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What do surgical trainees and educators around the world need: a global needs assessment survey from 6 regions around the world.

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## **Abstract**

### **Purpose:**

This study aims to conduct a comprehensive global needs assessment to identify the prevailing conditions, specific needs, and challenges faced by surgical trainees and educators across diverse healthcare contexts.

### **Methods:**

An international survey was developed and disseminated to surgical trainees and educators in 50 countries. The survey included sections on demographics, barriers to surgical education, educational activities, and training methods. Descriptive statistical analysis was performed on the responses, categorized into geographical regions: East Asia, South Asia, Africa, Europe and the Middle East, Latin America, and US and Canada.

### **Results:**

A total of 1,262 responses were collected: 515 from trainees and 747 from educators across 50 countries. Among trainees, key barriers included a lack of access to simulation resources, insufficient protected time for education, and limited hands-on surgical experience, particularly in East Asia and South Asia. In these regions, trainees reported working long hours with minimal exposure to simulation-based training. For educators, significant challenges included the lack of dedicated educational budgets, insufficient protected time for teaching, and a lack of formal training in educational methodologies. Despite these obstacles, there was a strong global interest among educators in improving their teaching skills.

### **Conclusions:**

This global needs assessment of surgical trainees and educators revealed critical gaps in surgical training, including limited access to simulation training and insufficient support for educators, particularly in developing regions. Addressing these disparities by expanding simulation resources and offering formal training for educators is essential for improving the training of surgical trainees globally.

Keywords:

Surgical education,

Global needs assessment,

Training barriers,

Simulation,

Educator support,

Regional disparities

## Introduction

Surgical trainees and educators around the world face diverse challenges and have distinct needs, reflecting the varied healthcare contexts in which they operate [1]. Nonetheless, the fundamental needs of trainees—to learn how to operate independently—and of educators—to train trainees to operate safely—remain the same [1]. In the Western world, surgical education has experienced a significant paradigm shift over the past decade. Traditional apprentice-style training has evolved into a more structured, competency-based model, with a strong emphasis on simulation training [2, 3]. This shift aims to improve surgical competence and ensure safer, more effective surgical practices.

Globally, needs assessment surveys have primarily focused on trainees and educators in North American countries, with fewer conducted in European countries, Japan, and African countries [4-8]. These surveys have been instrumental in introducing or modifying training curricula in these regions [9]. However, it is clear that the majority of these surveys have concentrated on trainees and educators in developed countries, often overlooking the unique challenges and educational needs faced by those in low-resource settings [10]. Furthermore, most of these surveys address on the needs of a single country or region, and to our knowledge, no comprehensive global needs assessment surveys have been conducted to date.

An international needs assessment survey with the aim of mapping the current conditions was conducted, identifying needs, and pinpointing the challenges faced by surgical trainees and educators globally in their pursuit of surgical education. Our primary objective was to uncover common trends and collect valuable data that could guide decision-making and drive global initiatives aimed at enhancing surgical education.

## **Methods**

### **Ethical issues**

This research proposal was approved by the Research Ethics Review Committee of Hokkaido University (R4-019). At the start of the survey, participants received detailed explanations about the study. Only those who gave their consent proceeded with the survey. To protect the anonymity of the respondents, no personal data that could identify them, such as names, email addresses, training hospitals, or IP addresses, were collected.

### **Development of the Survey**

The Association for Surgical Education brought together surgical educators from around the world and established an international taskforce with the following objectives:

- Expand the network of surgical educators and trainees globally.
- Support the work and career of international surgical educators and aspiring educators.
- Promote global surgical education projects and international research studies in surgical education.

A member of the international task force drafted an initial version of a survey for surgical educators, based on the themes to be explored with input from other members. Another survey for surgical trainees was then drafted, using the survey for surgical educators as a reference. Both drafts were finalized after several rounds of discussions among the members (Supplementary material 1 and 2). The trainee survey consisted of 48 questions categorized into four primary sections: personal information, barriers encountered in surgical education, surgical educational activities, and training methods in surgical education. It explored various aspects of surgical training including background, training hospital environment, number of trainees and faculty, typical weekly

workload, time allocated to surgical procedures versus educational and non-educational activities, barriers to education, number of operations performed and expected by graduation, satisfaction with case variety, preparedness for independent practice, training methods in the operating room (OR), training frequency outside the OR, access to simulation resources, and evaluation processes.

The educator survey, consisting 51 questions, was divided into four sections similar to the trainee survey: personal information, barriers in surgical education, surgical education activities, and training methods in surgical education. It collected information on the educators' background, practice environment, motivations for engaging in surgical education, types of trainees, number of trainees and faculty, percentage of the workday devoted to education, compensation, budget, access to skills labs or simulation centers, proportion of operations performed by trainees, training modalities inside and outside the OR, and evaluations of trainees and educators.

Both surveys encouraged respondents to highlight the positive and negative aspects of their training or teaching experiences and to offer suggestions for improvement. The survey was developed in English and translated into Japanese, Portuguese, and Spanish by bilingual team members involved in its development. The Mandarin translation was initially completed using online translation services, then refined with the assistance of a Chinese medical professional, and verified by a Chinese team member. Two separate survey pages were created on an online platform using the SurveyMonkey tool (SurveyMonkey Inc., San Mateo, CA, USA, [www.surveymonkey.com](http://www.surveymonkey.com)). Participants could view and complete the survey in any one of the five available languages.

## **Participants**

The survey was intended for trainees and surgical educators from all surgical specialties or subspecialties that perform surgical procedures, such as General Surgery (Includes: Gastrointestinal surgery, bariatric, upper GI, colorectal, HPB surgery, Transplant, breast surgery, Acute care surgery, Surgical Oncology), Urology, Cardiothoracic and vascular surgery, Pediatric surgery, Orthopedic and Trauma surgery, ENT (Ear, Nose, and Throat), Neurosurgery, Plastic surgery, Gynecology and Obstetrics. Trainees were defined as any medical school graduate currently undergoing clinical training in a surgical specialty or subspecialty. Surgical educators were defined as any surgeon who, within the past year, had been directly involved in either of the following:

- Training a trainee in a core surgical or surgical specialty in the OR or simulation center.
- Management of the training of the surgical trainee.

