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Transferability of Technical and Non-Technical Skills Across Robotic Surgery Platforms – A Scoping Review

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ADMINISTRATIVE INFORMATION

INTRODUCTION

Review question / Objective Amongst surgeons (ranging from robotically naive to those exhibiting mastery), assessing what types of skill are and should be transferable across robotic surgical platforms. Quantifying the degree to which these skills are transferrable, and the related impacts if known on curriculum development from this.

Rationale The introduction of new robotic systems to clinical practice brings many new design variations to the console and operating systems. Though curricula have been validated, to date this has mainly been on one robotic system. Little is known about the transferability of skills across platforms.

Condition being studied Are skills and competencies transferrable across robotic surgical platforms.

METHODS

Search strategy Pubmed and Cochrane Databases. Search strategy: (transfer OR transferability OR transference) AND (robot OR robotic) AND surgery AND (skill OR competency OR proficiency OR expert OR novice OR intermediate OR master OR mastery).

Participant or population Surgeons and robotic platforms of all types.

Intervention Technical and non-technical skills or competencies.

Comparator Performance on another platform or experience of same.

Study designs to be included Randomized controlled trials, cohort studies, case–control studies, other quasi-experimental studies. White or grey literature from surgical colleges or industry.

Eligibility criteria Above. And - Data pertaining to performance of participants across two or more robotic systems; performance as tested in simulation, dry/wet lab, or in vivo; competency in either/both technical and non-technical skills. Excluded -Articles wholly not published in English; construct validation of curriculums or trainee views when dealing with a solitary robotic console; data assessing the transferability of competency in open/laparoscopic surgery to a singular robotic system; data pertaining to competency degradation or learning curve appraisal across just one robotic platform.

Information sources Randomized controlled trials, cohort studies, case–control studies, other quasi-experimental studies. White or grey literature from surgical colleges or industry.

Main outcome(s) After removal of duplicates a total of 253 papers were screened according to the eligibility criteria. 50 full text articles were reviewed, and 3 studies were eligible for inclusion. Employing manual reference harvesting one further paper was included. Surgeons with mastery of the multi-port system, regardless of single port experience performed better than novices. Multi-port experts had reduced performance compared to those with previous single-port use. Despite the higher mean single-port performance scores by experts in the multi-port console the perceived difficulty ratings were comparable with novices. Performance and cognitive load was similar for both platforms in novices. Non-statistically significant reduced time to pass in console B versus console A across all exercises except one, regardless of use as first or second console. No difference in safety metrics. Participants felt there was good overlap of skills across platforms. Robotic surgeons (with previous Da Vinci use) performed better than laparoscopic surgeons and naïve participants on the Hugo Ras console (P=0.004, P=0.002). Improvement in Versius performance metrics most notable in surgeons with extensive Da Vinci experience, moving from intermediate at initial assessment to expert competency at end of training program.

Additional outcome(s) See above.

Data management Data was extracted and grouped thematically to synthesize the above results.

Quality assessment / Risk of bias analysis Studies were appraised for methodological rigor.

Strategy of data synthesis Data was extracted and grouped thematically to synthesize the above results.

Subgroup analysis Groups were categorized where available into novice/intermediate/expert in a previous robotic platform.

Sensitivity analysis N/A.

Language restriction Articles wholly or part in English.

Country(ies) involved Ireland.

Other relevant information N/A.

Keywords Robotic surgery; transferability; skills; competency; multi-platform; across platforms.

Dissemination plans At a national surgical meeting to educate locally, and broader international dissemination via publication in a peer reviewed journal.

Contributions of each author
Author 1 - Michael Devine - Question synthesis, search strategy, data extraction, analysis, manuscript writing.
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