

Potential of Telemedicine to Streamline Orthopedic Transfers to a Level 1 Pediatric Trauma Center



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BACKGROUND

- Proportion of non-emergent transports via ambulance has increased from 1997 to 2007 (1)
- Pediatric orthopedic trauma patients often require transfer to specialized centers for definitive care (2)
 - Such transfers require various amounts of resources, such as ambulance transport and emergency department (ED) personnel evaluation
- In addition, waiting times in the referring facility, as well as at the receiving specialized center, can be a burden for families (3, 4)
- Research has shown that telemedicine might help streamline ambulance transports to an ED and reduce time to treatment (5, 6)

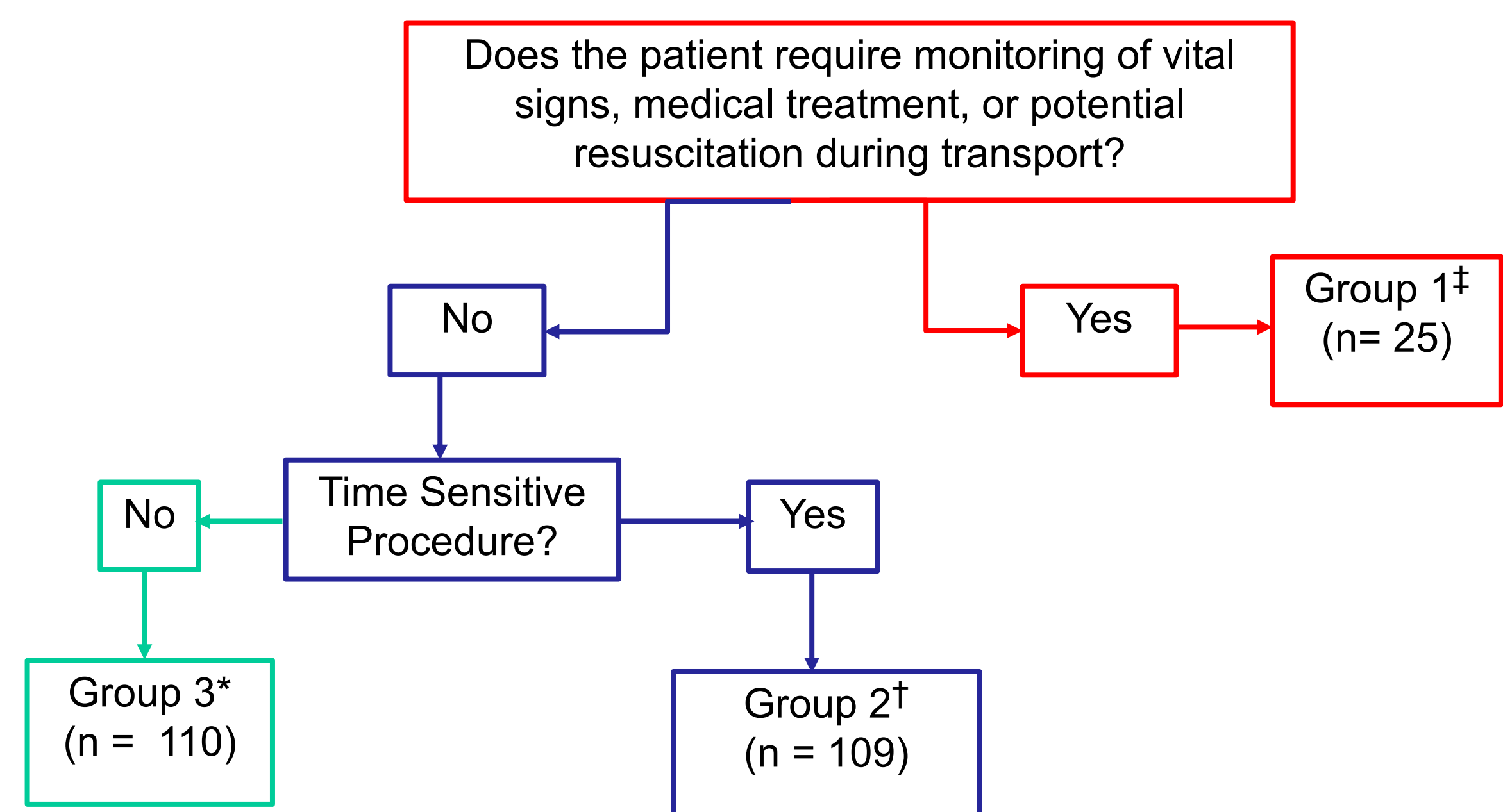
OBJECTIVES

- To retrospectively review orthopedic trauma transport cases to Nemours – AIDHC and determine if the use of telemedicine could have facilitated the transfer of these patients
- To determine time and money spent executing these transfers, in efforts to highlight the need for a more streamlined process

