Development of a Simulation Ventral Hernia Repair Curriculum using the AWSSOM – a synthetic Abdominal Wall Surgical Skills Operational Model

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BACKGROUND

- Ventral hernias are a common complication following abdominal surgery
- 300,000 ventral hernia repairs occur in the U.S. and account for 3 billion dollars in health care costs annually
- Currently there is no cost-effective dedicated ventral hernia simulation training for general surgery residents
- Cadaver-based curricula can cost $1500-2000 per cadaver alone, not including facility maintenance
- We sought to create and implement a basic and advanced ventral hernia repair simulation curriculum using a cost-effective and easily reproducible novel abdominal wall reconstruction model (the AWSSOM) shown in Figures 1 and 2.

METHODS

- A curriculum was created with the following cognitive and psychomotor objectives:
  - Correct identification of the abdominal wall layers and neurovascular structures
  - Classification of types of ventral hernia repairs
  - Differentiation of distinct repair techniques with mesh placement
  - Performance of an onlay, sublay/retrorectus, and underlay ventral hernia repair with mesh
- Curriculum layout and instructional strategy:
  - Pre-curriculum quiz and reported self confidence
  - Interactive lecture-based discussion
  - Dedicated hands-on simulation skills practice
  - Psychomotor assessment (Figure 3)
  - Post-curriculum quiz and reported self confidence (Figure 4)

FIGURES



Figure 1. AWSSOM Model Before and After Procedure Performance

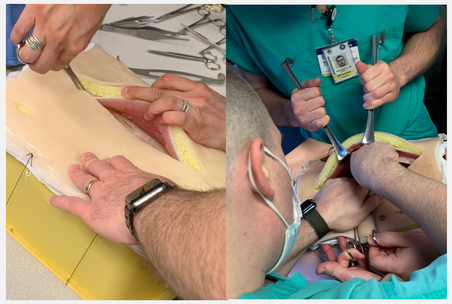
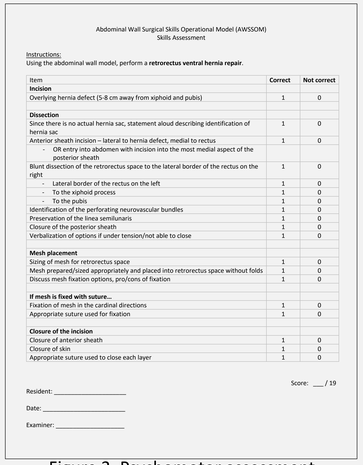


Figure 2. AWSSOM Model during Pilot Curriculum



Abdominal Wall Surgical Skills Operational Model (AWSSOM)
Skills Assessment

Instructions:
Using the abdominal wall model, perform a **retrorectus ventral hernia repair**.

Item	Correct	Not correct
Incision		
Overlying hernia defect (5-8 cm away from xiphoid and pubis)	1	0
Dissection		
Since there is no actual hernia sac, statement aloud describing identification of hernia sac	1	0
Anterior sheath incision – lateral to hernia defect, medial to rectus	1	0
- OR entry into abdomen with incision into the most medial aspect of the posterior sheath		
Blunt dissection of the retrorectus space to the lateral border of the rectus on the right	1	0
- Lateral border of the rectus on the left	1	0
- To the xiphoid process	1	0
- To the pubis	1	0
Identification of the perforating neurovascular bundles	1	0
Preservation of the linea semilunaris	1	0
Closure of the posterior sheath	1	0
Verbalization of options if under tension/not able to close	1	0
Mesh placement		
Sizing of mesh for retrorectus space	1	0
Mesh prepared/sized appropriately and placed into retrorectus space without folds	1	0
Discuss mesh fixation options, pro/cons of fixation	1	0
If mesh is fixed with suture…		
Fixation of mesh in the cardinal directions	1	0
Appropriate suture used for fixation	1	0
Closure of the incision		
Closure of anterior sheath	1	0
Closure of skin	1	0
Appropriate suture used to close each layer	1	0

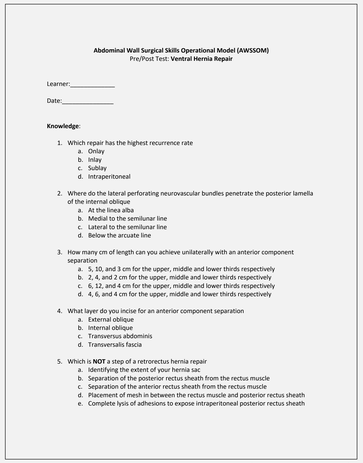
Score: ___ / 19

Resident: _____

Date: _____

Examiner: _____

Figure 3. Psychomotor assessment



Abdominal Wall Surgical Skills Operational Model (AWSSOM)
Pre/Post Test: **Ventral Hernia Repair**

Learner:_____

Date:_____

Knowledge:

1. Which repair has the highest recurrence rate
   a. Onlay
   b. Inlay
   c. Sublay
   d. Intraperitoneal
2. Where do the lateral perforating neurovascular bundles penetrate the posterior lamella of the internal oblique
   a. At the linea alba
   b. Medial to the semilunar line
   c. Lateral to the semilunar line
   d. Below the arcuate line
3. How many cm of length can you achieve unilaterally with an anterior component separation
   a. 5, 10, and 3 cm for the upper, middle and lower thirds respectively
   b. 2, 4, and 2 cm for the upper, middle and lower thirds respectively
   c. 6, 12, and 4 cm for the upper, middle and lower thirds respectively
   d. 4, 6, and 4 cm for the upper, middle and lower thirds respectively
4. What layer do you incise for an anterior component separation
   a. External oblique
   b. Internal oblique
   c. Transversus abdominis
   d. Transversalis fascia
5. Which is **NOT** a step of a retrorectus hernia repair
   a. Identifying the extent of your hernia sac
   b. Separation of the posterior rectus sheath from the rectus muscle
   c. Separation of the anterior rectus sheath from the rectus muscle
   d. Placement of mesh in between the rectus muscle and posterior rectus sheath
   e. Complete lysis of adhesions to expose intraperitoneal posterior rectus sheath

Figure 4. Cognitive Assessment (abbreviated)

RESULTS

- AWSSOM Simulator Cost
  - One-time cost of the AWSSOM frame - $137
  - Cost of materials to create the AWSSOM = $37
  - Total time in hours to create the AWSSOM = 65
- Pilot Study of the AWSSOM Curriculum
  - 13 general surgery resident learners
  - Average increase in test score = 23%
  - Average increase of 2.3 in self reported confidence for ventral hernia related skills on a 5-point Likert scale

CONCLUSIONS

- We created a simulation curriculum for ventral hernia repair with mesh using consensus guidelines across governing societies
- Through a pilot study we were able to see an increase in both knowledge and self reported confidence intervals following curriculum implementation
- Additional curriculum implementation is needed across a greater range of learners to assess overall effectiveness in cognitive and psychomotor development

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