This inclusive definition ensured broad representation from various fields within the surgical community, allowing for a comprehensive assessment of educational needs across different surgical disciplines.

### **Dissemination of the survey**

The survey was disseminated through personal communications by the members of the task force to individuals and local surgical associations worldwide. The primary goal was to capture a broad geographical reach, aiming to include as many countries as possible rather than seeking depth within each country. Consequently, we acknowledged that calculating the response rate was not feasible due to the diverse distribution methods and the lack of comprehensive tracking across all regions. Furthermore, the start date of the survey varied by country, depending on when it was introduced to the local participants.

### **Statistical analysis**

Descriptive statistical analyses were performed on the collected data using Microsoft Excel 2019.

Missing data were excluded, and the remaining responses were included in the analyses.

Categorical data were presented as the number of respondents (percentages), and continuous variables were expressed as mean  $\pm$  standard deviation for data with a normal distribution and median (interquartile range) for data with non-normal distribution. The responses of various countries were grouped into the following regions according to their geographical and socioeconomic conditions and analyzed: East Asia, South Asia, Africa, Europe and the Middle East, Latin America, and US and Canada.

## **Results:**

### **Background**

The trainee survey received 515 responses from 29 countries, while the educator survey received 747 responses from 44 countries, with the total of 1,262 responses from 50 countries. The number of respondents in each country is shown in Table 1. The survey respondents included educators from 11 different specialties and trainees from 9 specialties, with the majority from General Surgery. Participant backgrounds for both surveys are summarized in Table 2. Female trainees comprised about half of the respondents in Europe and the Middle East, Latin America, and the US and Canada (Table 2a). In other regions, and among educators in all regions, the majority were male. The training period was relatively shorter in South Asia and Latin America. The responding trainees were mainly residents, except in East Asia. Respondents across regions were predominantly from academic hospitals. More than half of the trainees in South Asia and Africa typically worked over 80 hours a week (Table 2a).

Most trainees (86.2%) chose surgery as a specialty because of their interest in it. Additionally, 261 (50.1%) chose it because they developed a passion for it after being exposed to surgery as medical students. These answers were consistent across regions.

The majority of educators, specifically 477 (64.3%), were involved in surgical education because they worked in teaching hospitals. Additionally, 440 (59.3%) enjoyed teaching young surgeons, and 318 (42.9%) were involved due to expectations placed on them as attending surgeons.

### **Barriers in surgical education:**

The main barrier to surgical education cited by trainees in Africa was being too busy with clinical work, while trainees from other regions cited being too busy with administrative work (Table 3a).

Over half of the trainees in South Asia and Africa region reported a lack of access to simulation as a barrier (Table 3a). Only 3 trainees in South Asia and none of the trainees in Africa had access to a simulation center (Table 4a).

A lack of protected time was cited by around 60% of educators in East Asia, Europe and the Middle East, and the US and Canada (Table 3b). Nearly 85% of educators in East Asia spent less than 30% of their typical working day on education (Table 4b). The lack of incentive or compensation for educational work was cited as a barrier by 65.3% of educators in East Asia (Table 3b). Only 9.8% of them were compensated for educational activities (Table 4b). In comparison, 57.6% of educators in Latin America received compensation (Table 4b). The lack of a dedicated budget was a barrier for 72.9% of educators in Africa region (Table 3b). Only 4.8% of them reported having a budget for education (Table 4b).

### **Surgical Training Systems**

In Africa, 20.0% of responding trainees spent less than 10% of their typical working day in the OR, either operating or assisting in operations (Table 5). In contrast, 45.5% of trainees in the US and Canada spent more than 50% of their typical working day in the OR. In Latin America, 37.7% of trainees operated on more than 50% of the cases they scrubbed in, whereas this figure was approximately 17% in East Asia and South Asia (Table 5).

Trainees performed a median of 40 (13-100) operations as the primary surgeon in the past year and expected to perform a median of 200 (68-400) operations before graduation (Table 4a). These numbers were lowest in South Asia, with a median of 30 (20-83) procedures performed in the past year and an expectation to perform a median of 100 (50-213) procedures before graduation. Similarly, educators in South Asia reported that trainees perform an average of  $30.3 \pm 16.3\%$  of procedures in their hospitals, the lowest compared to other regions (Table 4b). In the US and

Canada, 70.7% of trainees believed their training prepared them for independent practice. In Latin America, this figure was 67.6%, and 62.9% in Africa, while it was around 40% for other regions (Table 4a).

Various assessment methods were used in different regions to assess trainees. However, 20.6 % of trainee respondents and 27.6% of the educator responders from Europe and the Middle East Region, reported that trainees were not assessed (Table 4). External faculty were used in over 70% of responses from South Asia, but their use was low in East Asia and Latin America (Table 4). Attendings were not assessed according to 60.6% of educators in East Asia and 56.9% in Europe and the Middle East compared to 8.1% from US and Canada (Table 4b).

### **Training methods inside the OR**

Except for the US and Canada, and Europe and the Middle East region, around 70% of trainees responded that they almost always train by observing faculty operate (Table 6a). In South Asia, Africa, and Latin America it is fairly common for trainees to operate without faculty scrubbed in. More than half of the responding educators from South Asia and Latin America reported that trainees often or always observe without assisting. Training in a simulator before performing an operation was sometimes used according to half of the responding educators from US and Canada; however, it was never or rarely done by the majority of trainees or educators in other regions (Table 6).

### **Training outside of the OR**

Outside of the OR, lectures and interactive workshops were the most regularly used educational methods by both trainees and educators. The regular use of these modules was lowest in the East Asia region. In Africa, 37.9% of trainees reported receiving regular lectures, while 74.4% of

educators reported conducting them regularly. Dry labs were also regularly conducted across regions, although 48.3% of trainees from Africa region reported never experiencing them. The frequency of wet labs, animal labs, and cadaver labs was relatively low. However, these were relatively more common in East Asia and the US and Canada (Supplementary material 3).