MATERIALS AND METHODS

- Retrospective chart review approved by Nemours IRB
- Subjects: orthopedic trauma patients who were transferred to the Nemours-AIDHC ED from a referring hospital
- Transfers occurred between 01/2017 and 12/2017
- Patient demographics, injury details, medical procedures completed at Nemours-AIDHC, mode of transport to Nemours-AIDHC, length of stay in the Nemours-AIDHC's and referring facilities' EDs, and ambulance transport time and charge were collected
- Patients were categorized into proposed referral method categories by an orthopedic surgeon based on the treatment they received at the specialized center (Fig. 1)

Figure 1. Decision Making Process for Patient Categorization



*Advise patient to follow up with pediatric orthopedist within the next few days

† Transport via personal vehicle or low-acuity transport

‡ Transport emergently via ambulance

RESULTS

Table 1. Comparison of Patient Demographics by Group

	Group 1 n = 25	Group 2 n = 109	Group 3 n = 110
# Boys	11	79	55
# Girls	14	30	55
Average age at time of ED visit in years	10.07 (SD = 5.64)	9.17 (SD = 4.32)	7.26 (SD = 4.02)

RESULTS

- Almost 90% (219/244) of patients transferred to Nemours-AIDHC's ED from another hospital in 2017 did not need to be transferred via ambulance after review by orthopedic surgeon
 - Just over half (110/219) of these patients could have followed up as an outpatient within a few days
- Nearly \$3,000 in ambulance charges could have potentially been avoided per patient if telemedicine were utilized

