The Effect of Stretcher-Based Hand Tables on Operating Room Efficiency at an Outpatient Surgery Center

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ABSTRACT

BACKGROUND Traditionally, operating room (OR) protocol for hand surgery required patient transfer and attachment of a hand table to the standard OR table. A new protocol, using a stretcher-based hand table, would eliminate patient transfer, and the attachment process.

METHODS A prospective cohort study was performed comparing the use of a traditional OR table to a stretcher-based hand table for carpal tunnel and trigger finger releases. We collected data on "time in", defined as the duration between patient entry into the OR and the beginning of the procedure, and "time out", defined as duration between the conclusion of the procedure and the patient leaving the OR, for both the traditional table group (n=218) and the stretcher-based table group (n=217). We also collected surveys from the OR staff regarding the patient safety, staff satisfaction, and efficiency of the new workflow. Financial savings were also calculated.

RESULTS Both "time in" (p=0.03) and "time out" (p=0.0003) were significantly different when comparing the traditional and stretcher-based hand tables. Median "time in" and "time out" both improved by 2 minutes with the introduction of the stretcher-based hand table, leading to a 4-minute reduction per case.

CONCLUSION This study demonstrated that through the use of a stretcher-based hand table, OR efficiency can be improved. Based on modeling, this could return an annual savings of $46,335 per surgeon for isolated carpal tunnel and trigger finger releases. Additionally, the table made a favorable impression upon the OR staff, with 72% preferring the stretcher-based hand table and 100% thinking it improved efficiency.

LEVEL OF EVIDENCE Therapeutic Level II, Prospective Cohort Study

KEYWORDS Hand table, operating room efficiency, process flow, day surgery, outcomes, cost savings

The current state of healthcare, with decreasing reimbursements and increasing costs, makes improving hospital efficiency particularly relevant.[1] The operating room (OR) is one of the most expensive units within a hospital with variable efficiency.[2] Differences in case type, length, complexity, patient characteristics, and surgeon experience can make standardization difficult. Controlling efficiency and streamlining processes in the OR presents a challenge to both clinical and administrative staff.

Despite these barriers, improving OR efficiency is of great importance to both the surgeons and hospital administration. Variability in reported operating room time metrics and clinical experience demonstrate that there are opportunities for both time and cost savings.[3-5]

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Recent studies that have focused on decreasing turnover time within the OR have shown improved throughput and revenue savings. Hand surgery stands to benefit greatly from increased OR efficiency based on its high frequency of short cases necessitating multiple operating room cycles. A study by Avery et al. showed that a dedicated hand surgery team in the OR could improve efficiency and improve turnover time by 11 minutes per case.[6] Small changes in time between cases can result in increased net revenue by either allowing more cases per day to occur or by limiting total OR time per day.

We conducted a prospective cohort study to evaluate the effect a stretcher-based hand table would have on OR efficiency. This table is commercially available through Rycor Medical, Inc. (North Port, FL) and costs a total of $2,021, which includes a pad for the table. This hand table allows the patient to remain on the same stretcher from the preoperative holding area through the surgery and to the recovery room, eliminating the need for patient bed transfer. We hypothesized that the introduction of this stretcher-based hand table would improve efficiency by both decreasing cycle time for hand cases and increasing staff satisfaction, without negatively affecting patient outcomes.

FIGURE 1 The stretcher-based hand table, which when in position sits flush and perpendicular to the stretcher

METHODS

A prospective cohort study was performed using a stretcher-based hand table **(Figure 1)**, which was introduced into the operating room at the beginning of 2014. This study was approved by our Institutional Review Board, infection control, nursing, and anesthesia. Informed consent was obtained from all patients for being included in the study.

The stretcher-based hand table does not require transfer of the patient before or after his/her surgical procedure. Prior to the introduction of the stretcher-based hand table, traditional operating room tables with a screw-on hand table attachment were utilized at our institution. The traditional workflow required the patient to be brought into the operating room on a preoperative stretcher, transferred to the operating room table, removal of a preoperative stretcher from the room, and then attachment of a hand table to the standard operating room table. At the conclusion of the surgical procedure, the hand table was removed, the patient transferred from the operating room bed to a stretcher by the operating room staff, and the patient was taken by stretcher to the post anesthesia care unit (PACU). Conclusion of the surgical procedure was defined by drape removal and splint placement.