### **Training in Surgical Education**

Lack of training in surgical education was cited as a barrier by 30-40% of responding educators in East Asia, South Asia, Africa, and Europe and the Middle East region (Table 3b). A total of 583 (89.7%) educators and 374 (91.7%) trainees agreed that surgeons involved in teaching should receive training as educators. However, 41.6% of educators overall and 49.4% of educators in East Asia had never received any training as educators (Table 7). Among those who had received training, 202 (53.3%) paid for the cost themselves. The training courses attended covered performance assessment (223, 59.3%), providing feedback to learners (217, 57.7%), teaching in the OR (193, 51.3%), and curriculum development (186, 49.5%). A majority of 341 (90.9%) participants found these training courses useful. Additionally, 87.4% of educators overall, and all responding educators from South Asia and Africa, expressed a desire to enhance their skills as educators if given the opportunity (Table 7). Teaching in the OR, performance assessment and curriculum development were the top 3 topics educators wanted to be addressed in the training programs.

In terms of scholarly activity, 163 (25.1%) educators had published papers on topics of surgical education, and 146 (22.5%) had received formal training in surgical education research, with East Asia lagging behind other regions. Educators had published a median of 3 (1-8) papers, with those from the US and Canada being the most prolific (Table 7). Additionally, 513 (80.2%) educators and 363 (88.8%) trainees saw value in organizations focused on surgical education that facilitated

networking with educators and trainees worldwide. A significant number of trainees, 289 (70.8%), expressed interest in a career in surgical education.

In the free comments section, 208 trainees and 328 educators responded to the question: How can ASE help surgical educators in your region? Trainees primarily requested assistance with simulation and hands-on training (78 respondents, 37.5%), training the educators (66 respondents, 31.7%), curriculum development and standardization (46 respondents, 22.1%), and international collaboration and networking (34 respondents, 16.3%). Among the educators, training the educators was the most common response (116 comments, 35.4%), followed by curriculum development and standardization (56 respondents, 17.1%), simulation and hands-on training (52 respondents, 15.9%), and international collaboration and networking (47 respondents, 14.3%).

## **Discussion**

In this paper, we present the needs of surgical trainees and educators from 50 countries. This is the first-ever global needs assessment survey examining at needs of surgical trainees and educators from around the world. We found common barriers for trainees globally, including lack of access to simulation, being too busy with clinical and/or administrative work. Educators also faced similar challenges, such as lack of a dedicated budget and protected time. Surgical educators worldwide were seeking opportunities to enhance their skills as educators. We also identified unique barriers specific to each region (Table 8).

### **East Asia**

The East Asia region, primarily represented by developed countries with a majority of responses from Japan, showed a predominantly male demographic among both trainees and educators. Although the number of female surgeons is increasing, it still stands at around 25% [11]. Despite half of the respondents in this region being fellows who had completed residency training, trainees performed fewer operations and were expected to graduate with less surgical experience than trainees in other regions. Only 42% believed their training would adequately prepare them for independent practice. This may be due to 70% of trainees almost always training in the OR primarily by observing faculty. A survey of graduating residents in Japan also highlighted a gap between trainee confidence in surgery and the expectations of program directors [12]. Trainees in this region could benefit from more supervised operating opportunities. Educators of the East Asia region rarely received compensation for their work, and 60% were not assessed. Addressing these issues could improve educator motivation and quality.

## **South Asia and Africa**

The South Asia region had responses primarily from Nepal, while Africa mostly had responses from Nigeria. Both these regions are primarily composed of developing countries, and like East Asia, the respondents were overwhelmingly male. Trainees in these areas faced barriers such as limited access to simulation. Previous needs assessments have identified similar simulation needs among trainees and surgeons in Africa [6, 7]. Trainees in these regions worked longer hours, with more than half working over 80 hours a week. There were also inadequate numbers of educators and a lack of dedicated budgets for education, making it difficult to deliver quality training. Solutions such as remote simulation, asynchronous feedback, and low-cost simulation could be effective in addressing these needs. [13, 14]. South Asian trainees performed the fewest operations, operating only around 30% of the operations in their departments. Most trainees only observed without assisting, and two-thirds operated in fewer than 30% of the cases they scrubbed in. Trainees need more hands-on experience in the OR instead of just observing faculties' operations [15].

## **Europe and the Middle East**

Europe and the Middle East mainly had responses from Greece and Denmark. This region consisted of relatively developed countries. However, even in these regions, access to simulation training was limited. A recent survey of vascular surgeons across European countries showed a similar trend with no mandatory simulation-based training in 84% of the responding institutes and lack of curriculum, cost, lack of simulation culture, and lack of dedicated time as the biggest barriers in implementing simulation [16]. Only around 25% of the educators and trainees from this region

reported having protected time for education, which was the lowest among all the regions. Lack of protected time was also cited as the barrier for surgical educators by nearly 60% of the respondents in this region. While a number of studies have shown benefits of simulation training, only a few have actually demonstrated how to effectively integrate it into surgical training systems [17]. A recent study from Scotland, showed that simulation-based training is most effective if it is integrated within the training curriculum [18]. Other countries in this region could learn from this study and implement protected time while integrating simulation training into their surgical training systems.

### **Latin America**

The Latin America region mainly had responses from Brazil, with most of the countries represented being emerging economies. While educators were overwhelmingly male, females formed around half of the trainees in this region. Trainees and educators in this region had relatively better conditions; however, like Europe and the Middle East region, access to simulation was limited. Nearly 90% of the trainees in these regions also did not have the experience of training in animal or cadaver labs. However, trainees in this region performed more than 60% of the cases in their department and spent relatively more time in the OR. Incorporating simulation training could be the next step in the development of surgical education in this region [19].