Figure 2. Proposed Referral Method

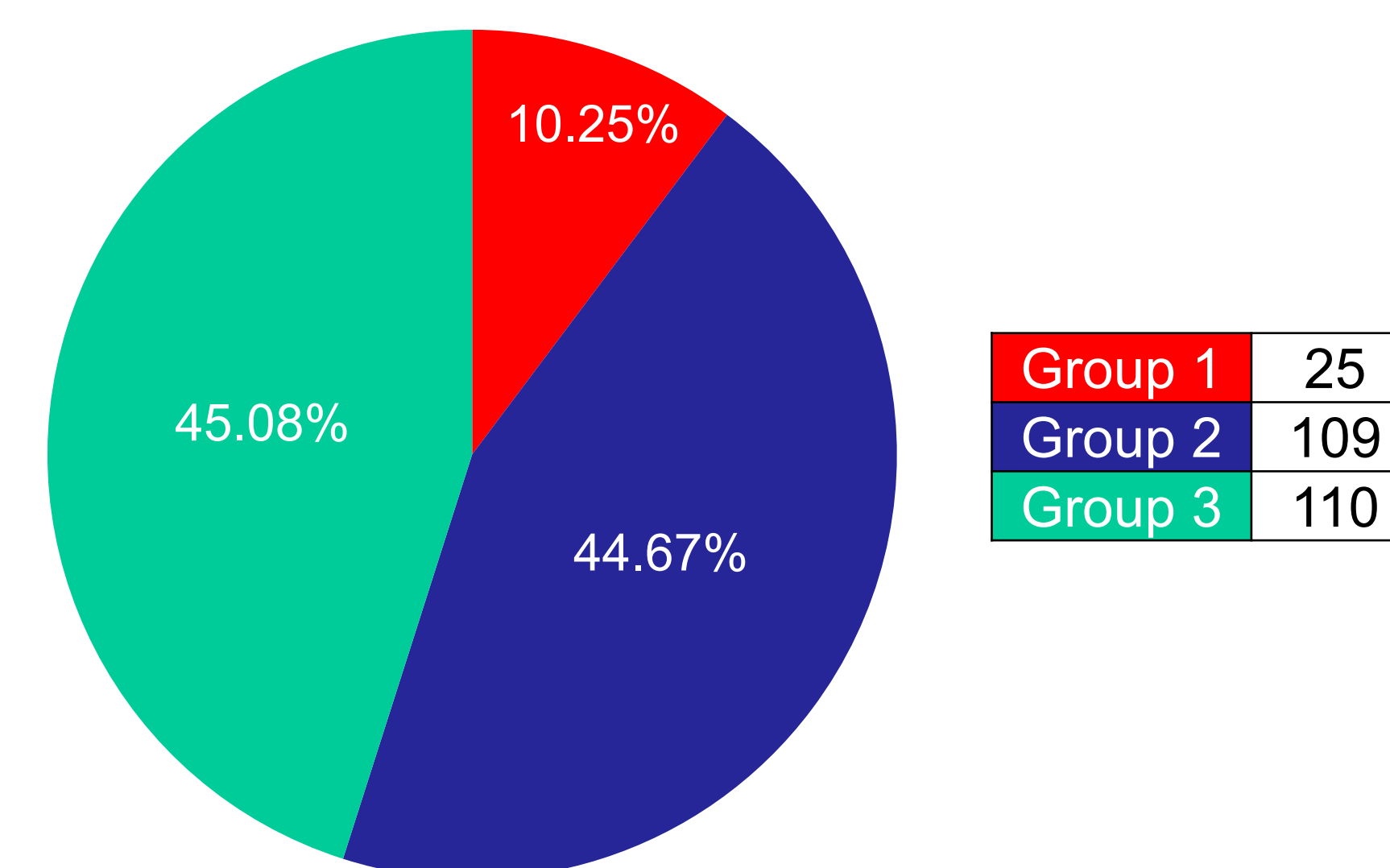
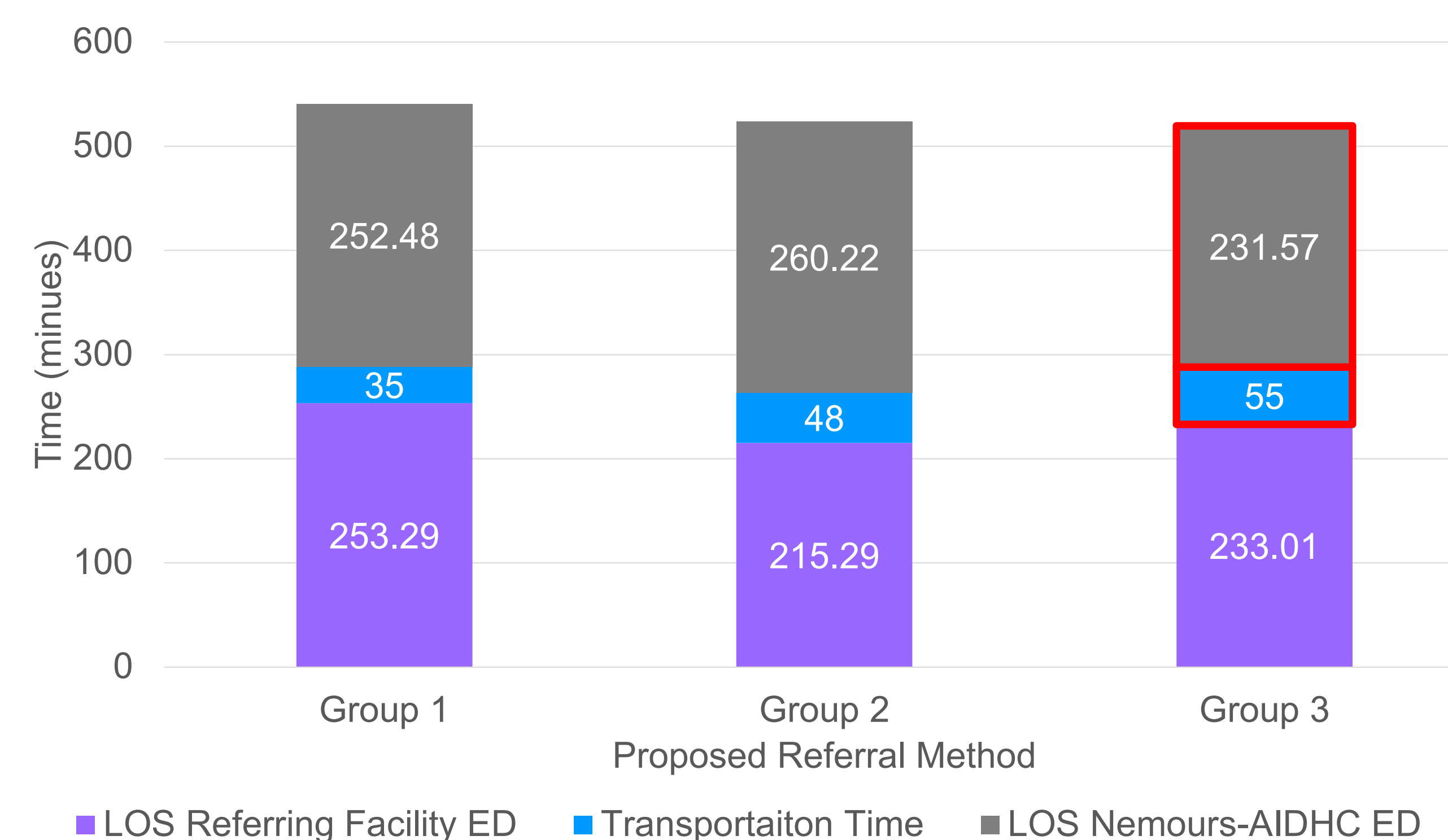


