

Minimally Invasive Surgery Training in the Caribbean – A Survey of General Surgical Residents and Their Trainers

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ABSTRACT

Background: There has been debate on the feasibility of incorporating minimally invasive surgery (MIS) into surgical practice in developing countries due to resource and training limitations. Our study establishes the current and desired state of MIS training in surgical residency programmes in the Caribbean.

Methods: An adapted version of a previously administered questionnaire was issued to surgeons and residents involved in the general surgical residency programme of The University of the West Indies in Barbados, Jamaica and Trinidad and Tobago. Data were analysed using the Statistical Package for the Social Sciences, version 17.0.

Results: The questionnaire was sent to 41 surgeons and 41 residents with a 65% response rate. Most residents had performed less than 25 basic laparoscopic procedures. Up to 82% of residents felt that they would be unable to perform advanced laparoscopic procedures due to lack of training. The principal negative factors influencing MIS training included lack of operating room time, lack of equipment and lack of preceptor expertise. Both surgeons (83.4%) and residents (93.4%) strongly felt that a surgical skills laboratory would be helpful for the acquisition of MIS skills. Both surgeons (85.7%) and residents (100%) felt that there was a role for an MIS surgeon in fulfilling training obligations.

Conclusion: The basic and advanced MIS experience of residents in the Caribbean is limited. Surgeon training and resource limitations are major contributing factors. There is a strong desire on the part of surgeons and residents alike for the incorporation of more effective MIS training into the residency programme in the Caribbean.

Keywords: Caribbean, developing, laparoscopy, residents, survey, training.

Entrenamiento de Cirugía Mínimamente Invasiva en el Caribe – Encuesta a los Residentes de Cirugía General y Sus Entrenadores

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RESUMEN

Antecedentes: Ha habido debates en torno a la factibilidad de incorporar la cirugía mínimamente invasiva (CMI) a la práctica quirúrgica de los países en desarrollo, debido a las limitaciones de recursos y entrenamiento. Este estudio establece cual es el estado actual y el estado deseado en relación con la CMI en los programas de residencia quirúrgica en el Caribe.

Métodos: Una versión adaptada de un cuestionario previamente aplicado fue administrada a cirujanos y residentes participantes en el programa de residencia de cirugía general del Hospital Universitario de West Indies en Barbados, Jamaica, y Trinidad y Tobago. Los datos se analizaron usando el Programa estadístico SPSS para ciencias sociales, versión 17.0.

Resultados: El cuestionario fue enviado a 41 cirujanos y 41 residentes, y se obtuvo una tasa de respuesta del 65%. La mayor parte de los residentes habían realizado menos de 25 procedimientos

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laparoscópicos básicos. Hasta un 82% de los residentes, nsentían que no serían capaces de realizar procedimientos laparoscópicos avanzados, debido a la falta de entrenamiento. Los principales factores negativos que afectaban el entrenamiento de la CMI incluían la falta de un horario para usar el salón de operaciones, la falta de equipos, y la falta de preceptores expertos. Tanto los cirujanos (83.4%) como los residentes (93.4%) sentían fuertemente que un laboratorio de habilidades quirúrgicas sería útil para el desarrollo de las habilidades de la CMI. Tanto los cirujanos (85.7%) como los residentes (100%) sentían que el papel de un cirujano debía incluir la obligación de impartir entrenamientos.

Conclusión: *La experiencia básica así como la experiencia avanzada de CMI de los residentes del Caribe es limitada. Las limitaciones en relación con los recursos y el entrenamiento a impartir por los cirujanos, es uno de los factores principales en tal sentido. Por parte de los cirujanos así como de los residentes, existe un fuerte deseo de incorporar entrenamientos más efectivos de CMI al programa de residencia del Caribe.*

Palabras claves: Caribe, desarrollo, laparoscopia, residentes, encuesta, entrenamiento

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INTRODUCTION

Minimally invasive surgery (MIS) has advanced significantly over the last three decades. Due to reduced short-term morbidity and a number of other patient-derived benefits, including reduced postoperative pain, shorter hospital stay and earlier return to normal activity, MIS has become the standard of care for many abdominal procedures (1–3). With the continuing evolution of technology to facilitate its expanded use and an increasing patient demand, there is a growing need for surgeons to acquire these skills and incorporate them into their surgical practice.