### **US and Canada**

In our survey, trainees in the US and Canada performed a median of 150 procedures in the preceding year and were expected to perform a median of 1,000 procedures by graduation which

were the highest in comparison to other regions. Almost all the trainees had access to a simulation center, had protected time for education and 70% of them believed that the training prepared them for independent practice. Frequency of use of animal labs and cadaver labs were also highest compared to other regions. Almost all educators had a budget for education; however, only around 30% of them had protected time for education. Although our study has a limited response, it is consistent with previous studies published from the regions [20, 21].

Overall, educators worldwide were looking to enhance their skills as educators. About 40% of them, and around half in East Asia, had no formal training in education. Outside of the US and Canada, the majority of trainees were still expected to learn in the OR by observing faculty. Both trainees and educators wanted ASE to provide training for educators in their region. Faculty development courses, such as the “Surgeons as Educators” program by the American College of Surgeons, which has been successfully implemented in the US, can help educators globally acquire the essential skills needed to effectively train surgical trainees both in and outside the OR [22].

This paper has several limitations. Due to the objective of collecting data from as many countries and regions as possible without aiming for deep penetration in each country, we were unable to calculate the response rate of this survey. Although we reached 50 countries, we received triple-digit responses from only 2 countries and double-digit responses from 8 countries. In most cases, the number of respondents from each country was in the single digits, with only one or two responses from half of the participating countries. The survey's dissemination method of using the surgical educators and word of mouth meant that it mainly reached academic institutions with a vested interest in surgical education, which may have introduced selection bias in the data

collection. Additionally, the actual situation in each region may be worse than the data suggest. The survey was long, consisting of 51 questions and required more than 10 minutes to fill, which could have led to survey fatigue and lower response in the later parts of the survey. Despite these limitations, we were able to gather crucial insights into the needs and challenges faced by trainees and educators globally, even in academic institutes focused on surgical education, allowing for a meaningful comparative analysis. This data can serve as a foundation for developing strategies to improve surgical education worldwide.

## Conclusion

This first-ever global needs assessment of surgical trainees and educators identified critical gaps in surgical training, such as limited access to simulation and a lack of support for educators, especially in developing regions. Addressing these disparities by enhancing simulation resources and providing formal training for educators is essential to improving the training of surgical trainees worldwide.

## Acknowledgement

This paper is dedicated to the late Dr. Yo Kurashima, the founding chair of the international taskforce, who played a vital role in conceptualizing and developing this project and passed away suddenly after its submission.

## Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Table 1: Number of Respondents from each country

|    | Countries  | Region     | Educator Survey | Trainee Survey |
|----|------------|------------|-----------------|----------------|
| 1  | Brunei     | East Asia  | 1               | 0              |
| 2  | Burma      | East Asia  | 2               | 0              |
| 3  | China      | East Asia  | 30              | 34             |
| 4  | Hong Kong  | East Asia  | 2               | 0              |
| 5  | Japan      | East Asia  | 388             | 162            |
| 6  | Malaysia   | East Asia  | 1               | 1              |
| 7  | Singapore  | East Asia  | 2               | 2              |
| 8  | Taiwan     | East Asia  | 1               | 0              |
| 9  | Thailand   | East Asia  | 4               | 3              |
| 10 | Vietnam    | East Asia  | 1               | 4              |
| 11 | Bangladesh | South Asia | 2               | 0              |
| 12 | India      | South Asia | 2               | 1              |
| 13 | Nepal      | South Asia | 54              | 32             |
| 14 | Pakistan   | South Asia | 0               | 1              |
| 15 | Benin      | Africa     | 1               | 0              |
| 16 | Ethiopia   | Africa     | 2               | 0              |
| 17 | Ghana      | Africa     | 0               | 1              |
| 18 | Kenya      | Africa     | 4               | 0              |
| 19 | Madagascar | Africa     | 1               | 0              |

|    |                |                        |    |    |
|----|----------------|------------------------|----|----|
| 20 | Niger          | Africa                 | 1  | 0  |
| 21 | Nigeria        | Africa                 | 34 | 40 |
| 22 | Rwanda         | Africa                 | 3  | 0  |
| 23 | South Africa   | Africa                 | 1  | 0  |
| 24 | Togo           | Africa                 | 1  | 0  |
| 25 | Cyprus         | Europe and Midde East  | 3  | 1  |
| 26 | Denmark        | Europe and Midde East  | 0  | 68 |
| 27 | France         | Europe and Midde East  | 0  | 1  |
| 28 | Germany        | Europe and Midde East  | 1  | 0  |
| 29 | Greece         | Europe and Midde East  | 43 | 46 |
| 30 | Ireland        | Europe and Midde East  | 3  | 2  |
| 31 | Italy          | Europe and Midde East  | 1  | 4  |
| 32 | Sweden         | Europe and Midde East  | 0  | 1  |
| 33 | Switzerland    | Europe and Midde East  | 1  | 1  |
| 34 | Turkey         | Europe and Midde East  | 1  | 0  |
| 35 | United Kingdom | Europe and Midde East  | 1  | 4  |
| 36 | Israel         | Europe and Middle East | 1  | 0  |
| 37 | Jordan         | Europe and Middle East | 0  | 2  |
| 38 | Kuwait         | Europe and Middle East | 5  | 1  |
| 39 | Lebanon        | Europe and Middle East | 1  | 0  |
| 40 | Oman           | Europe and Middle East | 2  | 0  |

|    |                        |                        |            |            |
|----|------------------------|------------------------|------------|------------|
| 41 | Qatar                  | Europe and Middle East | 1          | 0          |
| 42 | Saudi Arabia           | Europe and Middle East | 4          | 1          |
| 43 | Argentina              | Latin America          | 4          | 1          |
| 44 | Brazil                 | Latin America          | 52         | 62         |
| 45 | Chile                  | Latin America          | 35         | 14         |
| 46 | Mexico                 | Latin America          | 1          | 0          |
| 47 | Paraguay               | Latin America          | 3          | 0          |
| 48 | Uruguay                | Latin America          | 4          | 1          |
| 49 | Canada                 | US Canada              | 18         | 1          |
| 50 | United States          | US, Canada             | 24         | 23         |
|    | <b>Total</b>           |                        | <b>747</b> | <b>515</b> |
|    | <b>No of Countries</b> |                        | <b>44</b>  | <b>29</b>  |