The use of the stretcher-based hand table required no transfer of the patient throughout the entire procedure, allowing each patient to undergo his/her surgical procedure on the preoperative stretcher. For a given procedure, the patient was brought into an operating room from which the standard OR table had been removed. The stretcher was positioned, and the stretcher-based hand table was secured by sliding under the patient's mattress. At the conclusion of the procedure, the stretcher-based hand table was slid out from the stretcher, and the patient was taken to the PACU without any need for additional transfer.

From 10/11/13 to 12/31/13, data were collected for all patients meeting the following inclusion criteria: unilateral carpal tunnel or trigger finger surgery, local with monitored anesthesia care (MAC), and surgery by one of two hand-fellowship trained surgeons. During this period, 218 patients met the inclusion criteria. The following data were collected: "time in" (the duration between patient entry into the operating room and the beginning of the procedure) and "time out" (the duration between the conclusion of the procedure and the departure of the patient from the operating room). This was used as the time measurement since this would reflect the potential variability of table utilization and bed transfer time. We did not measure total time as the utilization of a different table should not affect operative time, and operative time can vary based on complexity and complications.

At the beginning of 2014, data collection ceased for the traditional workflow with standard OR hand tables and began for the new workflow with the stretcher-based hand table. From 1/3/14 to 3/21/14, data were collected for all patients meeting the inclusion criteria as described in the previous paragraph. During this period, 217 patients met the inclusion criteria.

"Time in" and "Time out" for the old and new tables was compared, resulting in a total of four groups being analyzed. A single statistician conducted descriptive statistics for analysis. Statistical analysis was performed using non-parametric tests after a Shapiro-Wilks test showed a non-normal distribution of data. Data had a right skew towards increased frequency of lower transition times in all groups. Grubb's test was performed resulting in the removal of one outlier per group after meeting the necessary criteria. A Mann-Whitney U-test was used to determine statistical significance between the traditional and new table workflows. Medians are reported instead of means due to the non-normal distribution of data and use of parametric testing.

TABLE 1 Staff Survey

1. Which hand table do you prefer?						
Traditional		Stretcher-Based		I view them equally		
2. How do you think the new stretcher-based hand table affected patient safety?						
Worsened		No difference		Improved		
3. How do you think the new stretcher-based hand table affected OR efficiency?						
Decreased		No difference		Increased		
4. Would you recommend the new stretcher-based hand table to another facilities?						
Very strongly not recommended	Strongly not recommended	Not recommended	Neutral	Recommended	Strongly recommended	Very strongly recommended

An on-staff survey, composed of 4 questions **(Table 1)**, was also sent to members of the operating room staff who participated in use of the stretcher-based hand table to assess their satisfaction with the new workflow. The survey was filled out by 25 outpatient surgery staff including surgical technologists, operating room nurses, anesthesiologists, CRNAs, and orthopaedic surgeons.

RESULTS

When using the stretcher-based hand table, there were no incidents of patient harm or increase in infections. Both "time in" (p=0.03) and "time out" (p=0.0003) were significantly different when comparing the traditional and the new workflows.

"Time In"

The median duration between patient entry into the operating room and the beginning of the procedure was 20 minutes for the old tables (95% confidence interval (CI) 19.0 to 21.0) and 18 minutes for the new tables (95% CI 17.1 to 18.9) **(Figure 2)**.

"Time Out"

The median duration between the conclusion of the procedure and the departure of the patient from the operating room was 7 minutes for the old tables (95% CI 6.4 to 7.6) and 5 minutes for the new tables (95% CI 4.4 to 5.6) **(Figure 2)**.

Staff Survey Results

The survey response rate was 100%. Seventy-two percent of respondents preferred the stretcher-based hand table to the traditional OR hand table. One hundred percent of respondents thought the stretcher-based hand table improved efficiency. Sixty-two percent of respondents thought the stretcher-based hand table improved patient safety, 34% thought it made no difference, and 4% thought it worsened patient safety. Ninety-five percent of respondents would recommend the stretcher-based hand table to another facility; only 5% were neutral. No respondent discouraged the use of the stretcher-based hand table **(Figure 3)**.