Initially, most pioneering surgeons were self-taught. The subsequent development of structured courses, faculty mentoring and fellowships to facilitate skill acquisition has allowed exponential growth in the field (4). With increasing demand and limitations in postgraduate MIS fellowship training worldwide, standards have been established to incorporate basic and advanced laparoscopic skills training into residency programmes. Currently, the Accreditation Council for Graduate Medical Education (ACGME) in the United States of America requires general surgery residents to complete a total of 60 basic laparoscopic cases, 25 advanced laparoscopic cases and 85 endoscopies prior to entry into independent practice (5). This standard has been supported by the Society of American Gastrointestinal and Endoscopic Surgeons [SAGES] (6).

There has been some debate as to the feasibility of incorporating MIS into surgical practice in developing countries due to resource limitations and training concerns (7, 8). Despite these concerns, the incorporation of MIS in these settings has been encouraged (8). Key to this evolution is the training of future surgeons. The limited availability and highly competitive nature of postgraduate fellowships (9) makes incorporation of MIS into the residency programme even more essential.

The Caribbean represents a region where the overall development of MIS has been slow, due in part to lack of

training. As the incorporation of MIS into residency training in the Caribbean has cost and resource implications, it is important to determine the interest of surgeons and residents in participating in MIS resident training as well as the potential barriers to be faced. This is an essential part of ensuring the success of such a programme. Our study serves to establish the current and desired state of MIS training in surgical residency programmes in the Caribbean through a survey of general surgical residents and the general surgeons who train them.

SUBJECTS AND METHODS

Following approval by the Ethics Committee of the University Hospital of the West Indies/University of the West Indies/Faculty of Medical Sciences, a questionnaire was developed to examine MIS training of residents in the Caribbean. It was adapted from questionnaires previously developed by Canadian (10, 11) and American (12) groups. Separate questionnaires were developed for surgeons and surgical residents (Tables 1 and 2). Surgeons involved in resident training and residents enrolled in the general surgery programme at The University of the West Indies (Barbados, Jamaica and Trinidad and Tobago) were electronically sent an introductory letter and link to the online questionnaire. To maximize response ratings, reminder e-mails were sent to non-responders three weeks and six weeks after the initial contact was made.

The questionnaire addressed basic demographic issues, current training, future career plans, resident interest in performing laparoscopic surgery, the basic and advanced laparoscopic procedures (as defined by SAGES) that may be involved in training, the access to an MIS surgical skills laboratory, the factors influencing the exposure of residents to MIS techniques, and the role of the MIS surgeon within the academic surgical department. Collected data were analysed using the Statistical Package for the Social Sciences, version 17.0 (SPSS, Chicago, IL, USA).

Table 1: Survey for surgeons involved in general surgical training programme at The University of the West Indies