Table 2a: Background of the trainee respondents. Categorical data are presented as number of respondents (percentage of respondent to that question) and continuous data are presented as Mean  $\pm$  standard deviation

|                                    | Overall        | East Asia      | South Asia     | Africa         | Europe&<br>Middle East | Latin America  | US, Canada     |
|------------------------------------|----------------|----------------|----------------|----------------|------------------------|----------------|----------------|
| Gender: Male                       | 334 (64.9)     | 163 (79.1)     | 30 (88.2)      | 32 (78.0)      | 56 (42.4)              | 42 (53.8)      | 11 (45.8)      |
| Age                                | 32.1 $\pm$ 5.5 | 31.8 $\pm$ 4.9 | 31.3 $\pm$ 3.0 | 36.8 $\pm$ 5.6 | 32.6 $\pm$ 5.7         | 30.4 $\pm$ 6.5 | 31.7 $\pm$ 3.6 |
| Years in training                  | 4.1 $\pm$ 2.7  | 4.6 $\pm$ 3.2  | 2.6 $\pm$ 1.4  | 5.0 $\pm$ 2.7  | 3.8 $\pm$ 2.4          | 3.5 $\pm$ 1.3  | 3.4 $\pm$ 2.2  |
| Current training<br>program length | 4.0 $\pm$ 1.9  | 3.7 $\pm$ 1.8  | 2.9 $\pm$ 0.4  | 6.2 $\pm$ 1.4  | 4.5 $\pm$ 2.1          | 2.6 $\pm$ 0.9  | 5.3 $\pm$ 1.8  |
| Position: Resident                 | 358 (69.5)     | 91 (44.2)      | 29 (85.3)      | 41 (100)       | 107 (81.1)             | 72 (92.3)      | 18 (75.0)      |
| General Surgery                    | 342 (66.4)     | 106 (51.5)     | 22 (64.7)      | 19 (46.3)      | 112 (84.8)             | 68 (87.2)      | 15 (62.5)      |
| Academic Hospital                  | 379 (75.6)     | 155 (76.4)     | 23 (74.2)      | 38 (100)       | 97 (75.2)              | 47 (60.3)      | 114 (77.0)     |
| Government/Public<br>Hospital      | 394 (78.8)     | 152 (74.9)     | 9 (29.0)       | 38 (100)       | 124 (96.1)             | 63 (81.8)      | 20 (90.9)      |
| Trainee Number                     |                |                |                |                |                        |                |                |
| 1-5                                | 193 (38.4)     | 106 (52.0)     | 12 (38.7)      | 16 (42.1)      | 26 (20.2)              | 32 (41.0)      | 1 (4.5)        |
| 6-10                               | 165 (32.9)     | 57 (27.9)      | 4 (12.9)       | 12 (31.6)      | 63 (48.8)              | 28 (35.9)      | 1 (4.5)        |
| >11                                | 144 (28.7)     | 41 (20.1)      | 15 (48.4)      | 10 (26.3)      | 40 (31.0)              | 18 (23.1)      | 20 (90.9)      |
| Faculty Number                     |                |                |                |                |                        |                |                |
| 1-5                                | 158 (31.6)     | 95 (46.6)      | 9 (29.0)       | 14 (36.8)      | 34 (26.6)              | 6 (7.7)        | 0 (0.0)        |
| 6-10                               | 148 (29.6)     | 60 (29.4)      | 17 (54.8)      | 12 (31.6)      | 41 (32.0)              | 17 (21.8)      | 1 (4.8)        |
| >11                                | 194 (38.8)     | 49 (24.0)      | 5 (16.1)       | 12 (31.6)      | 53 (41.4)              | 55 (70.5)      | 20 (95.2)      |
| Typical Working<br>hours >80hrs    | 124 (26.9)     | 50 (26.6)      | 15 (51.7)      | 22 (62.9)      | 16 (14.3)              | 16 (22.5)      | 4 (18.2)       |

Table 2b: Background of the educator respondents. Categorical data are presented as number of respondents (percentage of respondent to that question) and continuous data are presented as Mean  $\pm$  standard deviation

