THE USE OF VIRTUAL HUMANS TO ASSESS SURGEON COMMUNICATION SKILLS IN A SIMULATED LAPAROTOMY


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INTRODUCTION

• Simulation is increasingly used for team training but time constraints limit the availability of OR personnel to practice these essential communication skills.

• In this study, we examine the use of interactive VHs to simulate OR personnel during a surgical time out and a simulated laparotomy.
• Three interactive VH teammates (anesthesiologist, circulating nurse and surgical technologist) were projected on a 40-inch monitor mounted on a rolling stand.

• Nineteen surgeons (6 faculty and 13 residents) videotaped interacting with VHs while performing a surgical time out and laparotomy on a simulated model.

• Outpatient surgical center (OSC) at the University of Florida – Jacksonville.
Communication Elements
1. Leading a surgical timeout.
2. Addressing a timeout interruption.
   ✓ Raters (N=5) reviewed videotapes.

Psychomotor Elements
1. Performing a laparotomy.
   ✓ Raters (N=6) examined simulated laparotomy pads.
METHODS

LAPAROTOMY CLOSURE RATING FORM

1. Bites are between 5 mm to 10 mm wide with 5 mm to 10 mm advancement.

   1. Bites and advancement too large/small with no consistency
   2. Most bites are between 5-10mm are consistent with regular spacing
   3. All bites are between 5-10mm are consistent with regular spacing

2. Running closure started 1 cm above and below the apices of the fascial incision.

   1. Neither superior/inferior running suture started 1 cm above/below apex
   2. Either superior or inferior running suture started 1 cm above/below apex but not the other
   3. Both superior and inferior running suture started 1 cm above and below apex

3. Knots are square without “air knots” and have an adequate number of throws (6 to 8).

   1. Knots are not square multiple air knots inadequate number of throws
   2. Knots are for the most part square some air knots present most knots have adequate # of throws
   3. Knots are square no air knots all knots adequate number of throws

4. No obvious defects in the incision when placed under tension.

   1. Large defects in the closure when placed under tension
   2. Some/small defects in the closure when placed under tension
   3. No defects in the closure when placed under tension
RESULTS

Participant Level (N=19)

- Faculty: 6
- PGY5: 1
- PGY4: 3
- PGY3: 1
- PGY2: 4
- PGY1: 4
RESULTS

Participant Experience

- Laparotomy
- Time Out

>20
11-20
6-10
1-5
0
RESULTS

Post Interaction Survey

**Immersion Level**

- Closing was like closing real fascia: 2.79
- Simulated abdominal wall was life-like: 2.95
- VHs seemed real: 3.95
- VHs enhanced the immersiveness: 4.11
- I felt I was in a real OR: 3.58
RESULTS

Post Interaction Survey

*Skill Confidence/Improve*

<table>
<thead>
<tr>
<th>Skill Confidence</th>
<th>Pre-Interaction</th>
<th>Post-interaction</th>
<th>Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical Time Out</td>
<td>3.25</td>
<td>3.84</td>
<td>0.59</td>
</tr>
<tr>
<td>Abdominal Wall Closure</td>
<td>3.70</td>
<td>4.06</td>
<td>0.36</td>
</tr>
</tbody>
</table>

*Likert scale 1-5 (1=least confident, 5=most confident).*
[Please contact presentation authors for removed video.]
## RESULTS

### Communication Elements

<table>
<thead>
<tr>
<th>Surgical Time Out</th>
<th>Residents N (%)</th>
<th>Faculty N (%)</th>
<th>p Value (α=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiated</td>
<td>11 (84.6)</td>
<td>5 (83.3)</td>
<td>NS</td>
</tr>
<tr>
<td>Interruption Addressed</td>
<td>7 (53.8)</td>
<td>6 (100)</td>
<td>NS</td>
</tr>
<tr>
<td>Time Out Resumed</td>
<td>2 (15.4)</td>
<td>4 (66.7)</td>
<td>NS</td>
</tr>
<tr>
<td>Time Out Restarted</td>
<td>5 (38.4)</td>
<td>2 (33.3)</td>
<td>NS</td>
</tr>
</tbody>
</table>
### RESULTS

#### Communication Elements

<table>
<thead>
<tr>
<th>Response to Incorrect Count</th>
<th>Residents N (%)</th>
<th>Faculty N* (%)</th>
<th>P Value (α=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopped Operating</td>
<td>7 (53.87)</td>
<td>5 (100)</td>
<td>NS</td>
</tr>
<tr>
<td>Asked for Recount</td>
<td>7 (53.8)</td>
<td>3 (60.0)</td>
<td>NS</td>
</tr>
<tr>
<td>Asked for X-ray</td>
<td>6 (46.1)</td>
<td>2 (40.0)</td>
<td>NS</td>
</tr>
<tr>
<td>Searched Abdomen</td>
<td>10 (76.9)</td>
<td>5 (100)</td>
<td>NS</td>
</tr>
</tbody>
</table>

*One faculty did not receive incorrect count challenge.*
## RESULTS

### Psychomotor Elements

<table>
<thead>
<tr>
<th>Closure Item*</th>
<th>Residents Mean (95% C.I.)</th>
<th>Faculty Mean (95% C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bites (Distance/Spacing)</td>
<td>2.61 (1.97, 4.28)</td>
<td>1.97 (1.05, 2.89)</td>
</tr>
<tr>
<td>Running Closure (Start/Finish)</td>
<td>1.88 (1.25, 2.51)</td>
<td>1.50 (0.95, 2.01)</td>
</tr>
<tr>
<td>Knots (Square/# Throws)</td>
<td>3.51 (2.88, 4.14)</td>
<td>2.89 (1.70, 4.08)</td>
</tr>
<tr>
<td>Defects (With Tension)</td>
<td>3.88 (3.22, 4.54)</td>
<td>2.67 (1.42, 3.92)</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>11.88 (9.77, 13.99)</strong></td>
<td><strong>9.02 (5.51, 12.53)</strong></td>
</tr>
</tbody>
</table>

*Likert scale 1-5 (1=worst, 5=best).
Psychomotor Elements

LAPAROTOMY CLOSURE RATING FORM

1. Bites are between 5 mm to 10 mm wide with 5 mm to 10 mm advancement.

2. Running closure started 1 cm above and below the apices of the fascial incision.

3. Knots are square without "air knots" and have an adequate number of throws (6 to 8).

4. No obvious defects in the incision when placed under tension.
Participant Comments

“Phenomenal opportunity to practice surgical and verbal skills as a solo surgeon.”

“This was very helpful. I think that having a perfect performance to watch would be great in knowing how to improve.”

“It strengthened my ability to communicate with my team in the OR.”

“The tissue planes were strange at first, having never operated on simulated humans. Still, once I got the hang of it, I was fine.”
CONCLUSIONS

• We have successfully integrated VHs with a simulated laparotomy model to teach/assess communication/teamwork and psychomotor skills.

• Participant performance demonstrates a need for deliberate practice with feedback in correctly performing a surgical time out and a laparotomy with an incorrect sponge count for surgical residents and faculty.