



# MP01-06 - Development of a technical checklist for the assessment of suturing in robotic simulation

**Ahmad Guni<sup>1</sup>, Nicholas Raison<sup>2</sup>, Ben Challacombe<sup>3</sup>, Shamim Khan<sup>2</sup>, Prokar Dasgupta<sup>2</sup>, Kamran Ahmed<sup>2</sup>**  
<sup>1</sup>GKT School of Medical Education, King's College London, London, UK, <sup>2</sup>Division of Transplantation Immunology & Mucosal Biology, Guy's Hospital, MRC Centre for Transplantation, King's College London, London, UK, <sup>3</sup>Department of Urology, Guy's and St Thomas', NHS Trust, London, UK

## Introduction

- Simulation is a key training tool that facilitates training outside of the operating room (OR).
- It is recommended that robotic surgeons practice outside the OR, particularly in the initial error-prone phase of the learning curve.
- Training tools require objective forms of assessment to evaluate trainees.
- Checklists form an important component of surgical skills assessment.
- The Global Evaluative Assessment of Robotic Skills (GEARS) is the gold standard for assessing skills in robotic surgery, but there are no recognised checklist scoring systems.

## Objective

- The purpose of this study was to develop and validate a checklist for evaluating suturing in robotic surgery.

## Methods

- Participants performing a urethrovesical anastomosis were evaluated to construct a checklist with needle driving and suturing components.
- Key suturing procedural steps were identified from a review of expert videos.
- Observing novice videos allowed identification of further technical steps and common errors.
- 22 novices and 13 experts were marked on needle driving.
- 18 novices and 10 experts were assessed on knot tying.
- Validation was undertaken by comparison with the GEARS score.

## Results

### Reliability

- The internal consistency of the preliminary checklist was high (Cronbach's alpha = 0.870 for needle driving items, and 0.736 for knot tying items).
- After removal of poorly correlating items, the final checklist contained 32 items (Table 1).

### Construct Validity

Figure 1: Needle driving scores for novices and experts evaluated

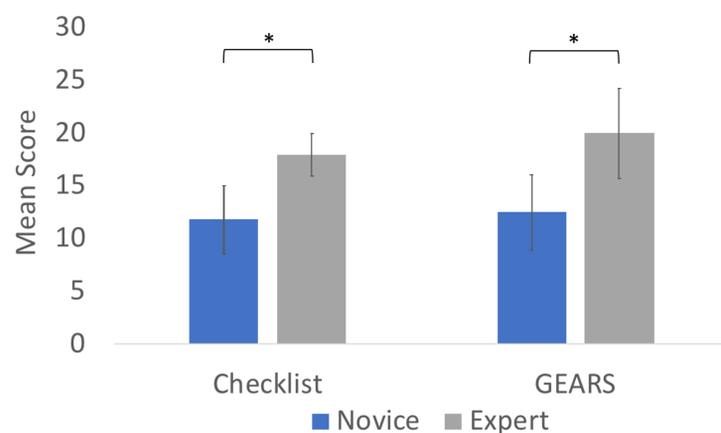
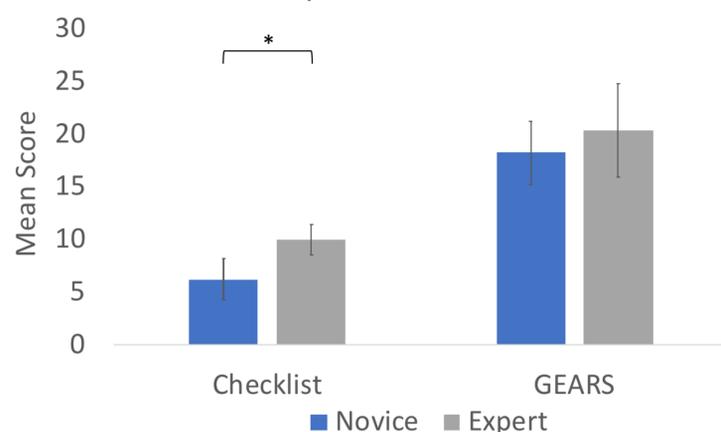


Figure 2: Knot tying scores for novices and experts evaluated



Needle Driving	Criteria	Attempts	1	0
1	Needle loaded at ½ to ⅓ from needle driver tip	1		
2		≤ 2		
3		≤ 3		
4	Needle inserted at 90°	± 10°		
5		± 20°		
6	Points of entry	1		
7		≤ 2		
8	Needle driven through in one movement			
9	Needle pulled out along its curve			
10	Stabilisation of tissue			
11	Injuries to tissue in process of needle driving	0		
12		≤ 1		
13		≤ 2		
14	No instrument clashes			
General				
15	Piercings same distance from each other			
16	Camera view centred			
17	No suture entanglement			
18	Continuity/no hesitation			
19	Competent use of both hands			
20	Progression			
Knot Tie				
21	Instruments positioned with correct C or reverse C loop			
22	Thread wrapped around needle driver (once or twice according to technique)	1		
23		≤ 2		
24	Short tail of thread is pulled completely through loop in one smooth motion			
25	For all subsequent knots, reverse of prior C loop formed			
26	For all subsequent knots, thread wrapped around needle driver (once or twice according to technique)	1		
27		≤ 2		
28		≤ 3		
29	For all subsequent knots, short tail of thread is pulled completely through loop in one smooth motion			
30	All throws squared			
31	Needles cut from thread			
32	No injuries to tissue in process of knot tying			

Table 1: Final checklist used for validity analysis

## Results (continued)

- Both the needle driving and knot tying categories significantly discriminated between novices and experts,  $p < 0.005$  (Figures 1 & 2).
- GEARS demonstrated construct validity for needle driving, but it could not significantly differentiate between novices and experts for knot tying,  $p = 0.286$  (Figure 1 & 2).

### Concurrent Validity

- The needle driving category significantly correlated with the corresponding GEARS scores ( $r_s = 0.613$ ,  $p < 0.005$ ).
- The correlation for knot tying was insignificant ( $r_s = 0.296$ ,  $p = 0.127$ ).

## Conclusions

- This study reports the development of a new assessment tool for evaluating suturing skills in robotic surgery, and demonstrates reliability and validity.
- The correlation for knot tying was insignificant, but the GEARS score was not able to discriminate significantly between experts and novices.
- Checklists are an unambiguous measure of performance and are easy to use, while global rating scales require more judgement.
- Although the study primarily assessed a UVA, the items in the checklist are designed to be general enough to be applied to any suturing procedure in robotics as they all follow the same fundamental steps.
- There is scope to use the checklist in both assessing trainees, as well as in surgical education research.