Surgical Trainee Experience with Open Cholecystectomy and the Dunning-Kruger Effect

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BACKGROUND: Laparoscopic cholecystectomy has become the standard approach to gallbladder surgery, but open cholecystectomy retains a role in complex cases.

AIMS: The aim of this study was to evaluate exposure of senior trainees in general surgery to open cholecystectomy and their experience and confidence in independent performance.

METHODS: General surgical trainees on a higher surgical training programme from surgical training years 5 (ST 5) to 8 (ST8) were invited to partake in an online anonymous survey. Data pertaining to case numbers, whether supervised or independently performed and level of comfort were collated and analyzed.

RESULTS: Twenty-six of 40 trainees responded (65%). Twenty-one (81%) had performed over 40 laparoscopic cholecystectomies with their trainer either scrubbed or un-scrubbed in theatre. As to open cholecystectomy experience, 12 trainees had assisted in 5 or fewer cases and only 3 assisted in over 20; 17 (65%) had performed 2 or fewer cases whilst assisted by their trainer while 24 of 26 trainees (92%) had no independent experience of open cholecystectomy. However, 16 felt they would be "somewhat comfortable" and 2 reported feeling "very comfortable" while only 8 reported they were "not comfortable" converting to open cholecystectomy.

CONCLUSIONS: This study confirms a steep decline in training opportunities in open cholecystectomy, but also raises concern about a Dunning-Kruger effect as, despite this lack of experience, the majority felt "somewhat comfortable" or "very comfortable" in converting to open surgery. Trainees need first to be familiar with safer alternatives to conversion. Surgical trainers need to consider the assessment of confidence as well as competence as an endpoint of trainee evaluation. (J Surg Ed 77:1076–1081. © 2020 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: Open cholecystectomy, Surgical training, Dunning Kruger

COMPETENCIES: Medical Knowledge, Practice-Based Learning and Improvement, Systems-Based Practice

INTRODUCTION

Laparoscopic cholecystectomy has replaced the open approach, becoming the "gold standard" treatment of symptomatic gallstone disease since its introduction in the late 1980s.[1] This cultural change is supported scientifically in the literature and in clinical practice with the appeal of less pain, shorter length of stay and an overall quicker recovery.[2] The rate of intraoperative conversion to an open cholecystectomy, however, still ranges from 1% to 15% and is mainly reserved for the "impossible gallbladder" which the operating surgeon cannot complete laparoscopically.[3-5] The current Tokyo Guidelines advise conversion to open as the first option when laparoscopic progression proves impossible, with partial cholecystectomy and cholecystostomy as further options,[6] none of which are easy for the surgeon with limited experience.

While open cholecystectomy remains a reliable "gold-standard" bailout procedure for complicated cases,[5,7] it's decreasing frequency in clinical practice is likely to prove problematic in surgical training. This presents a concerning gap in the surgical expertise of modern day trainees whereby fewer surgeons will have experience of a technique that is principally reserved for more difficult cases.[5] Combined with a growing concern about the competencies of general surgery residents and

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trainees entering independent consultant positions within Europe and North America, this obvious dilemma in training surgeons in open biliary surgery will likely continue and impact further on confidence and competence of trainees going forward.[8-10] The lack of experience at a trainee level is also likely to further complicate surgical practice at consultancy. A recent study of general surgery consultants and trainees from all levels found that only 40% of new consultants had performed more than 10 cholecystectomies during their training while 11% performed more than 20.[11] For these reasons, we hypothesize that only a small number of the current trainees may be appropriately exposed to open cholecystectomy and, therefore, competent in performing these cases independently. The primary aim of the current study is to determine the level of exposure, experience and confidence levels of senior general surgical trainees with open cholecystectomy.

