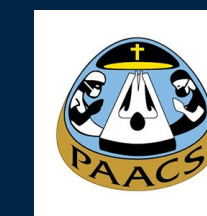


VALIDATION OF PERFORMANCE MEASURES OF LAPAROSCOPIC SALPINGOSTOMY USING A NOVEL LOW-COST ECTOPIC PREGNANCY SIMULATOR

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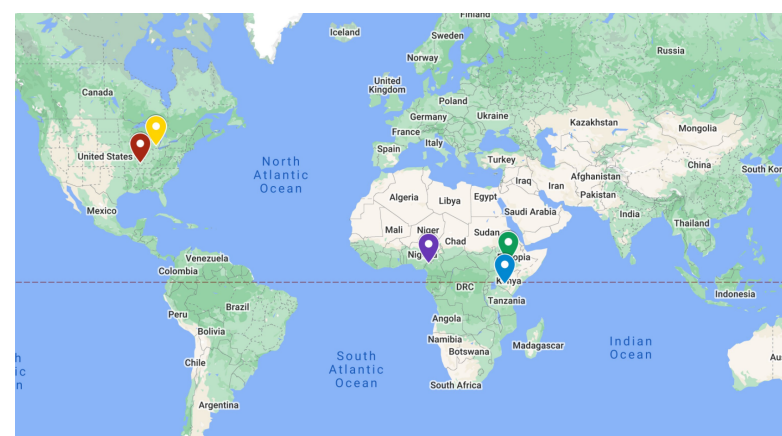
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Background

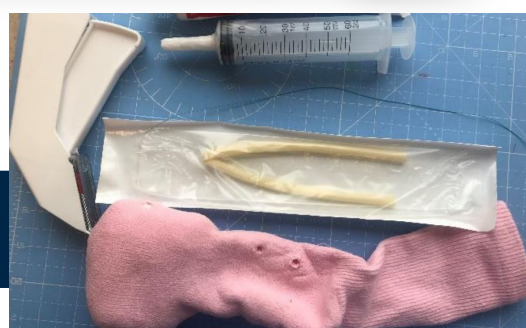
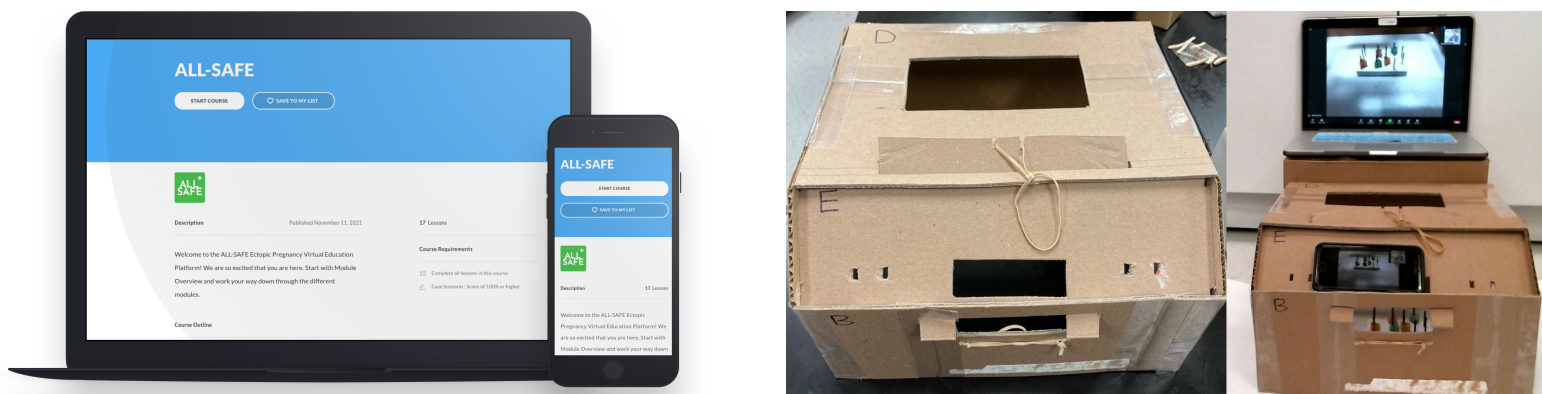
Background on ALL-SAFE

ALL-SAFE is a collaboration of investigators from the US and Sub-Saharan Africa at the sites seen on the map with a shared goal is to create a platform that will help surgeons and surgery residents in resource-constrained settings learn how to perform laparoscopy safely without the presence of a teacher and without special equipment.



