Impact of Overlapping Neuro-Surgeries on Patient Care Quality

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ABSTRACT

Overlapping surgeries, (OS) have been in use in the U.S. where a single surgeon coordinates operative resources with surgical teams for optimal patient care. Preparation for the procedure is completed in one room as a surgical procedure and care for another patient is completed in another. One of the primary drivers of this practice is trauma. In emergent situations, critical patients may require expedited life saving measures, requiring immediate attention and treatment in a second room. Thus, this practice offers quicker access to much needed medical care for the patients who get treated in a timelier manner. Benefits of this practice are decreased time to treatment and usually reduced overall length of stay. Secondly, overlapping surgeries allow optimal allocation of and efficient utilization of the most coveted healthcare resource, “Surgeon Time or Operative Time.” Thirdly, two room practices improve participation opportunities for the surgical residents and fellows. One negative however; is that patients dislike the fact that the attending surgeon is not present in the room for the entire surgical procedure, feeling that the absence of the surgeon could result in less desirable patient care and outcomes. Does the practice of OS really affect the quality of patient care?

This examination of the issue of overlapping surgeries practice and patient care quality involved the collection of data from neuro-surgery involving blunt and penetrating head injuries and spinal cases at a “level one” trauma hospital in the Southern U.S over a 41-month period. The hypothesis to be tested was that use of a second room will improve patient care by reducing “time to treatment,” decreasing “length of hospital stays,” and decreasing “overall hospital morbidity.” The results showed a significant decrease in “length of stay” (LOS) which could be a result of decreased procedure wait time or earlier intervention. Results also showed significantly fewer medical complications following surgeries that utilized overlapping procedure without a corresponding increase in surgical morbidity. Although overlapping surgery is a contentious topic, which has received unflattering press, we found utilization of overlapping surgeries at this hospital to be safe with reduction in LOS and complications, while reducing required post-surgical rehab in some cases. In conclusion, overlapping surgeries demonstrated positive impact on patient care quality and healthcare resource utilization in this hospital.

Keywords: Healthcare, overlapping, quality.

I. INTRODUCTION

Overlapping and concurrent surgeries (OS and CS) have been in use in many US hospitals. A single surgeon coordinates operative resources with surgical teams for optimal patient care of two patients in two rooms at the same time. Reference [1] defined OS as “The practice of the primary surgeon initiating and participating in another operation when he or she has completed the critical portions of the first procedure and is no longer an essential participant in the final phase of the first operation.” Critical portion is described as the “stages when the essential technical expertise and surgical judgement are necessary to achieve optimal patient outcome.” However, most of the time the surgeon only documents “I was present for the critical portion of the case, but not what the critical part of that case was” [2]. Reference [2] noted “OS” has been a common surgical practice for over 75 years, particularly in the surgical specialties in which the noncritical parts of opening and closing can routinely last for hours. OS primarily occurs in academic and Level I trauma centers, because they often have highly skilled surgical fellows and residents to assist with long opening and closures. Overlapping surgeries thus free up the attending surgeon to perform the critical part of another case that is occurring simultaneously, maintaining safety and efficiency. It is important to note that in OS, the critical portions of the two procedures never overlap.

Overlapping surgery practice has been criticized in recent years. Despite public chagrin and criticism, overlapping surgeries are used for several reasons. Undeniably, in an acute life-or-limb threatening presentation, it may be essential for a
surgeon to care for two individual patients simultaneously. Thus, a primary driver of OS is trauma. The secondary driver is efficient use of resources which include surgical skills and operating rooms [3].

Overlapping surgery offers many potential advantages for quality patient care. Overlapping procedures can increase access to needed emergency care for some patients. Critical patients can be treated in a timelier manner, decreasing time to treatment (reduced wait time) potentially minimizing worsening of the patient health status. This may result in reduction in the overall length of the hospital of stay, potentially contributing to higher patient satisfaction (reimbursements are tied to patient satisfaction) and lower healthcare costs. It offers improved opportunities for surgical residents and fellows to participate in the operative procedures thus enhance their training.

However, the practice of Overlapping Surgery has encountered some resistance due to negative “Patient Perception.” Some patients and their families fear it may endanger the patient resulting in morbidity or less desired outcomes, thus demanding the surgeon’s full attention throughout the procedure. Reference [2] reported that in the past surgeons may have contributed to the issue by not informing patients about OS, why it was practiced, how it was implemented and which parts of the procedure they would be present for. Perhaps if families and patients have a pre-operative understanding of what to expect during the operative procedure, it may result in reduced anxiety and concern. There is isolated support for critics who argue that OS is unsafe because challenging surgical procedures carry significant complication rates that may be exacerbated by distractions due to overlap with another complicated procedure.