Financial Calculations

Fully loaded costs of OR time was obtained from our hospital's financial department. The first thirty minutes cost $1530.94, and since the inclusion criteria only included carpal tunnel or trigger finger releases, which take less than 30 minutes to perform, cost per minute in the OR for this study was $51.03. Potential savings was then calculated by this value per minute multiplied by the total median time saved between the traditional and stretcher-based hand tables, for a total $204.12 saved per case.

FIGURE 2 Median "time in" and "time out" comparison for the old and new hand table workflows with 95% confidence intervals

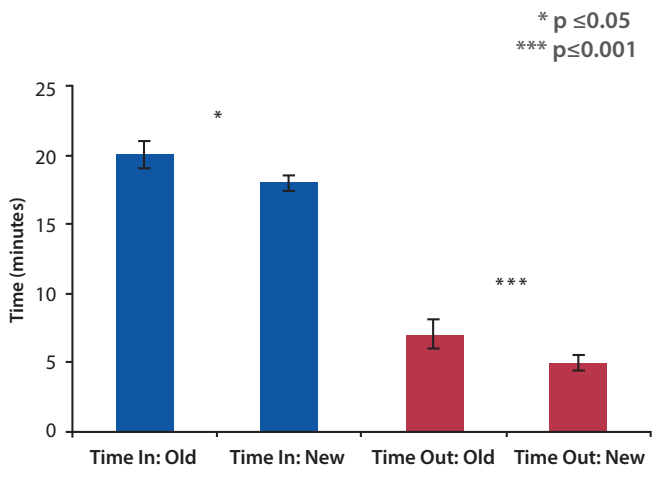
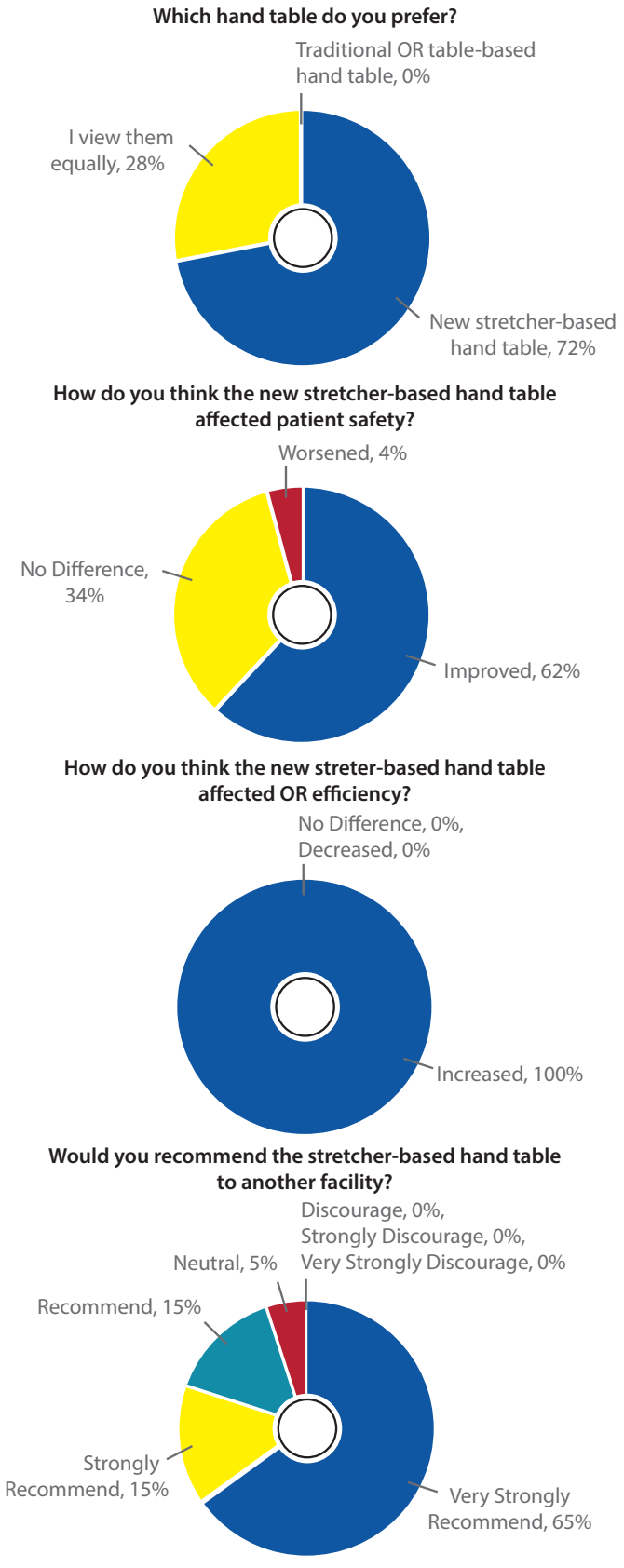


