Telemedicine	90.9%	9.1%
	In-Person	91.7%	8.3%
	Preceptor	90%	10%
Concerns	Telemedicine	50%	50%
	In-Person	30.8%	69.2%
	Preceptor	30%	70%

Lessons Learned

- ✓ Education is a non-threatening way to form relationships between providers and promote consultations
- ✓ Initial telemedicine encounters need to be positive for continued utilization of the program
- ✓ Technology must be used on a consistent basis for users to be comfortable with its use in emergent situations
- ✓ The technology cannot interfere with surgical workflow
- ✓ Construction of assessment forms to identify site-specific needs is vital
- ✓ Development of a collaborative network is imperative

EXPANDING THE SCOPE OF TELEMEDICINE

When evaluating core curriculum and demonstration of skills, our results demonstrated no statistical difference in the quality of education (based upon official scores) regardless of instruction modality and irrespective of age, sex, education, and computer competence.[6] We believe this sets the stage for further telemedicine applications in neurosurgery while meeting a critical need for specialized training in rural hospitals. As patients travel farther for neurosurgical care than any other type of treatment, and costs and length of stay are important factors in treatment, the need for neurosurgical care in remote areas is in high demand.[7] Developing and implementing new technology to combat these challenges will potentially improve patient care and outcomes.

Applications for Telemedicine in Neurosurgery[8]

- ✓ Neurosurgical exams
- ✓ Evaluation of injury
- ✓ Determine transport needs
- ✓ Specialists' advice to rural physicians.
- ✓ National/international grand rounds
- ✓ Follow-up evaluations
- ✓ More precise less invasive procedures
- ✓ Filming motor/neurological symptoms
- ✓ Radiosurgery
- ✓ Continuing medical education/training

Benefits of Integrating Telemedicine into Neurosurgery[8]

Surgical	Education	Consultations	Patient Perception
Use of robotics to improve surgical skills[8,9]	Use of simulators to refine surgical techniques[8]	Additional rounds on patients who are a concern	Reassure the family with specialists' input[10]
Reduce possible surgical error during complex surgeries[8,9]	Sharing knowledge and expertise, especially in emergent cases[10]	Saves travel time (one in-person consult =several robotic)	Access to specialists without traveling to reduce costs[8]
Standards created for surgical procedures[8,9]	Able to attend grand rounds even when traveling	Missing family members can be remedied in near the same time as a telephone call	More personal than the telephone if a family member misses the physician
Able to assess the patient post-operatively without returning to the OR	Expansion of services to underdeveloped areas and dangerous zones[8,9]	Reduces response time in an emergency	Introduced to the specialist in "face-to-face" interaction rather than on the telephone[8]

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