#	Actual question
Q1	Age (years): 20–25, 26–30, 31–35, 36–40, 41–45, 46–50, 51–60, 61–70, 71–80
Q2	Location: Barbados, Jamaica, Trinidad and Tobago
Q3	Years of practice: < 5, 5–10, 11–15, 16–20, 21–25, > 25
Q4	Sex: M/F
Q5	Training: residency, fellowship (other), fellowship (MIS)
Q6	Type of practice: generalist, subspecialty, combination
Q7	Regardless of your training, do you feel that you were well trained in MIS (minimally invasive surgery)?
Q8	If no to the above question, do you feel that you would have benefited from a formal MIS fellowship to complete your MIS training?
Q9	Do you feel that you were well prepared by your residency training programme to go out into a generalist practice once you completed your general surgical residency training?
Q10	During your residency did you receive instruction in laparoscopic surgery outside of your training programme?
Q11	After completion of your residency did you receive other training in laparoscopic surgery?
Q12	If yes to the above question, did you find this course helpful?
Q13	Do you train or have you trained residents in the past in MIS technique?
Q14	Does your institution have a skills lab dedicated to teaching basic MIS techniques?
Q15	If yes, are the skills that are taught tested in a standard format?
Q16	Does your institution train general surgery residents in FLS (Fundamentals of Laparoscopic Surgery)?
Q17	What types of laparoscopic instruction do you give in your surgical skills laboratory?
Q18	In your opinion, which teaching techniques are helpful in improving performance in the operating room?
Q19	On a scale of 1–6, please indicate the number that best describes how helpful you feel a skills lab is to teaching laparoscopic skills to residents:
Q20	SAGES defines the following as basic laparoscopic procedures. Please indicate the number of cases performed during your general surgical residency training.
Q21	By what stage of training do you think a general surgery resident should be able to perform the following basic laparoscopic procedures as the primary surgeon?
Q22	What factors influence your approach to teaching a resident BASIC laparoscopic skills?
Q23	What factors influence your approach to teaching a resident ADVANCED laparoscopic skills?
Q24	At your institution there is little extra time allotted for teaching of residents. T/F
Q25	What resident training level do you feel is optimal to teach residents training in BASIC laparoscopic techniques?
Q26	What resident training level do you feel is optimal to teach residents training in ADVANCED laparoscopic techniques?
Q27	At our institution we book many cases in a day – case volume is of primary importance. Teaching is a secondary concern. T/F
Q28	SAGES defines the following as advanced laparoscopic procedures. How many of these laparoscopic procedures did you perform in your residency training?
Q29	In your opinion, which of these laparoscopic procedures, if any, should be taught in general surgical residency training programmes?

Q30	Do you feel that your residency training programme has adequately prepared you to perform advanced laparoscopic procedures in your practice?
Q31	Do you feel that it is an academic surgical department's responsibility to incorporate, validate and teach BASIC laparoscopic surgical procedures?
Q32	Do you feel that it is an academic surgical department's responsibility to incorporate, validate and teach ADVANCED laparoscopic surgical procedures?
Q33	Do you feel that a surgical department which consists of open subspecialty surgeons performing a limited number of advanced laparoscopic procedures is able to meet this mandate?
Q34	On a scale of 1–5, please indicate the number that best represents to what extent these various factors have influenced the ability of your department to teach residents advanced laparoscopic surgical procedures.
Q35	How has the presence of a laparoscopic fellow influenced your ability to train general surgical residents?
Q36	Do you feel when residents are involved your complication rates increase?
Q37	How concerned are you that your programme will not be able to teach BASIC laparoscopic procedures to residents by the completion of their training?
Q38	How concerned are you that your programme will not be able to teach ADVANCED laparoscopic procedures to residents by the completion of their training?
Q39	Do you presently have a dedicated specialist laparoscopic/MIS surgeon on staff within your department?
Q40	Do you feel that there is a role for a laparoscopic/MIS surgeon within the academic surgical environment?
Q41	How important is the presence of a laparoscopic/MIS surgeon for teaching residents advanced laparoscopic procedural skills in your department?
Q42	Do you have an advanced laparoscopic fellowship at your institution?
Q43	Additional comments

Table 2: Survey for residents enrolled in general surgical training programme at The University of the West Indies

#	Actual question
Q1	Age (years): 20–25, 26–30, 31–35, 36–40, 41–45, 46–50
Q2	Location: Barbados, Jamaica, Trinidad and Tobago
Q3	Training Level: Year 1, 2, 3, 4 or 5
Q4	Sex: M/F
Q5	What are your career plans upon completion of your general surgical residency training?
Q6	Regardless of your career plans, do you feel that you will be well trained in MIS (minimally invasive surgery), after the completion of your general surgical residency?
Q7	I will need to complete a fellowship to complete my MIS/laparoscopic training. Y/N
Q8	Do you feel that you will be well prepared by your training programme to go out into a generalist practice once you have completed your general surgical residency training?
Q9	Have you received instruction in laparoscopic surgery outside of your training? programme?
Q10	Did you find this course helpful?
Q11	Do you have access to or receive training in a surgical skills laboratory that includes laparoscopic training?