Reference [4] reported surgical complications following Cervical Corpectomy in overlapping surgeries resulting in the patient being paralyzed. All investigations indicated that there were no violations of legal statutes or any policy errors and that the patient received safe, quality surgical care. Overlapping surgery was not found to be a contributing factor in the patient outcome. The investigative team did recommend regulating OS, defining critical portions of the procedures, and insuring that patients are aware when OS is occurring. Public outcry also resulted in changes to documentation ensuring that OS policies are followed and required the naming a secondary or back-up surgeon. Thus, researchers felt there was a need to investigate the effect of the practice of OS on quality of patient care and outcomes as well as utilization of healthcare resources, since costs are very important. One such study came later in 2017 involving retrospective evaluation of spinal surgeries [5]. Reference [5] compared overlapping vs non-overlapping outcomes and costs. They concluded that overlapping surgeries may be performed safely at their institution while reducing hospital costs.

In a meta-analysis of 18 studies published between 2016 and 2018 on Overlapping Surgeries done nationwide, [2] reported researchers studied mortality rates, reoperation rates, procedure length of time, readmission rates and hospital length of stay. Most studies focused on potential impact of OS practice on patient safety, healthcare costs and surgical resident training. Only one study examined “Total Hospital Costs” and one study examined “Disposition on Discharge.” Most studies indicated lower readmissions, reduced reoperation rates, fewer complications, and reduced mortality and morbidity rates associated with OS. The only negative outcomes reported were an increase in total procedure time and one isolated report of a higher infection rate.

The purpose of this research is to determine if there is an improvement in quality of patient care with the practice of overlapping surgeries in neurosurgery at a large teaching hospital located in the Southeastern United States when performing procedures involving blunt and penetrating head injuries and spinal cases. The specific objectives of this study were:

- Objective 1: To assess if there was reduction in “Time to Treatment” with OS practice
- Objective 2: To assess if there was a reduction in “Length of hospital stay” with OS practice
- Objective 3: To assess if there was reduction in “Overall morbidity” with OS practice
- Objective 4: To assess if there was an increase in “Home discharges” with OS practice

II. METHODOLOGY

A. Hypotheses Tested

To accomplish the objectives of the study the following hypotheses were tested:

- Null Hypothesis 1: There is a reduction in the “Time to Treatment” with Overlapping surgeries
- Null Hypothesis 2: There is a reduction in the “Length of Stay” with Overlapping surgeries
- Null Hypothesis 3: There is a reduction in the “Medical Complications” with Overlapping surgeries
- Null Hypothesis 4: There is an increase in “Home Discharges” with the use of Overlapping surgeries

III. DATA

Data for this study were secondary data obtained from patient records from previously performed trauma surgeries. It consisted of the information recorded for head injury patients in their medical files at a US Southern Regional Level 1 Trauma hospital. Thus, the data was retrospectively reviewed. It spanned a period of 41 months. During this timeframe, the hospital had transitioned from single room surgeries to overlapping surgeries where the same surgeon performed the critical part of concurrent surgeries. The timeframe was thus partitioned into Period 1 and Period 2. Period 1 was first part of the timeframe where the surgeries were “single room” surgeries only. Period 2 was the second part of the timeframe, after the hospital had transitioned to the overlapping surgeries and included overlapping surgeries only.

A total of 452 all Neurosurgery cases were reviewed. Out those surgeries included in the study, 122 surgeries were identified as emergent or urgent cases. In essence, the data consisted of two large independent samples, one for Period 1 and one for Period 2. Thus, to analyze the data, a matched cohort of urgent cases from two periods were examined. The
breakdown was as follows: The first sample taken in Period 1 involved single room surgeries. There were 59 such emergency cases. The second sample taken in Period 2 involved overlapping emergency surgeries only and consisted of 63 cases.

The qualitative variables included in the study, related to surgery were: Variable 1 - Surgical Indication, and Variable 2 - Type of Procedure. Both the variables had two levels or categories. For variable “Surgical Indication,” the first category was “Cranial” that is Cranial Surgeries involving blunt and penetrating head injuries and the second was “Spinal” consisting of Spinal Surgeries involving spine trauma, cord compression cases, etc. The variable “Type of Procedure” had two categories or levels to identify Single Room procedures vs. Overlapping procedures. All single room procedures occurred in “Period 1” (first half of the data period) before the adoption of overlapping surgical practices by the hospital. All overlapping surgeries occurred in “Period 2”. Thus, category 1 specifies Single Room procedures and category 2 specified overlapping (OS) procedures.

The objective of this investigation was to assess the impact of overlapping surgeries on patient care quality. Again, both quantitative and qualitative variables were used to assess patient care quality. The study examined the following qualitative variables related to Patient Care Quality. Variable 3 was “complications” (Medical and Surgical) with two levels Yes or No. Variable 4 was “Discharge to Location” with three levels indicating discharges to a) Home, b) Rehab, or c) to Nursing Home. Variable 5 was “30-Day Readmission status” which had two levels a) Yes and b) No.