Table 2. Most Frequent Locations of Injuries By Group

Group	Top Five Injury Locations*
1	1. Head 2. Lumbar spine, pelvis, abdomen 3. Lower leg 4. Thoracic area 5. Shoulder girdle, upper arm
2	1. Forearm 1. Shoulder girdle, upper arm 3. Hands, fingers 4. Lower leg 5. Upper leg, hip
3	1. Forearm 2. Shoulder girdle, upper arm 3. Lower leg 4. Hands, fingers 5. Upper leg, hip

* Injury locations determined by second digit in ICD 10 code. Frequency represents the number of times an ICD 10 code for that injury location appeared in the diagnosis.

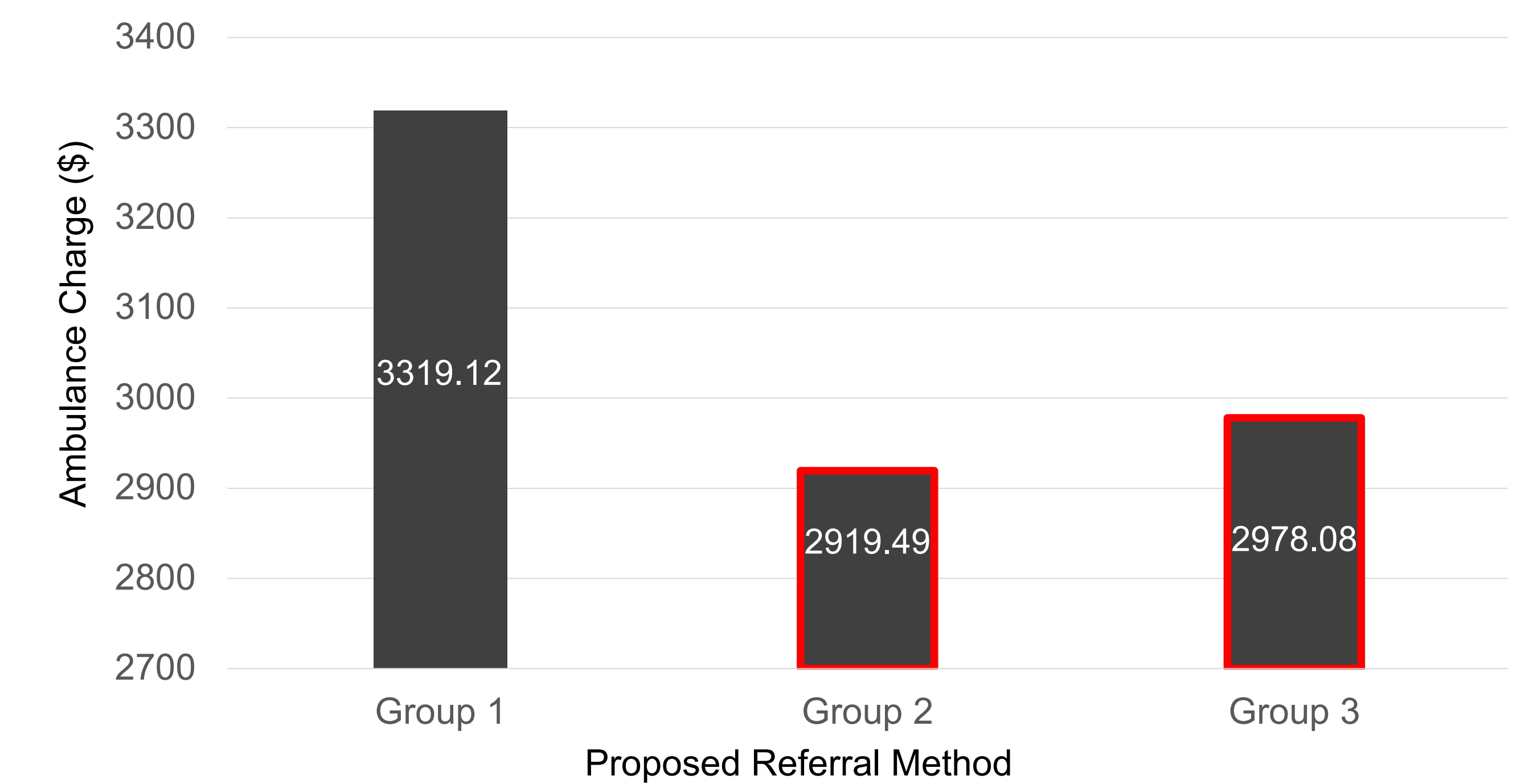
Figure 3. Breakdown of Patient ED Length of Stay (LOS) and Transport Times