|                              | Overall        | East Asia      | South Asia     | Africa         | Europe and Middle East | Latin America   | US, Canada      |
|------------------------------|----------------|----------------|----------------|----------------|------------------------|-----------------|-----------------|
| Gender: Male                 | 650 (87.0)     | 394 (91.2)     | 47 (81.0)      | 44 (91.7)      | 55 (80.9)              | 85 (85.9)       | 25 (59.5)       |
| Age                          | 48.1 $\pm$ 9.5 | 48.5 $\pm$ 8.6 | 41.2 $\pm$ 9.0 | 45.8 $\pm$ 7.2 | 47.4 $\pm$ 10.1        | 49.6 $\pm$ 10.5 | 53.5 $\pm$ 11.9 |
| Years as Educator            | 13.2 $\pm$ 9.4 | 12.7 $\pm$ 8.6 | 8.4 $\pm$ 7.1  | 9.9 $\pm$ 6.1  | 11.6 $\pm$ 8.9         | 18.4 $\pm$ 10.9 | 19.2 $\pm$ 12.0 |
| Educator Position            |                |                |                |                |                        |                 |                 |
| Professor/head of department | 255 (35.5)     | 183 (44.1)     | 11 (19.6)      | 9 (19.1)       | 18 (29.0)              | 19 (19.6)       | 16 (38.1)       |
| Program director/Coordinator | 102 (14.2)     | 28 (6.7)       | 6 (10.7)       | 12 (25.5)      | 8 (12.9)               | 40 (41.2)       | 9 (21.4)        |
| Other teaching faculty       | 353 (49.1)     | 204 (49.2)     | 39 (69.6)      | 26 (55.3)      | 36 (58.1)              | 35 (36.1)       | 17 (40.5)       |
| General Surgery              | 455 (60.9)     | 234 (54.2)     | 26 (44.8)      | 25 (52.1)      | 55 (80.9)              | 87 (87.9)       | 28 (66.7)       |
| Academic Hospital            | 594 (82.7)     | 339 (81.3)     | 51 (89.5)      | 39 (88.6)      | 44 (68.8)              | 85 (88.5)       | 36 (90.0)       |
| Government/Public Hospital   | 472 (63.2)     | 256 (59.3)     | 19 (32.8)      | 35 (72.9)      | 56 (82.4)              | 78 (78.8)       | 71 (74.0)       |
| Responsible for              |                |                |                |                |                        |                 |                 |
| Medical Students             | 445 (62.0)     | 238 (57.1)     | 32 (56.1)      | 39 (88.6)      | 39 (60.9)              | 58 (60.4)       | 39 (97.5)       |
| Interns                      | 535 (74.5)     | 332 (79.6)     | 31 (54.4)      | 37 (84.1)      | 38 (59.4)              | 69 (71.9)       | 28 (70.0)       |
| Residents                    | 652 (90.8)     | 372 (89.2)     | 45 (78.9)      | 43 (97.7)      | 58 (90.6)              | 94 (97.9)       | 40 (100)        |
| Fellow                       | 395 (55.0)     | 294 (70.5)     | 19 (33.3)      | 18 (40.9)      | 14 (21.9)              | 27 (28.1)       | 23 (40.5)       |
| Trainee Number               |                |                |                |                |                        |                 |                 |
| 1-5                          | 364 (51.1)     | 272 (65.2)     | 26 (46.6)      | 18 (40.9)      | 17 (26.6)              | 32 (33.3)       | 2 (5.0)         |
| 6-10                         | 171 (23.8)     | 104 (24.9)     | 11 (19.3)      | 9 (20.5)       | 24 (37.5)              | 21 (21.9)       | 2 (5.0)         |
| >11                          | 180 (25.1)     | 41 (9.8)       | 20 (35.1)      | 17 (38.6)      | 23 (35.9)              | 43 (44.8)       | 36 (90.0)       |
| Faculty Number               |                |                |                |                |                        |                 |                 |
| 1-5                          | 338 (47.1)     | 261 (62.6)     | 25 (43.9)      | 14 (31.8)      | 24 (37.5)              | 14 (14.6)       | 0 (0)           |
| 6-10                         | 192 (26.7)     | 103 (24.7)     | 20 (35.1)      | 9 (20.5)       | 28 (43.8)              | 26 (27.1)       | 6 (15.0)        |
| >11                          | 188 (26.2)     | 53 (12.7)      | 12 (21.1)      | 21 (47.7)      | 12 (18.8)              | 56 (58.3)       | 34 (85.0)       |

Table 3a: Barriers in surgical education for the Trainees. Multiple answers allowed for the question. Data are presented as number of respondents (percentage of respondent to that question).

|                                      | Overall    | East Asia  | South Asia | Africa    | Europe and Middle East | Latin America | US, Canada |
|--------------------------------------|------------|------------|------------|-----------|------------------------|---------------|------------|
| Too Busy with administrative work    | 259 (57.2) | 102 (54.5) | 12 (41.4)  | 7 (20.0)  | 76 (67.9)              | 47 (67.1)     | 15 (75.0)  |
| Too busy with clinical work          | 230 (50.8) | 97 (51.9)  | 7 (24.1)   | 23 (65.7) | 65 (58.0)              | 22 (34.1)     | 16 (80.0)  |
| Small number of case volume          | 153 (33.8) | 54 (28.9)  | 10 (34.5)  | 7 (20.0)  | 63 (56.3)              | 18 (25.7)     | 1 (5.0)    |
| Lack of well-defined curriculum      | 135 (29.8) | 56 (29.9)  | 8 (27.6)   | 17 (48.6) | 37 (33.0)              | 6 (8.6)       | 11 (55.0)  |
| No access to simulation              | 135 (29.8) | 43 (23.0)  | 15 (51.7)  | 18 (51.4) | 43 (38.4)              | 15 (21.4)     | 1 (5.0)    |
| Faculty member(s) not eager to teach | 114 (25.2) | 29 (15.5)  | 9 (31.0)   | 6 (17.1)  | 47 (42.0)              | 17 (24.3)     | 6 (30.0)   |
| Lack of qualified educators          | 84 (18.5)  | 42 (22.5)  | 4 (13.8)   | 1 (2.9)   | 24 (21.4)              | 7 (10.0)      | 6 (30.0)   |
| Lack of Case diversity               | 69 (15.2)  | 28 (15.0)  | 8 (27.6)   | 2 (5.7)   | 29 (25.9)              | 1 (1.4)       | 1 (5.0)    |
| Lack of motivation in trainees       | 53 (11.7)  | 19 (10.2)  | 2 (6.9)    | 10 (28.6) | 13 (11.6)              | 5 (7.1)       | 4 (20.0)   |
| Inadequate numbers of educators      | 52 (11.5)  | 22 (11.8)  | 4 (13.8)   | 7 (20.0)  | 12 (10.7)              | 7 (10.0)      | 0 (0)      |

Table 3b: Barriers in surgical education for the Educators. Multiple answers allowed for the question. Data are presented as number of respondents (percentage of respondent to that question).