FIGURE 3 OR and Anesthesia staff survey results



DISCUSSION

Operating room efficiency is an area of increasing focus to many health care systems, but relevant literature in orthopaedic surgery remains limited, particularly in hand surgery. The high number of daily cases in hand surgery makes it susceptible to a cumulative effect based on small variations in individual case metrics. This study demonstrated in a prospective fashion the impact of switching to a stretcher-based hand table in an outpatient surgery setting. Both median "time in" and "time out" improved by 2 minutes (p=0.03 and p=0.0003, respectively), leading to an overall reduction of 4 minutes per each local and monitored anesthesia carpal tunnel or trigger finger procedure. Additionally, the stretcher-based hand table made a favorable impression upon the operating room staff, with 72% preferring the stretcher-based hand table, 100% thinking it improved efficiency, and 62% reporting a belief that it improved patient safety. No respondents thought that the stretcher-based hand table reduced efficiency or would avoid recommending the table to another facility.

Our study has several strengths. We evaluated a large contingent of consecutive, prospectively collected cases. This study compared only trigger fingers and carpal tunnel releases; these are two of the most common hand surgeries performed, and their minimal and consistent equipment needs reduced variability with regard to equipment delay or changes. This study included the same two surgeons performing similar operative techniques in the same center throughout the collection period, and the data were entered by nursing staff uninvolved with the publication. The response rate of the survey was 100% among the operating room staff and included participation of all members of the operating room team, including surgeons, anesthesia providers, nursing staff, scrub technicians, and surgical house staff. The stretcher accommodates the Trendelenburg position, and the stretcher-based hand table is radiolucent, which would allow it to be used in procedures requiring fluoroscopy. Additionally, no incidents of patient harm were noted during the study or since as a result of the stretcher or the stretcher-based hand table.

Weaknesses include the possibility of performance bias with staff and surgeons changing their pattern of behavior based on wanting the stretcher-based hand table to be successful. While the staff indicated a belief that the stretcher-based hand table would decrease the risk of injury to OR staff or patients by eliminating the task of moving the patient, we were unable to assess any difference in actual worker injury or claims due to the fortunate rarity of these instances. Lastly, there could be some concern that bringing in the stretcher from the pre-anesthesia unit and leaving it during the case could increase the infection risk. This study was unable to address any statistical change in infection rate, as infection is such an infrequent complication of trigger finger and carpal tunnel release.[7,8,9] Our infection control officer has confirmed that there has not been any increase in infections since implementation of the stretcher-based hand table two years ago.

CONCLUSION

Our results support the use of stretcher-based hand tables for improving OR efficiency with a median time improvement of 4 minutes compared to the traditional operating room table. At our institution, OR cost is $51.03 per minute, for a potential savings of $204.12 per case. In 2014, the two surgeons who participated in the study performed 454 cases that met the inclusion criteria. Annually, there is a potential savings of $46,335 per surgeon. The financial incentives, combined with the aforementioned benefits to OR turnover rate, staff satisfaction, and patient safety, make a strong argument advocating the use of the stretcher-based hand table for carpal tunnel and trigger finger releases. In fact, its use may be applicable and beneficial for the majority of orthopaedic hand procedures and has become our standard of practice for all hand, wrist, and elbow procedures done in the supine position.

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