5G-assisted remote guidance in laparoscopic simulation training based on 3D printed dry lab models

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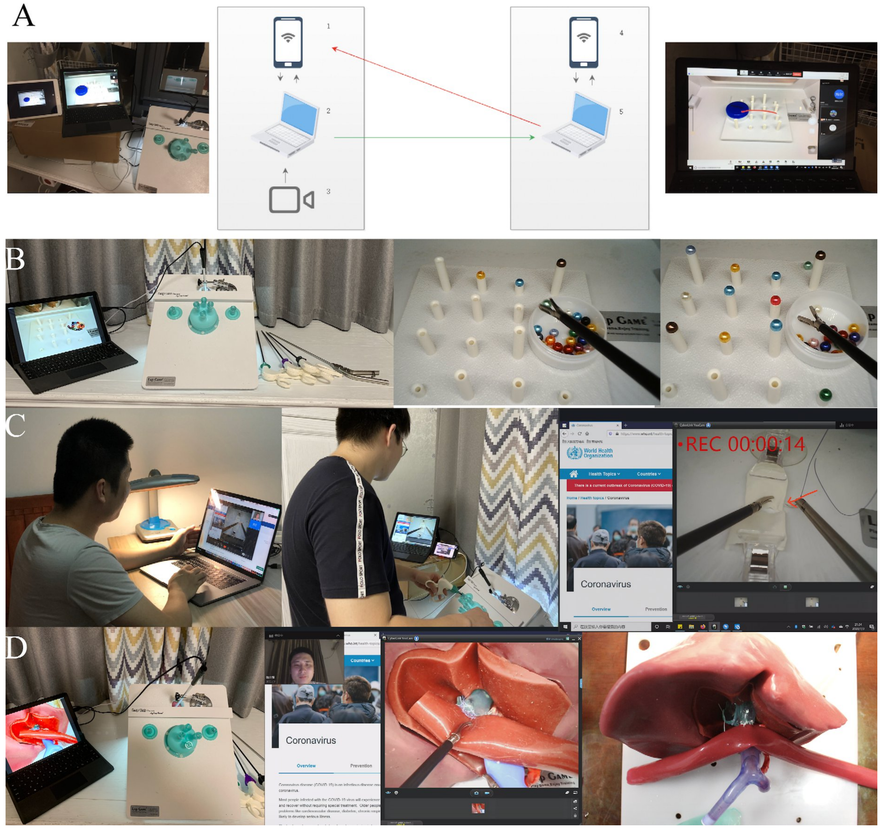


Figure1 Network settings and the training tasks. A Network and equipment for 5G-assisted remote guidance procedures. **B** The basic task 1 was to clamp 14 beads to staggered piles using laparoscopic instruments. **C** The basic task 2 was to suture the pre-cut latex gloves using laparoscopic instruments. **D** The model task was to practice choledochjejunostomy using the 3D printed dry lab models using laparoscopic instruments.

OBJECTIVES This study aimed to provide a preliminary attempt of 5G-assisted remote guidance in laparoscopic simulation training. **METHODS** A junior surgeon was recruited as the operator to complete three rounds of tasks (basic task 1, basic task 2 and model task), with all performances recorded for evaluation. The operator completed each task three times. All tasks, except for basic task 1, were completed under guidance by a remote instructor of an more experienced surgeon using 5G technology. Tasks completion time and a 30-point Objective Structured Assessment of Technical Skills (OSATS) score were utilized to assess the results of simulation training. **RESULTS :** All remote guidance processes were completed smoothly without significant network latency. Through basic task 1, the operator was quickly familiar with the trained laparoscopic instruments. For basic task 2, the OSATS score was increased from 16 points to 24 points, and the completion time was shortened from 1500 seconds to 986 seconds after training under 5G-assisted remote guidance. For the model task, the OSATS score was improved from 15 points to 26 points and the completion time was reduced from 1734 seconds to 1142 seconds. **CONCLUSIONS:** The 5G-assisted remote guidance in laparoscopic simulation training may be feasible and may have certain training effectiveness.

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