|                                        | Overall    | East Asia  | South Asia | Africa    | Europe and Middle East | Latin America | US, Canada |
|----------------------------------------|------------|------------|------------|-----------|------------------------|---------------|------------|
| Lack of protected time                 | 442 (59.2) | 274 (63.4) | 20 (34.5)  | 26 (54.2) | 40 (58.8)              | 54 (54.5)     | 28 (66.7)  |
| Lack of incentive/compensation         | 427 (57.2) | 282 (65.3) | 27 (46.6)  | 23 (47.9) | 23 (33.8)              | 50 (50.5)     | 22 (52.4)  |
| Lack of dedicated budget               | 409 (54.8) | 250 (57.9) | 25 (43.1)  | 35 (72.9) | 34 (50.0)              | 46 (46.5)     | 19 (45.2)  |
| Requirements for clinical productivity | 276 (36.9) | 159 (36.8) | 15 (25.9)  | 22 (45.8) | 22 (32.4)              | 39 (39.4)     | 19 (45.2)  |
| Lack of training in surgical education | 259 (34.7) | 174 (40.3) | 18 (31.0)  | 18 (37.5) | 21 (30.9)              | 24 (24.2)     | 4 (9.5)    |
| Lack of motivation in trainees         | 192 (25.7) | 103 (23.8) | 17 (29.3)  | 17 (35.4) | 25 (36.8)              | 23 (23.2)     | 7 (16.7)   |
| Inadequate number of educators         | 176 (23.6) | 97 (22.5)  | 19 (32.8)  | 20 (41.7) | 9 (13.2)               | 17 (17.2)     | 14 (33.3)  |

Table 4a: Surgical training system and scenario for trainees. Categorical data are presented as number of respondents (percentage of respondent to that question) and continuous data are presented as Median (Interquartile range)

|                                    | Overall      | East Asia    | South Asia   | Africa        | Europe and Middle East | Latin America | US, Canada      |
|------------------------------------|--------------|--------------|--------------|---------------|------------------------|---------------|-----------------|
| Number of cases as primary surgeon |              |              |              |               |                        |               |                 |
| Past year                          | 40 (13-100)  | 30 (5-100)   | 30 (20-83)   | 35 (16-62)    | 50 (15-105)            | 44 (20-100)   | 150 (28-250)    |
| Until Graduation                   | 200 (68-400) | 150 (50-300) | 100 (50-213) | 200 (100-350) | 200 (85-600)           | 150 (98-258)  | 1000 (925-1000) |
| Have Protected time                | 213 (46.8)   | 103 (55.1)   | 13 (44.8)    | 16 (45.7)     | 28 (25.2)              | 32 (45.1)     | 21 (95.5)       |
| Have Sim center                    | 109 (23.9)   | 53 (28.3)    | 3 (10.3)     | 0 (0.0)       | 20 (17.9)              | 14 (19.7)     | 19 (86.4)       |
| Satisfied with                     |              |              |              |               |                        |               |                 |
| Number of cases                    | 197 (43.2)   | 90 (48.1)    | 12 (41.4)    | 17 (48.6)     | 28 (25.0)              | 34 (47.9)     | 16 (72.7)       |
| Variety of cases                   | 247 (54.3)   | 95 (50.5)    | 12 (41.4)    | 17 (48.6)     | 52 (46.4)              | 52 (73.2)     | 20 (90.9)       |
| Prepares for independent practice  | 222 (48.6)   | 79 (42.0)    | 12 (41.4)    | 22 (62.9)     | 45 (40.2)              | 48 (67.6)     | 16 (70.7)       |
| Trainee Evaluation method          |              |              |              |               |                        |               |                 |
| Operative performance              | 188 (44.3)   | 82 (46.1)    | 4 (14.8)     | 13 (43.3)     | 48 (47.1)              | 31 (44.9)     | 10 (55.6)       |
| End of rotation                    | 181 (42.7)   | 67 (37.6)    | 4 (14.8)     | 6 (20.0)      | 47 (46.1)              | 41 (59.4)     | 16 (88.9)       |
| Written exams                      | 160 (37.7)   | 64 (36.0)    | 22 (81.5)    | 17 (56.7)     | 27 (26.5)              | 25 (36.2)     | 5 (27.8)        |
| In clinic or ward                  | 147 (34.7)   | 56 (31.5)    | 8 (29.6)     | 16 (53.3)     | 38 (37.3)              | 24 (34.8)     | 5 (27.8)        |
| No assessment                      | 59 (13.9)    | 27 (15.2)    | 0 (0.0)      | 2 (6.7)       | 21 (20.6)              | 9 (13.0)      | 0 (0)           |
| Evaluator                          |              |              |              |               |                        |               |                 |
| Faculty Member                     | 287 (74.2)   | 121 (76.1)   | 18 (66.7)    | 19 (63.3)     | 61 (69.3)              | 50 (76.9)     | 18 (100)        |
| Program director                   | 156 (40.3)   | 87 (54.7)    | 6 (22.2)     | 5 (16.7)      | 19 (21.6)              | 24 (36.9)     | 15 (83.3)       |
| External Faculty                   | 94 (24.3)    | 41 (25.8)    | 19 (70.4)    | 14 (46.7)     | 15 (17.0)              | 4 (6.2)       | 1 (5.6)         |
| Evaluating organization            |              |              |              |               |                        |               |                 |
| Training Hospital                  | 167 (43.5)   | 62 (37.6)    | 7 (26.9)     | 8 (27.6)      | 48 (56.5)              | 35 (55.6)     | 7 (43.8)        |
| University/Medical school          | 161 (41.9)   | 82 (49.7)    | 25 (96.2)    | 2 (6.9)       | 20 (23.5)              | 26 (41.3)     | 6 (37.5)        |
| Accreditation Council              | 129 (33.6)   | 68 (41.2)    | 0 (0.0)      | 21 (72.4)     | 26 (30.6)              | 9 (14.3)      | 5 (31.3)        |
| Surgical Society                   | 89 (23.2)    | 44 (26.7)    | 0 (0.0)      | 14 (48.3)     | 23 (27.1)              | 7 (11.1)      | 1 (6.3)         |