METHODS

Survey Participants

Surgical trainees affiliated with the Royal College of Surgeons in Ireland (RCSI) were invited via email to participate in an online survey. This study model was chosen for ease of dissemination, cost effectiveness and to maintain the anonymity of respondents. A "run-through" stream-lined training pathway was introduced by the Royal Colleges, taking effect since 2013. In the "new" pathway, trainees complete 2 years of core surgical training (ST1 and ST2) before applying to a higher surgical training (HST) programme in general surgery, composed of 6 further years in clinical practice.[12] This has moved from the traditional training pathway of 2/3-years in basic surgical training in addition to several "gap-years" prior to the HST application.[13] The current programme consists of a defined curriculum pertaining to general surgical knowledge and attitudes and requires trainees to rotate through several level 3 and level 4 hospitals within the Republic of Ireland.[14] Recipients of the survey email were surgical trainees from training years 5 to 8 (ST5 - ST8) enrolled in the general surgical programme within the Republic of Ireland under the auspices of RCSI. We specifically targeted more senior trainees who were likely to operate more independently in a clinical setting and, consequently, include trainees from both the "new" run-through and "old" training scheme.

Survey Design

The survey was designed using an online application (Survey Monkey, Inc. Seattle, WA. http://www.surveymonkey.com) and was limited to 8 questions in an effort to avoid the phenomenon of respondent fatigue,[15] focusing on individual experiences and exposure to open cholecystectomy throughout their training years. The last question used a 3-point Likert scale to determine trainee comfort level in independent operative performance. Data collection was open from March 9th to July 9th 2019 to correlate with the end of the hospital training rotation prior to the nonconsultant hospital doctor (NCHD) changeover. The survey was sent to trainee institutional emails by the speciality training administrator for general surgery in RCSI with a second reminder sent to trainees 2 weeks prior to survey closing. No information identifying individual trainees, trainers or specific training units was collected and data were summarized using percentages to describe responses. Due to the anonymity and voluntary nature of the survey, registration with the ethics committee was not required based on the online National Research Ethics Service decision tool.[16]

RESULTS

Trainee Demographics

Twenty-six out of 40 trainee surgeons from ST 5 to ST 8 completed the online questionnaire while the survey was live (response rate of 65%). Fourteen of the trainee respondents were of the "old" pre - 2013 training scheme with the remaining 18 passing through the new streamlined training pathway. Sixty-two percent of respondents ($n = 16$) completed at least one 6-month rotation in either an upper gastrointestinal (UGI) or hepatobiliary and pancreatic (HPB) surgical department during their general surgical training. The remaining 10 trainees reported that they did not rotate through a specific UGI or HPB surgical post during their training.

Laparoscopic Cholecystectomy Experience

With regard to the number of laparoscopic cholecystectomies performed by trainees from ST5 to ST8 with their respective trainer either scrubbed or un-scrubbed in theatre, 7 trainees reported taking the lead in performing over 80 procedures; 9 report performing between 40 and 60 procedures, and 8 performed over 20 procedures. Only 2 trainees performed fewer than 20 laparoscopic cholecystectomy cases. Table 1 displays the laparoscopic procedural numbers reported by trainees in the survey.

Open Cholecystectomy Experience

When asked how many open cholecystectomies they had assisted at, 12 trainees (46%) assisted at 5 or fewer open cholecystectomy cases during their training and

TABLE 1. The Number of Laparoscopic Cholecystectomies Performed by Trainee (Trainers were either Scrubbed on Unscrubbed in Theatre at the Time of Surgery)

Number of Laparoscopic Procedures Performed by Trainee	Number of Trainees (*n*)
<20	2
20-40	3
40-60	9
60-80	5
>80	7
Total	**26**

TABLE 2. The Number of Open Cholecystectomies Trainee Assisted their Trainer with

Number of Open Procedures Trainee Assisted with	Number of Trainees (n)
≤ 5	12
6-8	6
9-15	3
16-20	2
>20	3
Total	26

TABLE 3. The Number of Open Cholecystectomies Performed by a Trainee While their Trainer Assisted

Trainee Open Cholecystectomy Rate (Assisted by Trainer)	Number of Trainees (*n*)
≤ 2	17
3-5	7
6-15	1
>16	1
Total	26

only 3 reported assisting their trainer with over 20 open cholecystectomy procedures (Table 2).

