Editorial

Factors affecting the acquisition of robotic colorectal surgical skills

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We found that the article "*Structured training curricula for robotic colorectal surgery in China: does laparoscopic experience affect training effects?*" to be interesting and very informative, especially given the increased adoption of robot-assisted laparoscopic surgery (RLS) in recent years (1). Through this outcome-based, retrospective multicenter study, the authors demonstrate that the current RLS training program in China may be better suited to surgeons with more extensive laparoscopic experience. By comparison, according to this study, surgeons who have less familiarity with laparoscopic operations seem underprepared relative to their more experienced colleagues, and as a result, their cases have higher rates of complications. To rectify this, the authors propose aligning China's RLS curriculum more closely with that of Europe and the United States, by including training in robotic suturing and anastomoses, increasing surgical case variety, covering more cases overall, and implementing a standardized and more vigorous scoring system when evaluating the performance of trainees.

The authors' findings on the importance of laparoscopic experience towards the efficacy of robotic surgery learning has also been validated by others (2-4). Odermatt and colleagues documented that prior laparoscopic experience in colorectal surgery could shorten the learning curve for robotic rectal resections (2,3). Moreover, Kilic *et al.* found that surgical residents with more extensive laparoscopic experience were able to gain more insights from an initial robotic suturing experience than residents with limited laparoscopic experience (4). These results agree with the notion that a more elaborate robotic training program that considers laparoscopic aspects could improve the learning curve for new robotic surgeries. This is also supported by a review done by Chahal *et al.* which found that even in the simulated setting, successful transfer of previously learned laparoscopic skills was observed, especially when performing advanced robotic tasks (5).

However, other studies demonstrated a transfer effect for more basic tasks, and prior laparoscopic as well open surgical skills (6). More specifically, Chahal *et al.* argued that it may not be necessary to have substantial laparoscopic experience for successful skill transfer to occur, since there also appears to be a transfer effect in surgical novices who completed short laparoscopic training courses (5). For example, a study done at Michigan State University found that otherwise novice medical students with some previous laparoscopic exposure performed better in a robotic simulator test than students with no laparoscopic training, demonstrating a transference of skills from laparoscopic to robotic (7). A European study showed that robotic colorectal surgery can be adopted safely and relatively quickly by surgeons with prior laparoscopic experience following the European Academy of Robotic Colorectal Surgery (EARCS) training program (8). Their robotic training course included four major segments: (I) Case observations and theoretical learning, (II) robotic dissection training using porcine models, (III) hands-on robotic training by EARCS faculty members, (IV) competence quantification using the Global Assessments Scoring. In summary, several recent studies reported that previous operating experience of surgeons who are training for robotic colorectal surgeries is significantly important. This experience involved both open and laparoscopic colorectal surgeries (3).

On the other hand, it needs to be noted, that there are studies showing that experience in open surgeries was more helpful compared to prior training in laparoscopic procedures when learning robotic surgery by surgically naïve subjects (6). According to a study from Denmark, training in open surgery was found to be superior to laparoscopic training when transitioning to robotic surgery in a simulation setting. They found that open surgery skills might be useful to learn the economy of motion and dexterity needed to complete basic tasks in robotic surgery. These findings underscore the importance of open surgical training as part of a robotic curriculum. According to the authors, this could potentially shorten the learning curve for robotic surgery training by acquiring basic skills in open surgery simulation while saving time and money (6).

More interestingly, a prospective study by Kowalewski and colleagues documented that experience in both open and minimally invasive surgery produced a limited transferability or usefulness when acquiring and practicing robotic surgical skills (9). According to their study, learning and practicing high quality robotic assisted surgeries need very distinct skills that are different from conventional laparoscopy and open surgical procedures (9). And their findings highlight the importance of establishing rigorous training curricula specifically developed for learning and practicing various robotic surgeries that were evaluated in the paper by Shu *et al.* and others (1,10).

Backed by evidence from these studies, China's RLS curriculum may stand to benefit from modifications to account for surgeons with less laparoscopic experience. Standardized scores and the inclusion of measurable objective outcomes, with a focus on accomplishing defined tasks, are crucial to evaluating the skills of new robotic surgeons (11). This is made more difficult due to the rapid emergence of new technologies and training methods in this area but should nonetheless be incorporated to the degree possible (10).

While the use of RLS simulators is the norm for new robotic surgeons, a shift towards more realistic training, such as virtual reality (VR) simulation, and supervised cases is important to prepare them for the reality of robotic operations (10,12). Both are possible relatively early in training thanks to dual console systems, allowing the trainee to experience a real RLS operation with the safety net and guided instruction of an experienced robotic surgeon (13). As a review by Schmidt *et al.* has shown that certain skills acquired in robotic VR simulation can be transferred to the operating room (10). Furthermore, robotic surgical skills in the operating room seem to be correlating well with the performance of the surgeons using robotic VR simulation. In addition, participating in a larger number of actual robotic cases will also expose the trainee to a greater variety of patient anatomy and disease presentations, which can make encountering variations or challenging situations in solo robotic operations much easier later (11-13).

In conclusion, this is a great study about the characteristics and the results of structured training curricula for teaching robotic colorectal surgery. The requirements of the completion of at least 150 robotic cases make these curricula especially practical and strong. The experience with cadaver surgical training can be made more specific and detailed. Additionally, the incorporation of robotic VR simulation with extensive training would make the curricula even better. In addition to the above points, the conclusions of the paper are insightful regarding the need for further refinement of the program. In future studies, the comparative analysis could be made more robust by including more surgeons and a broader selection of different types of colorectal surgeries. Overall, the paper points our attention in the right direction regarding the best achievable training for all kinds of robotic procedures in the field of colorectal surgery.

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Footnote

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