The Need

Laparoscopic skills have been shown to improve with simulation-based training. We developed a low-cost simulator to teach technical skills required to perform laparoscopic salpingostomy. Learners viewed an annotated video of an expert performing the procedure in the simulator and then uploaded a video of their own performance. To validate technical skills performance assessment, participants reviewed and rated one another's deidentified videos using a novel checklist of key technical components created by ALL-SAFE (African Laparoscopic Learners for Safe Advancement for Ectopic Pregnancy).



Methods

Participants' (11 novices and 7 experts) performances were digitally recorded and uploaded. A total of 10 de-identified videos (5 novices and 5 experts from each site) were randomly selected. Participants (n=12) independently rated these videos using the ALL-SAFE dichotomous checklist of 8 key tasks (2=Done, 0=Not done) and 3 critical errors (3=Error avoided, 0=Error), a 5-item modified OSATS scored on 5-point scales, and a 3-point overall "Final Rating". Using current Standards we evaluated a) the tools' summed scores' utility at discriminating between novice and expert performances (Kruskal-Wallis), b) inter-rater agreement of novice (n=7) versus expert (n=5) ratings (ICC), and c) the correlation between the checklist and m-OSATS summed scores (Pearson r).

ALL-SAFE Laparoscopic Salpingostomy: Psychomotor Skills Assessment			
Tasks	Y	N	Comments
Evaluates both fallopian tubes by pointing to both with an instrument			
Stabilizes involved fallopian tube by grasping adjacent to ectopic pregnancy site			
Avoids excessive grasping of fallopian tubes			
Creates a longitudinal salpingostomy			
Extends salpingostomy to encompass length of ectopic pregnancy			
Avoids transecting involved fallopian tube			
Avoids damaging mesosalpinx when performing the salpingostomy			
Evacuates at least 80% of ectopic contents from tube			
Retrieves specimen from abdomen with laparoscopic instrument			
Places single suture at marked edge of fallopian tube			
Performs intracorporeal knot with a surgeon's knot followed by two additional throws			
Cuts suture			

Global					
Respect for Tissue	1 Frequently used unnecessary force on tissue or caused damage by inappropriate use of instruments	2	3 Careful handling of tissue/occasionally caused inadvertent damage	4	5 Consistently handled tissue appropriately with minimal damage
Economy of Time and Motion	1 Many unnecessary / disorganized movements	2	3 Organized time / motion, but some unnecessary movements	4	5 Economy of movements and maximum efficiency
Instrument Handling	1 Repeatedly made tentative or awkward moves with instruments	2	3 Competent use of instruments/occasionally appeared stiff or awkward	4	5 Fluid moves with instruments and no awkwardness
Flow of Operation	1 Frequently stopped operating and seemed unsure of next move	2	3 Demonstrated ability for forward planning with steady progression of operative procedure	4	5 Obviously planned course of operation with effortless flow from one move to next
Overall Performance	1 Undeveloped	2 Developing	3 Competent	4 Skilled	5 Master
Final Rating: Does this participant demonstrate competency? (choose only one)		Other Summative Comments:			
Yes		Borderline	No		

The ALL-SAFE checklist discriminated novice (Mn=21.8,SD=2.8) from expert (Me=23.5,SD=1.9), regardless of judge expertise, P=0.001, as did the m-OSATS (Mn=36.8, SD=6.7; Me=42.1, SD=5.4), P=.01. Inter-rater agreement across novice and expert judges was estimated (ICC =|.88,.95|,CI=|.79,.97|). Findings indicated a strong positive correlation between summed ALL-SAFE checklist and m-OSATS scores, r(114)=.534, P=.0001, and with Final Rating, r(114)=.76, P=.0001.

Results

Preliminary evidence supports use of the ALL-SAFE checklist and m-OSATS tool for laparoscopic salpingostomy skills training and performance assessment. The tool can reliably distinguish novice from expert surgeons. Additionally, inter-rater agreement was demonstrated across novice and expert judges, alleviating the need for expert review and scalability concerns.

