# A PROSPECTIVE OBSERVATIONAL STUDY ON MINIMALLY INVASIVE SURGERY SKILL ACQUISITION ACROSS NOVICE LEVELS

Elisa Reitano MD[1,2,3], Pietro Riva MD[1,3], Deborah S Keller MD[4], Maria Vannucci MD[5], María Rita Rodríguez-Luna MD[1] Alain Garcia Vazquez MD [6], Jacques Marescaux MD[1], Silvana Perretta MD[1,3].

1) Research Institute against Digestive Cancer (IRCAD), Strasbourg France; 2) Department of Translational Medicine, University of Eastern Piedmont, Italy 3) Department of General Surgery, Nouvel Hôpital Civil, CHRU-Strasbourg, Strasbourg, France

4) Department of Surgery, Lankenau Medical Center, Wynnewood PA USA; 5) Department of General Surgery, University of Turin, Turin, Italy 6) Institute of Image-Guided Surgery, IHU-Strasbourg, France

## INTRODUCTION

MIS requires specialized training and skills beyond traditional open surgery. Individual's intuitive logical capabilities, technical predisposition, problem-solving abilities could have a role in surgical skills development and success, independent of their medical exposure.

Cognitive skills are also relevant in other fields of science, such as engineering. Engineers need strong problem-solving skills, which involve using logic and developing innovative solutions to problems that have never been solved before. This study aims to address the ability to perform basic tasks using laparoscopy and robotic technologies among surgical novices with medical and non-medical background.

## METHODS

A prospective observational study was performed during the Business Engineering and Surgical Technologies (B.E.S.T.) course in August 22-26, 2022. Participants laparoscopic and robotic hands-on sessions. Laparoscopic skills were assessed according to the Laparoscopic Assessment Skills Training Testing (LASTT) and the Global Operative Assessment of Laparoscopic Skills (GOALS) Score System. One of the LASTT exercise (bi-manual coordinator) was reproposed during the robotic sessions to assess robotic skills. Global Evaluative Assessment of Robotic Skills (GEARS) Score System was used to quantify robotic skills among participants. participants on the four different robotic platforms: DaVinci X (Intuitive Surgical, Sunnyvale, CA, USA); DaVinci Si (Intuitive Surgical, Sunnyvale, CA, USA); Versius Surgical System (CMR Surgical, Cambridge, UK) and HugoTM RAS system (Medtronic, Minneapolis, MN, USA).

## RESULTS

Twenty-nine students (13 medical and 14 non-medical) attended the course. The mean age was 27.37 (SD ± 4.45), and 35.7% were female. The attendees came from 13 different countries in three different continents [ 3 (11%) from Asia, 3 from South America (11%) and 21 (77.7 %) from Europe]. The medical group performed significantly better in all LASTT exercises, reaching higher GOALS score in depth perception (p=0.008), bimanual dexterity (p=0.008), and efficiency (p=0.021) defined as the ability to maintain focus on a task and fluidly progress. In the robotic arm, no significant differences between medical and non-medical groups were observed in time to complete the tasks, depth perception, bimanual dexterity, autonomy, or robotic control with all the robotic platforms.

## CONCLUSIONS

Robotic platform can equalize learning at all experience levels with more predictable learning curves and have the potential to accelerate and democratize skills acquisition in minimally invasive surgery. Robotic platforms settled the differences in technical skills between medical and non-medical subjects.



Fig 1: Laparosco pic hands-on session



Fig 2: CMR hands-on session



Fig 3: Intuitive hands-on session



Fig 4: Hugo-RAS hands-on session