Table 2 (Cont'd): Survey for residents enrolled in general surgical training programme at The University of the West Indies

#	Actual question
Q12	If yes, are the skills that are taught tested in a standard format?
Q13	How often do you actually get to use the laparoscopic skills lab in your training?
Q14	If you choose "not at all but would like to", from the above question, please answer why this is the case:
Q15	Please indicate the usefulness of the following types of laparoscopic instruction received in your surgical skills laboratory.
Q16	On a scale of 1–6, please indicate the number that best describes how helpful is/was learning laparoscopic skills in a non-operating room setting to your performance in the operating room.
Q17	If no, please indicate the number that best indicates how important you feel a laparoscopic surgical skills laboratory would be in your programme.
Q18	SAGES defines the following as basic laparoscopic procedures. Please indicate the number of cases performed during general surgical residency training to date.
Q19	SAGES defines the following as basic laparoscopic procedures. Which of these procedures will you be comfortable performing upon completion of your residency training?
Q20	SAGES defines the following as advanced laparoscopic procedures. How many of these laparoscopic procedures have you performed to date in your residency training?
Q21	Which of these procedures will you be comfortable performing laparoscopically upon completion of your residency training?
Q22	Do you feel that your residency training programme is adequately preparing you to perform advanced laparoscopic procedures in your practice upon completion of your training?
Q23	Do you feel that it is an academic surgical department's responsibility to incorporate, validate and teach advanced laparoscopic surgical procedures?
Q24	Do you feel that a surgical department which consists of open subspecialty surgeons performing a limited number of advanced laparoscopic procedures is able to meet this mandate?
Q25	On a scale of 1–5, please indicate the number that best represents to what extent these various negative factors have influenced the ability of your department to teach residents advanced laparoscopic surgical procedures.
Q26	How has the presence of a laparoscopic fellow influenced your training?
Q27	Do you feel there are limited opportunities to be the primary surgeon in laparoscopic cases because the surgeon or senior resident is the primary surgeon?
Q28	On a scale of 1–5, please indicate the number that best represents how concerned you are that you will not be able to learn ADVANCED laparoscopic procedures AFTER you have completed your residency training.
Q29	Do you presently have a dedicated specialist laparoscopic/MIS surgeon on staff within your department?
Q30	Do you feel that there is a role for a laparoscopic/MIS surgeon within the academic surgical environment?
Q31	How important is the presence of a laparoscopic/MIS surgeon for teaching residents advanced laparoscopic procedural skills in your department?
Q32	Do you have an advanced laparoscopic fellowship at your institution?
Q33	Are you considering an advanced laparoscopic fellowship to get the advanced laparoscopic/MIS training you feel you need?
Q34	Where are you planning on completing your fellowship training in laparoscopic surgery?
Q35	Additional comments

RESULTS

The questionnaire was sent to 41 surgeons and 41 residents involved in the general surgical residency programme. Fifty-three (23 surgeons, 30 residents) questionnaires were completed providing a response rate of 65%. Most residents (59.3%) were in the 31–35 year age group with 88.9% of responders being male – a finding similar to the male predominance among surgeons (90.5%); 51.8% of residents were in their final year of training.

The majority (95%) of surgeons felt that their residency training prepared them well to be generalist surgeons. Only 42.9% felt well-trained in basic MIS, with 93.3% believing their advanced MIS skills training to be inadequate. Similarly, most residents (92.6%) felt that they would be well prepared to practise as general surgeons following their residency. However, 85.2% did not feel that they would be competent in MIS.