Table 1. Validity evidence relevant to internal structure. Comparison of novice v. expert performance ratings

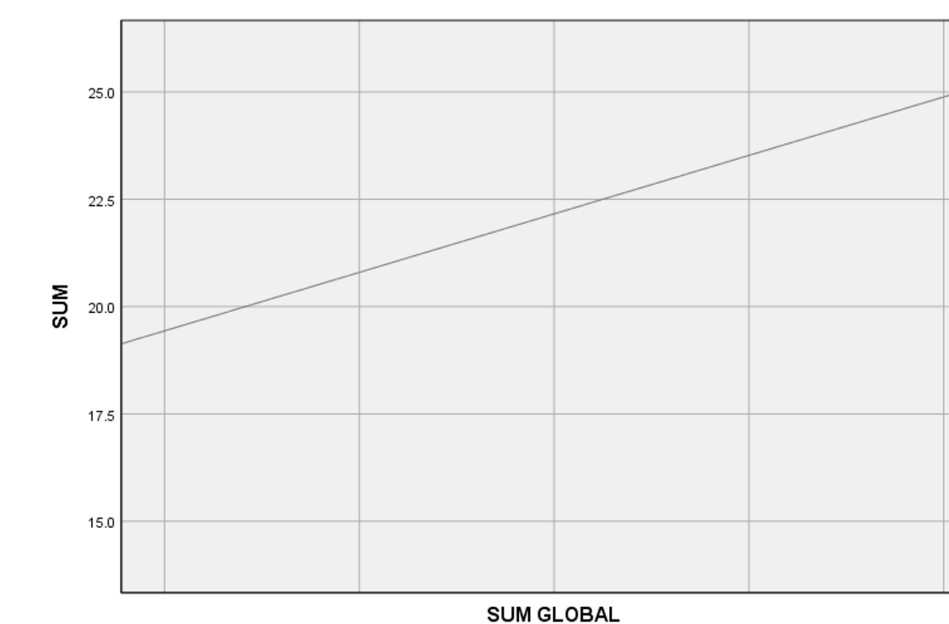
Tool	Novice Mean (SD) Combined All Raters	Experts Mean (SD) All Raters	P-value	Novice Mean (SD) Combined Expert Raters Only	Experts Mean (SD) All Raters Expert Raters Only	P-value
Checklist Summed	21.79 (2.81)	23.50 (1.88)	.001	21.65 (2.84)	24.04 (1.33)	.002
m-OSATS Total	14.75 (4.83)	18.79 (4.51)	.01	14.57 (5.27)	18.96 (4.16)	.006
Checklist + m-OSATS Total	36.79 (6.67)	42.13 (5.37)	.01	36.22 (7.47)	43.00 (4.46)	.001
Final Rating	2.30 (.78)	2.75 (.51)	.01	2.22 (.85)	2.83 (.49)	.006

Table 2. Validity evidence relevant to internal structure. Rater agreement across novice and expert judges

item	Domain	ICC	95% Confidence Interval
Checklist			
-	Checklist Summed	.96	.85 - .95
Global			
1	Respect for Tissue	.90	.70 - .90
2	Economy of Time and Motion	.90	.83 - .95
3	Instrument Handling	.90	.82 - .94
4	Flow of Operation	.89	.80 - .94
5	Overall Performance	.77	.58 - .87
GLOBAL SUMMED		.93	.88 - .96
TOTAL SUMMED		.95	.91 - .97
Final Rating		.88	.79 - .94

Conclusion

Figure 1. Validity evidence relevant to relationships to other variables. Correlation of summed checklist scores (SUM) with summed m-OSATS scores (SUM GLOBAL) estimated by Pearson's r



Because this research demonstrates that novices are as reliable as experts in rating ectopic salpingostomy simulation surgeries in the ALL-SAFE box trainer, we plan to use learners as peer graders in an ectopic pregnancy educational platform. This platform is open-access to all but specifically geared for surgical learners in low-income countries. Each learner will upload a video of themselves performing the procedure in the ALL-SAFE box trainer, and another learner/peer will rate their performance. The creates a sustainable way for surgical learners across the globe to receive free, timely, and accurate feedback that they can translate clinically. This concept of peer-to-peer rating is being studied by our team with other simulation procedures.