When asked to quantify the number of open cholecystectomies they had performed as the lead surgeon, with their trainer assisting them, the majority ($n = 17$) led an open cholecystectomy case in 2 or fewer instances with only 2 trainees performing more than 6 cases, assisted by their trainer, one of whom reported leading over sixteen cases whilst also assisted by a trainer (Table 3).

When asked about the numbers of open cholecystectomies that they had independently performed 24 (92.3%) have never performed an open cholecystectomy on their own (Table 4). Two trainees reported independent experience with open cholecystectomy; 1 trainee having performed 4 cases while a second trainee reported performing 1 case.

TABLE 4. The Number of Open Cholecystectomies Trainees Performed Independently

Number of Open Cholecystectomies Performed Independently by Trainee	Number of Trainees (n)
0	24
1-4	2
Total	26

TABLE 5. Trainee Comfort Level in Performing an Open Cholecystectomy Independently

Trainee Comfort Level	Number of Trainees (n)
Not comfortable	8
Somewhat comfortable	16
Very comfortable	2
Total	26

Trainee Confidence in Performing Open Cholecystectomy

When trainees were asked to describe their comfort level in converting a laparoscopic cholecystectomy to an open cholecystectomy while operating independently, 18 (69%) of 26 respondents describe either feeling "somewhat" or "very comfortable" converting to open cholecystectomy (Table 5). Only 8 (31%) respondents reported they were "not comfortable" with converting to open surgery.

DISCUSSION

In the era of minimally invasive surgery, laparoscopic cholecystectomy has become the standard of care for cholelithiasis and open cholecystectomy rates have declined substantially over the past 3 decades. There is, undoubtedly, a role for open cholecystectomy for challenging cases[8,9] but the issues of who should do it and how they can be trained remain to be resolved. At the beginning of the laparoscopic era, surgeons embarking on laparoscopic cholecystectomy were advised to "convert-to-open", if they encountered difficulty, as all were experienced with open cholecystectomy. Now, however, when a surgeon has difficulty proceeding with laparoscopic dissection, mainly due to an inability in identifying the contents of an inflamed Calot's triangle, "convert-to-open" may no longer be prudent advice,

despite what international guidelines advocate,[6] because so few surgeons are familiar with open cholecystectomy. In this study of senior general surgical trainees, we found, as have others[9,17,18] a mismatch in laparoscopic and open cholecystectomy experience. Most trainees have only assisted in a small number of open cases and the vast majority had never performed a case independently. Even more concerning was the fact that the majority expressed some or considerable confidence in converting to open, should the situation arise.

It is arguable that these trainees possess a very high standard of training, technical proficiency and clinical astuteness instilling a healthy level of confidence in their operative skills and in their ability to "transfer" previously learned skills and apply them to open cholecystectomy. We found that 62% of respondents had completed at least one 6-month rotation in an UGI or HPB rotation and the cases witnessed during this time may explain trainee comfort. Despite this experience, however, open cholecystectomy exposure and both supervised and unsupervised performance rates remain low. A more troubling explanation is that this may be evidence of the Dunning- Kruger effect, a phenomenon of cognitive miscalibration whereby people may overestimate their own abilities.[19,20] In such instances, a cognitive bias may exist and hinder a trainee's awareness in actual and self-perceived skill.[21] This "pseudo-security" may have important implications in compromising patient care, not just for open cholecystectomy but for many more procedures with which the trainee is unfamiliar. Paradoxically, improving trainee skill seems to be a reliable solution to re-calibrate metacognitive competence.[20,22]

While this is a preliminary investigation into trainee experiences in open cholecystectomy, it further supports the compelling evidence of the challenges of modern surgical training.[23] Graduating chief residents in the United States have reported a decrease in open cholecystectomy from 70 in the pre-laparoscopic era to a mean of 3.6 during their entire training over the past decade.[11] In the UK and Ireland, only 3.3% of laparoscopic cholecystectomies are converted to open[12] and the majority of conversions are performed by consultants. Concerns have been expressed about general surgical competency in the United States when a survey involving 254 programs reported that basic competency levels were not being achieved at residency level.[17] In addition, a study of 232 graduating residents found that only 52% were confident in performing various open procedures with minimal guidance, of which less than 60% expressed confidence in open cholecystectomy.[24] In the UK, two-thirds of consultants have also expressed deep concerns on the future standards in surgical practice as a result of current training paradigms.[25]