Three procedures were defined as basic laparoscopic procedures: diagnostic laparoscopy, laparoscopic cholecystectomy and laparoscopic appendectomy. Table 3 demonstrates the distribution of resident experience, indicating that most had undertaken less than 25 procedures to date. Based on the current training system, 58.3%, 91.3% and 36.4% of residents will feel comfortable in independently performing diagnostic laparoscopy, laparoscopic cholecystectomy and laparoscopic appendectomy, respectively. Overall, 59.1% of residents would like to perform laparoscopic appendectomy but did not feel that they would be prepared. The majority of residents (57.1% to 81.8%) felt that they would not be able to perform advanced laparoscopic procedures because of lack of training (Fig. 1). There is a desire, however, to learn these skills during residency.

The majority of surgeons believed that residents should be able to perform diagnostic laparoscopy (66.7%) by year three and laparoscopic cholecystectomy (60%) and laparoscopic appendectomy (53.3%) by year four. They did feel, however, that certain advanced laparoscopic procedures such as hernia repair and colonic resections are appropriate for residency training while others such as hepatic resection and bariatric surgery should be reserved for fellowship training (Fig. 2).

Surgeons are of the opinion that both the need to complete cases expeditiously (time restrictions) and the lack of equipment have predominantly (66.3%) influenced their approach to teaching residents basic laparoscopic skills (Fig. 3). Tables 4 and 5 indicate the extent to which negative factors are thought to impact residency training in advanced laparoscopic procedures. Using a 5-point Likert scale, where 1 represents strong disagreement and 5 represents strong agreement, residents indicated that the most important limiting factors were lack of preceptor expertise (median, 5), lack of operating room time (median, 5), lack of surgeon interest (median, 4) and a limited number of advanced laparoscopic cases (median, 4). Surgeons indicated the most important limiting factors to be lack of operating room time

Table 3: Experience of residents in basic minimally invasive surgery (MIS) procedures (number of cases), in percentages

Basic MIS procedures	< 25	25-50	50-100	100-125	125-150	150-200	> 200
Diagnostic laparoscopy	95.8	4.2	0.0	0.0	0.0	0.0	0.0
Cholecystectomy	78.3	17.4	0.0	0.0	0.0	4.3	0.0
Appendectomy	100.0	0.0	0.0	0.0	0.0	0.0	0.0

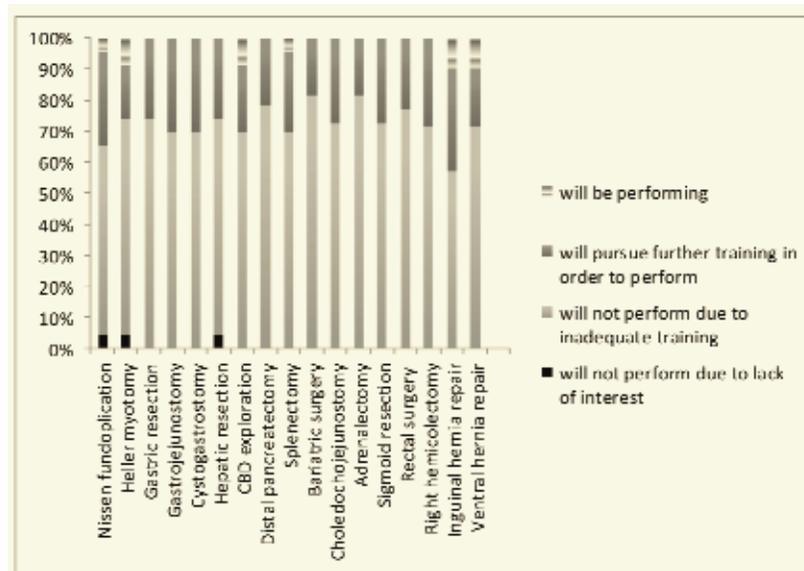


Fig. 1: Residents' perceived end-of-training abilities in performing advanced laparoscopic procedures.