Portions with red borders (Group 3 transport time and LOS in Nemours-AIDHC's ED) indicate potential time savings if telemedicine were used. Group 3 patients did not require ambulance transport or treatment in Nemours - AIDHC ED.

RESULTS

Figure 4. Breakdown of Average Ambulance Charge Per Patient



Portions with red borders indicate potentially avoidable charges if telemedicine were used. Patients in Groups 2 and 3 did not require ambulance transport.

CONCLUSIONS

- Given the benefits of telemedicine, this existing technology might be utilized so that specialists can determine necessity of immediate ED transfer as well as appropriate mode of transportation
- Benefits of using telemedicine to facilitate transfers include:
 - Time savings and increased satisfaction for patients
 - Decreased cost related to ambulance transfer
 - Appropriate resource utilization and allocation to more severely injured patients
- Prospective studies utilizing telemedicine to facilitate the transfer of these patients are warranted

LIMITATIONS

- Retrospective study design
- Requiring orthopedists to do telemedicine visits for potential transfers could be time-consuming and logistically challenging
- Ambulance cost data were only calculated for patients transferred by the AIDHC Transport Team and did not include cost of medical procedures performed on the ambulance
- Categorization of patients into transport groups was performed by a single orthopedic surgeon

REFERENCES

- Weaver, M. D., Moore, C. G., Patterson, P. D., & Yealy, D. M. (2012). Medical necessity in emergency medical services transports. *American Journal of Medical Quality: The Official Journal of the American College of Medical Quality*, 27(3), 250–255.
- Sethi, D., & Subramanian, S. (2014). When place and time matter: How to conduct safe inter-hospital transfer of patients. *Saudi Journal of Anaesthesia*, 8(1), 104–113.
- Derlet, R. W., & Richards, J. R. (2000). Overcrowding in the nation's emergency departments: Complex causes and disturbing effects. *Annals of Emergency Medicine*, 35(1), 63–68.
- Bynum, A. B., Irwin, C. A., Cranford, C. O., & Denny, G. S. (2003). The impact of telemedicine on patients' cost savings: some preliminary findings. *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association*, 9(4), 361–367.
- Langabeer, J. R., Gonzalez, M., Alqusairi, D., Champagne-Langabeer, T., Jackson, A., Mikhail, J., & Persse, D. (2016). Telehealth-Enabled Emergency Medical Services Program Reduces Ambulance Transport to Urban Emergency Departments. *Western Journal of Emergency Medicine*, 17(6), 713–720.
- Pedragosa, A., Alvarez-Sabin, J., Molina, C. A., Sanclemente, C., Martin, M. C., Alonso, F., & Ribo, M. (2009). Impact of a telemedicine system on acute stroke care in a community hospital. *Journal of Telemedicine and Telecare*, 15(5), 260–263.