

Relationship Between Non-Technical Skills for Surgeons (NOTSS) and Risk-Adjusted Complications

Egide Abahuje, MD, MHPEd¹; Lixuan Cong, MPP; Cassandra Iroz, MS, Julie Johnson, MSPH, PhD¹; Amy Halverson, MD, MHPE¹

¹Northwestern Quality Improvement, Research and Education in Surgery (NQUIRES)

BACKGROUND

- Effective nontechnical skills (decision-making, situation awareness, leadership, communication, and teamwork) are necessary for surgeons to provide optimal patient care.
- There is limited data regarding how nontechnical skills are associated with patient outcomes.

OBJECTIVES

- To assess the relationship between surgeons' non-technical skills and postoperative outcomes.

METHODS

- Prospective observational study.
- Trained NOTSS raters with nurses and anesthesiologists used the NOTSS tool to assess the intraoperative non-technical skills of general surgeons from February to September 2022.
- The overall NOTSS score for each surgeon was calculated by averaging the NOTSS scores assessed by rater, nurses, and anesthesiologists.
- Patient outcome data were collected from the Illinois Surgical Quality Improvement Collaborative (ISQIC) database.
- The American College of Surgeons National Quality Improvement Program (ACS NSQIP) approach was used to calculate the risk-adjusted complications.
- Robust linear regression models were used to assess the association between surgeons' nontechnical skills and risk-adjusted post-operative complications.

Results

- Of the 45 surgeons who were observed in the study, 23 (51.1%) had patient outcome data captured by the ISQIP database.
- 2 of the 23 participants (8.7%) were female.
- For every unit increase in the NOTSS score, there was a significant 3.9 decrease in the adjusted risk of any post-operative complication, a significant 0.8 decrease in risk of mortality, and a significant 0.6 decrease in the adjusted risk of returning to the operating room.

Risk-Adjusted Complications

	Adjusted complications (O/E)
Any complication	
Median (IQR)	1.2 (0.79 – 2.25)
Mortality	
Median (IQR)	0.08 (0 – 0.66)
Readmission	
Median (IQR)	0.46 (0.08 – 0.75)
Death or serious morbidity	
Median (IQR)	1.12 (0.54 – 1.71)
Return to the operating room	
Median (IQR)	0.41 (0.23 – 0.75)
Surgical site infection	
Median (IQR)	0.16 (0 – 0.59)
Skills composite	
Median (IQR)	1.78 (1.2 – 3)
Non-skills composite	
Median (IQR)	1.18 (0.75 – 3)

NOTSS Score

Situation Awareness	
Median (IQR)	3.94 (3.62 – 4)
Decision Making	
Median (IQR)	3.93 (3.62 – 4)
Communication and Teamwork	
Median (IQR)	4 (3.66 – 4)
Leadership	
Median (IQR)	3.91 (3.62 – 4)
Average NOTSS Score	
Median (IQR)	3.87 (3.64 – 4)

Robust regression adjusted for surgeon's gender and experience

	Coef (95%CI)	p-value
Any complication	-3.9 (-6.6 to -1.1)	0.008
Mortality	-0.8 (-1.5 to -0.2)	0.01
Readmission	0.3 (-0.4 to 1.1)	0.40
Death or serious morbidity	-1.1 (-2.4 to 0.2)	0.09
Return to the operating room	-0.7 (-1.4 to -0.1)	0.03
Surgical site infection	0.1 (-0.5 to 0.4)	0.85
Skills-related composite	-4.1 (-6.6 to -1.6)	0.003
Skills unrelated composite	-4.5 (-6.5 to -2.5)	<0.001

CONCLUSION

- Higher surgeons' non-technical skills were associated with the decreased risk-adjusted complication of any postoperative complication, mortality, and returning to the operating room.
- Strategies to improve post-operative patient outcomes should include the improvement of surgeons' non-technical skills.