Robotic simulation: validation and qualitative assessment of a general surgery resident training curriculum

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Background

- The frequency of robotic surgery has increased, leading to a need for general surgery residency programs to implement a robotic curriculum that largely incorporates simulation training.
- **The *daVinci* Skills simulation curriculum has previously been validated in the literature. The updated simulator, *SimNow*, features restructured exercises that have not been formally validated**.
- This study also consists of a **qualitative assessment that gives greater insight into the learner's experience completing the robotic curriculum**, which has never been done so in the literature.

Question

- Does the SimNow robotic simulation system demonstrate **validity**, measured by the **ability to discriminate between users of different skill levels**, for the purpose of serving as a general surgery residency **robotic simulation curriculum**?

Methods

- 18 participants in this study: **6 novice surgeons, 6 competent surgeons, and 6 expert surgeons**
- The curriculum was comprised of **5 tasks, p**articipants completed **one practice trial and three consecutive scored trials**
- **Computer-derived performance metrics** were recorded.
- The **NASA Task Load Index (NASA-TLX) survey** was used to assess subjective mental workload.
- Subjects were asked a series of open-ended **qualitative** questions regarding their experience.

Results

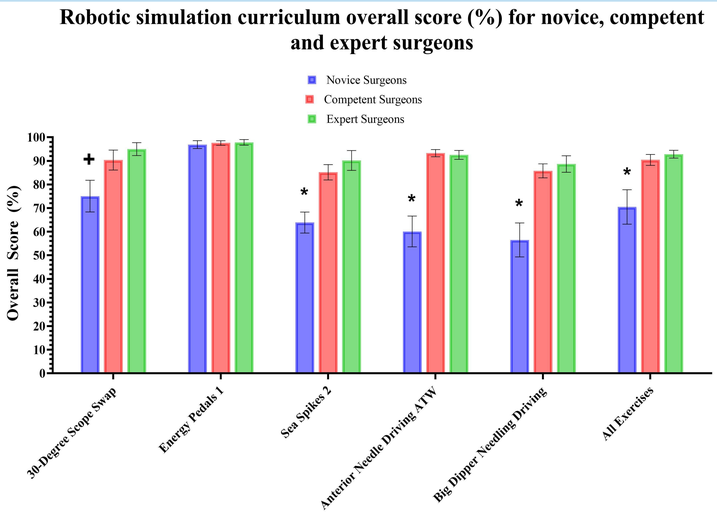


Figure 1: Average overall score (%) of each and all exercises. Asterisk (*) denotes a significant difference between novice surgeons versus all groups, $p < 0.05$. Plus (+) denotes a significant difference between novice surgeons versus expert surgeons, $p < 0.05$

- Performance metrics differed significantly in **most exercises** and were **only between novice and competent surgeons, and novice and expert surgeons (**Figure 1**)**
- **Time to completion** was significantly different for every exercise.
- The only significant score dimension from the NASA-TLX that was different between the groups was **novice vs expert surgeons' perceived level of performance**
- All groups **noted a similar experience using the robotic simulator**, with 7 major themes emerging (Figure 2)
- Competent and expert surgeons were better able to assess and critique the **clinical application** of exercises

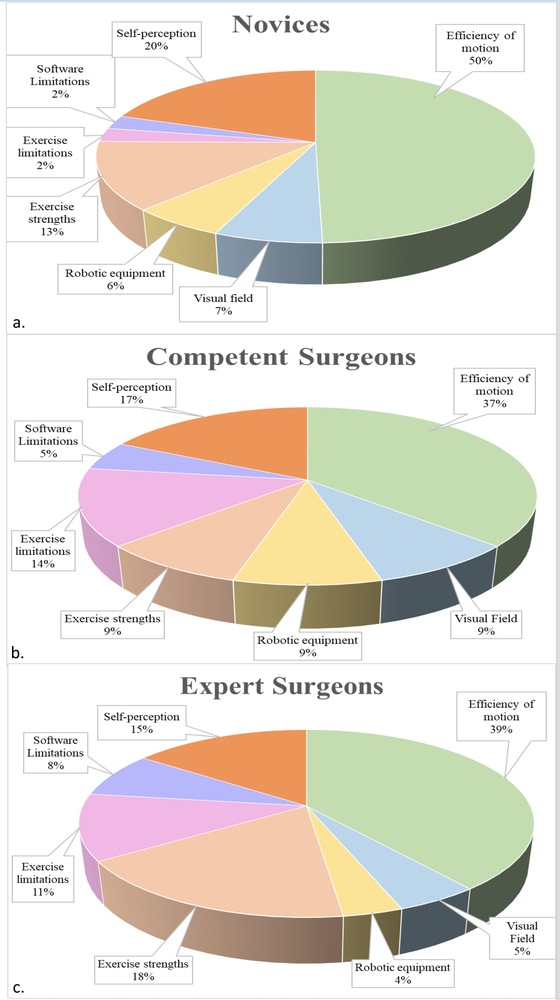


Figure 2: Frequency of 7 Significant themes regarding the robotic experience revealed through qualitative interviews with Novice (a), Competent (b), and Expert (c) surgeons.

Discussion

- **The SimNow curriculum is a valid simulation training as part of a general surgery resident robotic curriculum.**
- The curriculum distinguishes between **novices compared to competent and expert robotic surgeons**, however not between **competent and expert surgeons.**
- **Experience and overall mental workload using the robotic simulator are not affected by clinical training level**, except for competent and expert surgeons' ability to assess **clinical application** better.

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Future Work

- Future work includes applying the methods of this study in order to validate other *SimNow* curriculums, including the **Advanced Training Curriculum and Re-credentialing curriculum**.
- Future work validating these curriculums may reveal if and when the *SimNow* simulator software can **distinguish between the robotic surgical skills of competent vs expert surgeons.**

References

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