The rates of open cholecystectomy will likely continue to fall in the advanced era of minimally invasive, robotic and interventional radiological techniques and working time legislation may further exacerbate the current technical deficit in general surgical trainees. To address the issue, a recent publication by Buchwald recommends establishing postresidency fellowships in open surgery to further acquire the open surgical skills lacking during the early years of training.[9,26] This seems parallel with the current trend in trainees seeking additional training post residency due to feelings of unpreparedness and lack of confidence in the majority of residents upon graduating.[27,28] While an open surgery fellowship seems ideal, it is difficult to see how they might work as there are so few occasions when open cholecystectomy is required, especially in the best of centers, and in most cases these are unplanned. If difficulty is anticipated, an interventional radiological alternative may be more appropriate as it would be unethical to select patients for open surgery who are suitable for laparoscopic cholecystectomy just to benefit trainees.

As open surgery opportunities dwindle, we must first of all recognise that this is a good thing. The morbidity and mortality of conversion is substantially higher in open cases, particularly in the emergency setting.[29,30] As such, while conversion to open is necessary in some settings, both the decision and task should be performed by experienced surgeons who have encountered various anatomical anomalies and challenges in the open setting. Most of the surveyed trainees feel "comfortable" proceeding with this decision, but it is unclear if they are aware of the associated risks and potential difficulties encountered in such cases as their own experience is extremely limited. This observation again alludes to a potential Dunning-Kruger effect.

In cases where laparoscopic progression is impossible, alternative "bailout" techniques can be considered by trainees inexperienced in open surgery for the "difficult gallbladder". Satisfactory patient outcomes have been described in centers experienced in subtotal cholecystectomy, a fundus-first approach and cholecystostomy.[31-33] Such procedures also require a practical level of experience and an intriguing question is whether trainees are equally as comfortable with these "more-conservative" approaches. More recently, Kharytaniuk et al. have shown that in complicated laparoscopic cases, even for the sickest patients, simply aspirating the gallbladder contents allows the inflammation to settle and laparoscopic cholecystectomy can safely be performed in the majority 2 months later.[34] This satisfies the time-honored aphorism "ubi pus, ibi evacua" and should be regarded as "damage control surgery" which has been so successfully translated from combat zones to civilian practice in recent years for the most complex injuries.[35,36] If the surgeon anticipates difficulty at a subsequent laparoscopy the

patient can be referred to a surgeon or centre with a specialist interest.

Trainees seeking fluency in specialized skills have always gravitated to where they can get hands-on experience in high volume centers. As laparoscopic surgery is unavailable to 80% of the world's population[37] it would be worth considering a fellowship to one of these, often low-income, countries where expertise in open cholecystectomy is retained. This could combine the opportunity to gain invaluable open surgical experience while reciprocating by training local surgeons in more advanced techniques. High quality simulation and access to a video archive of open surgery are a further invaluable adjunct. But the drastic reductions in numbers of open opportunities, reduced working hours and increased specialization all conspire to ensure that only a limited number of surgeons can be fluent in open cholecystectomy in the future.

We acknowledge some limitations of the current study. Firstly, there are well documented challenges in survey questionnaires and data collection relating to several selection and response biases inherent to this method, combined with the phenomenon of survey fatigue. Secondly, while our participant number is small, it is reflective of the current trainee pool especially since the survey was limited to senior trainees to capture reliable and accurate experiences with a complex procedure. Larger multicentre studies are further warranted to verify our findings and may further inform surgical training structures and realistic trainee and trainer experiences.

In conclusion, our findings confirm the difficulty that surgical trainees are having in getting experience in open cholecystectomy but also raises concerns of the Dunning-Kruger phenomenon of a cognitive bias in which they mistakenly overestimate their ability. Trainees need first to be aware of and experienced in simpler and safer alternatives for the impossible gallbladder such as a damage control procedure, obviating the need for conversion. In addition, trainers need to assess confidence as well as competence as training endpoints so that mismatch is not overlooked.

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