The quantitative variables related to patient care quality examined in the study, were Variable 6 - Length of Stay (# of Days in the hospital) named “LOS” and Variable 7 - “Time to Treatment” (Hours) named TOT. Personal variable recorded (Variable 8) was “Gender of the patient” with two level a) Male and b) female.

The proportion of female patients in Period 1 was 24% and it was 27% in Period 2. The data were analyzed using EXCEL treating it as data from two independent samples. Thus, Z and t-tests for 2 independent samples were employed for testing differences in the samples for:

- Changes (reduction or increase) in average Length of Stay (LOS)
- Changes (reduction or increase) in proportion of Medical Complications
- Changes (reduction or increase) in proportion of Home Discharges
- Changes (reduction or increase) in average Time to Treatment (TOT)

Test of Independence was employed to investigate whether Factor “Type of Procedure” (Single vs. Overlapping Procedures) was related to “Surgical Indication” (Cranial vs Spinal). Contingency Tables were developed and tested using the statistical Test of Independence.

IV. RESULTS

A. Mean Length of Stay

The first dependent variable examined that was related to patient care quality was “Mean Length of Stay.” For Single Room Procedures in this sample this was 19.0 days. The “Mean Length of Stay” for Two Room Overlapping Procedures in this sample was 14.2 days. The t-test confirmed that the difference, a reduction in the average length of stay in the hospital for patients, was statistically significant (p < 0.04).

B. Medical Complications

The second dependent variable examined that was related to patient care quality was “Proportion of Medical Complications relative to number of procedure types performed.” For Single Room Procedures in this sample the number of complications noted was 18 resulting in the proportion of procedures with complications = p = 0.305. The number of complications for overlapping procedures in this sample was 8, resulting in the proportion of procedures with complications = 0.14. The Z-test for proportions indicated a statistically significant reduction in the proportion of patients with medical complications in overlapping procedures compared to single room procedures (p < 0.03).

C. Average Time to Treatment

The results of the t-test showed a statistically significant reduction in the mean “Time to Treatment” for patients receiving overlapping procedures compared to single room procedures (p < 0.05).

D. Proportion of Home Discharges

Results of the Z-test also showed a significant increase in “Proportion of Home Discharges” for patients receiving overlapping surgeries compared to single room procedures (p < 0.05).

E. Surgical Indication and Type of Procedure

Test of independence was employed to check if the variables Surgical Indication (Cranial vs. Spinal) and Type of Procedure (Single room vs. Overlapping) were related. They were found to be statistically independent (p = 0.418). The Expected and Found frequencies for # of Surgical Indications for single room and overlapping surgeries, in the two periods were not significantly different (i.e. the expected and found frequencies were fairly close). This indicates that differences in surgical indications had only minor impact on observed dependent variables in the two periods, first involving single room procedures only and second involving overlapping procedures only. Thus, complexity of the surgical procedure did not seem to alter the outcomes in terms of the dependent variables observed in the study.

V. CONCLUSION

Based on the results of the study, it appears that there was a significant improvement in the quality of patient care with utilization of overlapping surgeries in terms of the length of hospital stay, medical complications, time to treatment and discharges to home for patients. Looking at the sheer numbers, it appears that the surgeons also completed more procedures with overlapping surgeries in period 2 compared to single room procedures in period 1 without compromising the patient care quality. One could speculate that this may indicate better utilization of healthcare resources assuming everything else equal. We expect better patient satisfaction as a result of the “Discharge to Home” outcome, although no
data was available from the patient medical records regarding patient satisfaction.

VI. POSSIBLE EXPLANATIONS
It is possible that the improvement in “Quality of patient care and outcomes” was because of the reduced time to treatment (early intervention) although that was not analytically verified. Early intervention may have also reduced recovery time, reducing the average length of stay, which again was not analytically verified. Along the same lines, we suspect that early intervention may also have reduced medical complications in procedures. We assume that home discharges may improve patient satisfaction, although that was not verified with patient satisfaction data.

VII. IMPLICATIONS
Improvement in quality, and better utilization of existing resources should reduce healthcare costs which have been the focus of national attention as of late. Medicare ties reimbursements to patient satisfaction, which should be higher with lower medical complications and more discharges to the home rather than rehabilitation centers or nursing homes. We find that overlapping surgeries have been performed at this hospital with no additional risk and with more desirable outcomes compared to single room surgeries. These results confirm and extend earlier studies reported by [2] and [5]. Future research is called for which more closely examines the areas of cost savings and patient satisfaction associated with performing overlapping surgery versus single room procedures.

ACKNOWLEDGEMENT
The authors would sincerely like to thank Dr. Jason Wilson, Neurosurgery of the University Medical Center for providing the research data and many explanations making this paper a reality.

CONFLICT OF INTEREST
Authors declare that they do not have any conflict of interest.

REFERENCES