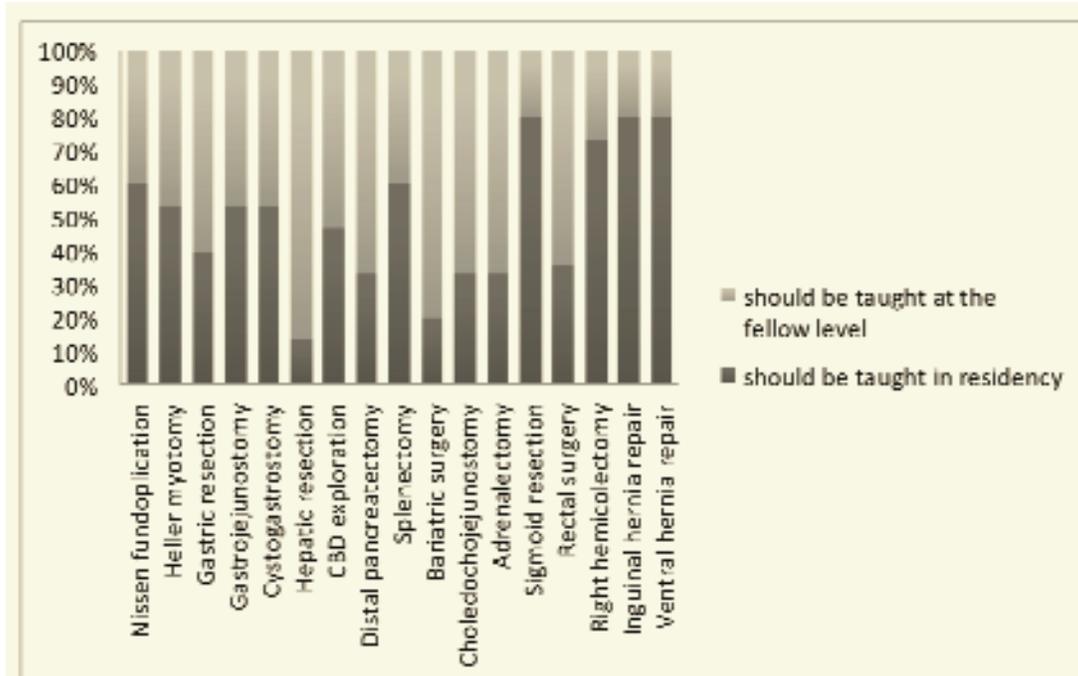


Fig. 2: Surgeons' opinions of timing of teaching advanced laparoscopic procedures.

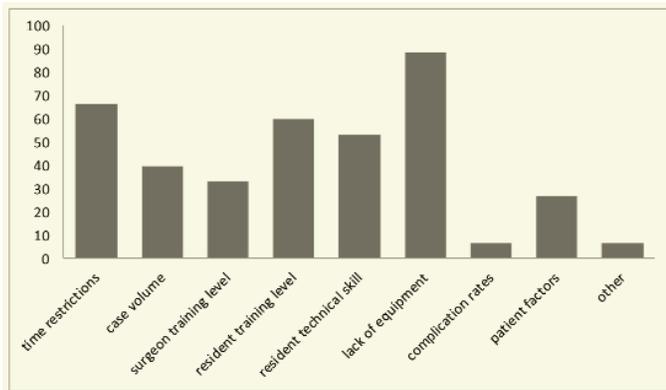


Fig. 3: Surgeons' opinion of factors inhibiting teaching of basic laparoscopic procedures.

(median, 5), lack of preceptor expertise (median, 4) and limited chance for the resident to be the primary surgeon (median, 3).

Only three residents have had access to a surgical skills laboratory. Both surgeons (83.4%) and residents (93.4%) strongly felt that a surgical skills laboratory would be helpful for the acquisition of MIS skills in a residency programme (score 5 or 6 on a Likert 6-point questioning scale where 1 represents not helpful and 6 represents very helpful). Twenty-six per cent of responding surgeons had previously used the Fundamentals of Laparoscopic Surgery (FLS) simulator for resident training.

