Verbal Communication Improves Laparoscopic Team Performance

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The impact of verbal communication on laparoscopic team performance was examined. A total of 24 dyad teams, comprised of residents, medical students, and office staff, underwent 2 team tasks using a previously validated bench model. Twelve teams (feedback groups) received instant verbal instruction and feedback on their performance from an instructor which was compared with 12 teams (control groups) with minimal or no verbal feedback. Their performances were both video and audio taped for analysis. Surgical backgrounds were similar between feedback and control groups. Teams with more verbal feedback achieved significantly better task performance ($P = .002$) compared with the control group with less feedback. Impact of verbal feedback was more pronounced for tasks requiring team cooperation (aiming and navigation) than tasks depending on individual skills (knotting). Verbal communication, especially the instructions and feedback from an experienced instructor, improved team efficiency and performance.

Keywords: Surgical training; team performance; communication; simulation; assessment

According to the American College of Surgeons, adverse outcomes remain as a source of patient morbidity, excess cost, and litigation. Recent studies on adverse events in medical practice have revealed a weak link between the increase of surgeons’ technical skills and a decrease of incidence of surgical errors. The occurrence of medical errors is more strongly associated with failures of nontechnical skills of the surgeons. These nontechnical skills include communication, decision making, situational awareness, and teamwork.

Failures of communication in surgery contribute up to 43% of surgical errors. One multicenter study on patient outcomes in the intensive care unit showed that part of the difference in mortality was directly related to the level of interaction and coordination between staff. Poor communication skills and ineffective teamwork have been identified as the primary source of many adverse medical outcomes. Conversely, effective communication has been shown to reduce medical errors.

We report a prospective study on the impact of verbal communication on team performance for a surgical team performing laparoscopic tasks in a simulated training system. In this study, the team performance was analyzed between 2 laparoscopic groups comprised of personnel with minimal laparoscopic skills. The feedback group was provided with sufficient verbal instruction and feedback from an instructor which was compared with the control group with minimal or no verbal feedback. Our hypothesis was that team performance in the surgical teams with sufficient verbal instruction, and feedback from an experienced instructor, improved team efficiency and performance.

Methods

Participants and Study Groups

A total of 24 dyad teams were recruited from Minimally Invasive Surgery Program of Legacy Health System...
at Portland, Oregon. Each team was comprised of medical students, office staff without clinical experience, and junior surgical residents. All participants had limited skills for performing any surgical task and even less experience for laparoscopic tasks. Teams were randomly assigned into 1 of 2 groups. Verbal conversations were allowed for trainees in both groups. One group of 12 teams received sufficient verbal feedback from an experienced instructor (feedback group), whereas the other 12 teams received minimal or no verbal feedback during their tasks (control group).

Procedures and Tasks
Each team underwent 2 formulated laparoscopic tasks that required team members to collaborate to accomplish the goal. The method was adapted from the Legacy Inanimate System for Laparoscopic Team Training (LISETT) system. In brief, each team was required to perform 2 laparoscopic tasks. In peg transportation, 1 member of the team (assistant) held the camera and followed his/her team member (operator) who used laparoscopic instruments to transport an object between pegs from the left corner to the center and to the right corner of a cardboard box and then back in the reverse order. In the cooperative suture task, a team member (assistant) was required to retract an obstacle away and above a suture field and drive the laparoscope at the same time while the other member (operator) performed laparoscopic suturing. The suturing task required the operator to first load the needle in a correct position with the needle curve up and 90 degrees relative to the needle holder. The operator then drove the needle through rubber tubing at designated spots on either side of the tube. Two throw of knots were performed to secure the suture.

All teams were provided with brief, informal training on the instruments and tasks right before the task. Task performances were recorded with video and audio for documentation. Analyses of the data were conducted by a surgeon and a research assistant.

Metrics
Task performance was assessed by a valid scoring system. LISETT score was a normalized score based on speed and accuracy of both peg transportation and cooperative suture. Briefly, the accuracy of peg transportation was assessed by the drop of the object and the unsynchronized movement of the camera. In addition, the quality of surgical knot was taken into the calculation of suture accuracy. Prior to each trial, surgical experience was surveyed from each of the participants.

For each individual, the surgical and laparoscopic experience was estimated by having participants recall the number of basic and advanced procedures he/she performed. The frequency for performing each type of procedure was rated in a 5-point scale. The participant was also required to estimate the number of years in surgical training. The participants had chances to take part in a different study for practicing with LISETT more than once. Once a LISETT test was completed, 1 point was added to participant’s experience score. In sum, the surgical experience scores for each team were calculated by summarizing team members’ experience on performing a number of different surgical procedures, the years of working together on general and laparoscopic surgery, and the number of LISETT trials performed. Basically, the more surgical training a participant had, the higher the experience score would be.

Verbal communication was quantified by checking the number of verbal communication episodes during each task. Verbal communication included all speeches between 2 team members and instructor when presented. Number of verbal communication episodes, the speaker, and durations were computed from each task; data were compared between the 2 groups.

In an effort to determine whether verbal feedback from an instructor improved individual skill or team coordination, the complicated laparoscopic suture task was further broken down stepwise into aiming and knotting subtasks. Aiming was part of the suturing task from loading the needle to driving the needle through the rubber tubing. This part required the assistant who drives the laparoscope to show the operator the designated spot to aim and drive the needle through. This required a significant amount of team coordination. The second part of the suture task was knotting. This part required minimal manipulations of the laparoscope and relied more on individual laparoscopic technical skills. The knotting time was the time required by the operator to throw 2 single knots to secure the suture.