All surgeons believed that the surgical department is obligated to teach residents basic laparoscopic skills. Overall, 73.3% of surgeons and 91.7% of residents felt that

Table 4: Surgeons' reasons for inadequate exposure of residents to advanced minimally invasive surgery (MIS) procedures, in percentages

Reasons	Likert scale*				
	1	2	3	4	5
Lack of surgeon interest	53.3	0.0	33.3	6.7	6.7
Lack of surgeon experience	6.7	20.0	0.0	46.7	26.7
Lack of resident interest	60.0	6.7	20.0	6.7	6.7
Lack of OR time	6.7	6.7	13.3	33.3	40.0
Our centre does not have sufficient case volume	20.0	33.3	13.3	26.7	6.7
Limited number of advanced laparoscopic cases	20.0	33.3	20.0	13.3	13.3
Limited chance for resident to be primary surgeon because senior resident present	20.0	20.0	20.0	33.3	6.7
Limited chance for resident to be primary surgeon because I am not comfortable	20.0	20.0	40.0	13.3	6.7

*1 represents strong disagreement and 5 represents strong agreement

Table 5: Residents' reasons for inadequate mastering of advanced minimally invasive surgery (MIS) procedures, in percentages

Reasons	Likert scale*				
	1	2	3	4	5
Lack of resident interest	62.5	12.5	16.7	4.2	4.2
Lack of surgeon interest	12.5	8.3	25.0	29.2	25.0
Lack of preceptor expertise	4.2	8.3	25.0	29.2	33.3
Lack of OR time	8.3	8.3	0.0	33.3	50.0
Our centre does not have sufficient case volume	29.2	25.0	8.3	20.8	16.7
Limited number of advanced laparoscopic cases	16.7	29.2	12.5	29.2	12.5
Limited chance to be primary surgeon because senior resident present	45.8	8.3	12.5	16.7	16.7
Limited chance to be primary surgeon because surgeon not comfortable with my expertise	50.0	20.8	12.5	8.3	8.3

*1 represents strong disagreement and 5 represents strong agreement

advanced laparoscopic surgical procedures should be taught in the residency programme. However, 80% of surgeons were greatly concerned that the latter could not be fulfilled (score 4 or 5 on a Likert 5-point questioning scale where 1 represents no concern and 5 represents great concern). Both surgeons (85.7%) and residents (100%) felt that there was a role for an MIS surgeon in the academic environment as most (86.7% and 83.3%, respectively) did not feel that a department consisting of only open subspecialty surgeons could adequately teach residents laparoscopic techniques.

DISCUSSION

The results of the current study support the need and desire for MIS training of residents in the Caribbean. This represents an important issue to both surgeons and general surgical residents. This issue is not unique to the Caribbean. Surveys from North America (10–12) and Europe (13) demonstrate that concerns about surgeon experience in MIS and the desire and need for further training spread worldwide. Chiasson *et al* showed that 92% and 53% of residents expected to perform basic and advanced procedures respectively after completion of their residency. Only 18% thought that their MIS training would be adequate (10).

Unlike ACGME, the general surgery residency programme in the Caribbean does not formally require the demonstration of MIS skills prior to its completion. As is the case in many regions, basic laparoscopic skills are gained mainly through the performance of laparoscopic cholecystectomy. This is confirmed by our study results. The lack of experience in laparoscopic appendectomy and diagnostic laparoscopy is likely related to a decision by the institutions to limit these procedures. There is continued debate, however, on the benefit of laparoscopy for appendectomy (14) and for diagnostic purposes (15). Along with cost concerns, the absence of demonstrable long-term improvement in health outcomes (compared to open surgery) likely drive the lack of enthusiasm in using laparoscopy in these and other situations. This clearly will affect resident exposure.

The main concern of residents in North America and Europe has been the inability to learn advanced MIS skills in their residency training (10, 12, 13). This was echoed by residents in the present study, who did not feel that they would be able to perform the majority of advanced laparoscopic procedures at the end of their training. Whereas inability to be the primary surgeon and lack of procedural volume are the main inhibitory factors in the developed world (10, 13), lack of equipment has been suggested to be the predominant reason for lack of training in our programme. Advanced laparoscopy requires special graspers, retractors, coagulation devices, stapling devices and prosthetic materials which may not be readily available or considered affordable in the developing world (16). This clearly limits the ability for residents to learn these advanced operative skills. Reports have suggested that the overall cost of laparoscopy, taking into account reduced hospital stay and

earlier return to work, may be equivalent to open surgery for certain procedures (17–19). Depending on the health policies and fund allocation for laparoscopy in countries in the region, these findings may or may not be applicable. Regional cost analyses may prove useful in determining the benefit of investing in basic equipment.

Where lack of operating time and the need to complete cases expeditiously hinder resident training, strategies that support teaching technical skills outside of the operating room (20) are useful. Surgical skill laboratories incorporate a variety of methods including virtual reality simulators, video trainers, synthetic models and animal models. In the present study, it was unanimously believed that a skills laboratory would be beneficial in honing the skills of residents in the surgical programme. Other surveys of residents (10, 13) and surgeons (21) have also shown strong support for these tools. There is evidence to support the benefit of a skills laboratory in basic MIS skill acquisition (22) with those skills being transferable to the operating room (23). In a region where the number of operative MIS cases, both basic and advanced, are limited by lack of operating room time, equipment and preceptor expertise, such tools may be critical in developing and maintaining the skills of both surgeons and surgical residents. Such a facility was recently opened at the University of the West Indies campus in Jamaica with the hope of enhancing competency-based surgical residency training.

In particular, video trainers and telesimulation have potential value in the further development of basic laparoscopic skill training in the Caribbean. The SAGES Fundamentals in Laparoscopic Surgery (FLS) course which uses web-based study guides and a compact laparoscopic (video) trainer box to train and assess the laparoscopic skills of residents, fellows and practising surgeons has been conducted worldwide – South America, Asia and even the Caribbean [including Jamaica] (24). Simulator training in FLS has clearly shown benefit in improving the MIS skills of residents in the operating room (23) and in reducing costs for advanced training (25). The reuse of box trainer components (endoloops, sutures and penrose drains) can result in almost 30% cost saving (26), a useful strategy for its incorporation into resource-constrained settings. Recently, the development of telesimulation for the remote training of FLS skills has broadened the scope for MIS skill acquisition (27, 28).

Most surgical departments in the developing world consist mainly of open surgeons. The view of participants in the present study that open surgeons are not ideal to teach residents MIS skills is supported by other surveys (10). Having an MIS surgeon as a part of the academic department appears to be a strategy that benefits the academic surgical environment greatly (29) and one that would be welcomed by both surgeons and residents alike. Fowler and Hogle showed that the presence of an MIS surgeon increased the number of MIS procedures in which residents participated by more than 100% (29). Through the influence and expertise of an MIS

surgeon, an environment that embraces MIS can hopefully develop. Concerns regarding overlap of areas of clinical interest (30) do not appear to be an issue that deters our surgeons' opinions, most of whom are open surgeons.

Cost containment strategies may play a critical role in facilitating the further development of MIS in the region and in residency programmes. The use of reusable trocars and the use of sutures rather than expensive stapling devices are viable techniques (31). The expanded use of donated first-generation equipment should be considered (32). Most of the evidence to support these above-mentioned strategies comes from the developed world. As such, further studies need to be undertaken to determine their applicability to developing countries. We do believe that the adoption of some or all of these strategies can carry MIS in the region to the next level.

There is a long-standing culture supporting open general surgery in the Caribbean. The world and the discipline of surgery continue to evolve. Although there are limitations to the incorporation of laparoscopy (particularly advanced laparoscopy) into residency programmes in the region, such incorporation is not only desired by surgeons and residents alike but required. Through cost-effective strategies and the training of MIS-enthused faculty, these potential limitations can be addressed allowing for evolution of MIS in the Caribbean.

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