Results
Both feedback and control groups had similar levels of surgical training before entering the study. Surgical
experience scores of feedback and control groups were 36.4 and 33.4, respectively. There was a trend that the feedback group included people with marginally higher surgical experience than the control group. However, the difference between feedback and control group was not significant ($P = .057$).

The duration of each communication episode ranged from 0.5 to 120 seconds. The verbal communications consisted of asking questions, providing comments, instructions, instant correction of movement, positive encouragement, and constructive feedback. On average, the control team had 20 verbal communication episodes recorded during each task between 2 team members. In contrast, the feedback group had 55 verbal communication episodes. Most of the verbal communications recorded in the feedback group occurred between the instructor and the operator when the instructor noticed that the operator had a difficult time performing a movement. In other words, team members in the feedback group received more instructions and feedback from instructors than team members in the control group. Examples of communication episodes recorded in the feedback group are shown in Table 1.

As a direct result of receiving different quantities of verbal instruction and feedback, team performance was significantly different between 2 groups of training teams. Teams with verbal feedback achieved significantly higher LISETT scores (67.2 ± 12.0) compared to the control group (46.3 ± 16.5, $P = .002$). With further analysis of the tasks, the feedback group had better peg transportation scores (88.1 ± 7.2) and cooperative suturing scores (46.4 ± 17.2) than the control group (peg score [64.6 ± 17.2], $P < .001$; suture score [28.0 ± 19.3], $P = .040$; Figure 1).

Results showed significantly shorter aiming time in the feedback group (102 ± 44.2 seconds) compared with the control group (285.1 ± 99.9 seconds, $P < .001$). In contrast, no significant difference ($P = .778$) in knotting time was noticed between the feedback group (304 ± 138.9 seconds) and the control group (319 ± 132.6 seconds; Figure 2). Results suggested that improving team collaboration quality was more highly correlated with verbal feedback than with individual surgical skills.

**Discussion**

This prospective study took a novel step in measuring verbal communication between team members and the impact of verbal feedback from an experienced instructor on simulated laparoscopic tasks. Normally, verbal communication, body gestures, and facial expression are the most common means for exchanging information between team members. Facial expression and body gestures are limited in the operating room due to masks, restraint of the workspace, and surgical costume. Thus, in the operating room, verbal communication becomes a prominent means for team collaboration in surgery.9 Verbal communication provides team members with instant guidance, error correction, and performance feedback, which are constructive for team collaboration and efficiency.

Team collaboration and efficiency in this study were measured by LISETT scores. The LISETT scores were significantly higher in both peg transportation and laparoscopic suturing among the feedback group. It was interesting to note that when the
The laparoscopic suture task was broken down into sub-tasks, there was a significantly shorter time for aiming the target in the feedback group compared with the control group. However, there was not a statistically significant difference between the 2 groups with suture knotting.

Both peg transportation and the aiming portion of the suture task required more coordination between team members. These 2 tasks required a greater degree of laparoscope manipulation than knotting. During peg transportation, the laparoscope was manipulated to identify the target sites and the object. Similarly, the aiming part of suturing required the assistant using the laparoscope to identify the tip of the needle and the target spot. These 2 tasks required significant collaboration between team members, and they were easily guided with verbal instructions from the instructor for team cooperation.

The knotting subtask depended more on individual surgical skills. Verbal information received from the instructor could help but was not able to improve the performance instantly. Thus, it was not surprising that there was no significant difference in performance between the control and feedback groups. Results implied that different strategies should be implemented to improve different aspects of surgical skills during surgical practice and laparoscopic training.

One limitation of this study was that we did not further categorize communication episodes based on their content. We noticed that most episodes in the feedback group occurred between the instructor and the operator, providing guidance for upcoming tasks and instant feedback and encouragement to the operator. In contrast, the instructional or feedback type of communication was inadequate in the control group. Future studies are necessary to investigate the communication patterns and examine their impacts on team performance.

Another limitation of this study was the subjective manner in which verbal feedback was delivered. When instant verbal feedback was provided to trainees, instructors should consider when and how to give verbal feedback. Redundant and contradictory information might lead to disagreement and negative attitudes among the trainees, resulting in detrimental effects on team collaboration. Further studies will need to investigate this phenomenon to determine the appropriate amount of verbal feedback and instruction to provide and the most suitable time to provide it. In addition, this study had a small sample size. This limited the generalizability of the results found in this study.

In summary, results from this study demonstrated that the quantity of verbal communication, especially those of instruction and feedback received from an experienced instructor, was important for trainees to build effective surgical teamwork. The impact of verbal instruction on team performance was more pronounced when tasks required a higher degree of team cooperation rather than individual skills. Further studies will need to investigate communication patterns during team maturation and the optimal methods for providing verbal instructions and feedback.

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Table 1. Dictation of Verbal Speeches During a Cooperative Suture Task

<table>
<thead>
<tr>
<th>Task</th>
<th>Start Time (min:s:ms)</th>
<th>End Time (min:s:ms)</th>
<th>Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suture</td>
<td>20:37:19</td>
<td>20:45:29</td>
<td>Operator: am I grasping the right tail?</td>
</tr>
<tr>
<td></td>
<td>21:00:25</td>
<td>21:03:24</td>
<td>Instructor: can you bring it up a little bit?</td>
</tr>
<tr>
<td></td>
<td>22:07:11</td>
<td>23:08:27</td>
<td>Instructor: yes!</td>
</tr>
<tr>
<td></td>
<td>28:40:05</td>
<td>29:02:24</td>
<td>Instructor: you can turn this knob.</td>
</tr>
<tr>
<td></td>
<td>29:03:01</td>
<td>29:05:34</td>
<td>Operator: like this?</td>
</tr>
</tbody>
</table>

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References