Table 4b: Surgical training system and scenario for educators. Categorical data are presented as number of respondents (percentage of respondent to that question) and continuous data are presented as Mean  $\pm$  standard deviation

|                                       | Overall         | East Asia       | South Asia      | Africa          | Europe and Middle East | Latin America   | US, Canada      |
|---------------------------------------|-----------------|-----------------|-----------------|-----------------|------------------------|-----------------|-----------------|
| % of operations performed by trainees | 42.9 $\pm$ 24.8 | 38.3 $\pm$ 24.4 | 30.3 $\pm$ 16.3 | 49.8 $\pm$ 19.1 | 41.8 $\pm$ 21.5        | 60.4 $\pm$ 21.8 | 62.6 $\pm$ 24.3 |
| % of typical working day in education |                 |                 |                 |                 |                        |                 |                 |
| Less than 10%                         | 140 (20.0)      | 121 (29.6)      | 6 (10.9)        | 0 (0)           | 5 (8.1)                | 6 (6.5)         | 2 (5.1)         |
| 10-30%                                | 345 (49.4)      | 224 (54.8)      | 23 (41.8)       | 14 (33.3)       | 33 (53.2)              | 39 (42.4)       | 12 (30.8)       |
| 31-50%                                | 130 (18.6)      | 47 (11.5)       | 16 (29.8)       | 14 (33.3)       | 15 (24.2)              | 29 (31.5)       | 9 (23.1)        |
| More than 50%                         | 83 (11.9)       | 16 (3.9)        | 10 (18.2)       | 14 (33.3)       | 9 (14.5)               | 18 (19.6)       | 16 (41.1)       |
| Have Protected time                   | 219 (31.4)      | 107 (26.2)      | 35 (63.6)       | 18 (42.9)       | 16 (25.8)              | 31 (33.7)       | 12 (31.6)       |
| Get compensated for education         | 147 (21.0)      | 40 (9.8)        | 10 (18.2)       | 11 (26.2)       | 12 (19.4)              | 53 (57.6)       | 21 (53.8)       |
| Have budget for education             | 242 (34.9)      | 163 (39.9)      | 6 (10.9)        | 2 (4.8)         | 13 (21.3)              | 25 (27.2)       | 34 (87.2)       |
| Have Sim center                       | 188 (26.9)      | 112 (27.4)      | 3 (5.5)         | 4 (9.5)         | 13 (21.0)              | 30 (32.6)       | 26 (66.7)       |
| Satisfied with                        |                 |                 |                 |                 |                        |                 |                 |
| Number of cases                       | 362 (51.9)      | 201 (51.5)      | 24 (43.6)       | 19 (45.2)       | 23 (37.1)              | 50 (54.3)       | 36 (92.3)       |
| Variety of cases                      | 428 (61.2)      | 231 (56.5)      | 33 (60.0)       | 24 (57.1)       | 38 (61.3)              | 68 (73.9)       | 34 (87.2)       |
| Trainee Evaluation method             |                 |                 |                 |                 |                        |                 |                 |
| Operative performance                 | 351 (53.7)      | 223 (56.9)      | 24 (51.1)       | 19 (50.0)       | 26 (44.8)              | 29 (35.8)       | 30 (78.9)       |
| In clinic or ward                     | 315 (48.2)      | 186 (47.4)      | 20 (42.6)       | 29 (76.3)       | 28 (48.3)              | 25 (30.9)       | 27 (71.1)       |
| End of rotation                       | 300 (45.9)      | 146 (37.2)      | 20 (42.6)       | 22 (57.9)       | 20 (34.5)              | 57 (70.4)       | 35 (92.1)       |
| Oral exams                            | 183 (28.0)      | 47 (12.0)       | 35 (74.5)       | 24 (63.2)       | 10 (17.2)              | 45 (55.6)       | 22 (57.9)       |
| Written exams                         | 169 (25.8)      | 33 (8.4)        | 39 (83.0)       | 25 (65.8)       | 15 (25.9)              | 32 (39.5)       | 25 (65.8)       |
| No assessment                         | 91 (13.9)       | 71 (18.1)       | 3 (6.4)         | 0 (0.0)         | 16 (27.6)              | 1 (1.2)         | 0 (0)           |
| Evaluator                             |                 |                 |                 |                 |                        |                 |                 |
| Faculty Member                        | 401 (65.6)      | 207 (57.2)      | 37 (82.2)       | 31 (86.1)       | 27 (54.0)              | 62 (76.5)       | 37 (100)        |
| Program director                      | 360 (58.9)      | 241 (66.6)      | 9 (20.0)        | 15 (41.7)       | 25 (50.0)              | 41 (50.6)       | 29 (78.4)       |
| External Faculty                      | 112 (18.3)      | 36 (9.9)        | 32 (71.1)       | 12 (33.3)       | 15 (30.0)              | 6 (7.4)         | 11 (29.7)       |
| Evaluating organization               |                 |                 |                 |                 |                        |                 |                 |
| Training Hospital                     | 216 (35.3)      | 141 (39.0)      | 11 (23.4)       | 9 (24.3)        | 11 (22.0)              | 34 (43.6)       | 10 (26.3)       |
| University/Medical school             | 295 (48.2)      | 165 (45.6)      | 38 (80.9)       | 9 (24.3)        | 12 (24.0)              | 40 (51.3)       | 31 (81.6)       |
| Accreditation Council                 | 289 (47.2)      | 181 (50.0)      | 13 (27.7)       | 28 (75.7)       | 31 (62.0)              | 18 (23.1)       | 18 (47.4)       |
| Surgical Society                      | 205 (33.5)      | 167 (46.1)      | 3 (6.4)         | 11 (29.7)       | 9 (18.0)               | 13 (16.7)       | 2 (5.3)         |
| Attending Evaluation                  |                 |                 |                 |                 |                        |                 |                 |
| No assessment                         | 339 (51.8)      | 237 (60.6)      | 13 (27.7)       | 17 (43.6)       | 33 (56.9)              | 36 (43.4)       | 3 (8.1)         |
| Evaluation by trainees                | 188 (28.7)      | 88 (22.5)       | 7 (14.9)        | 9 (23.1)        | 20 (34.5)              | 29 (34.9)       | 35 (94.3)       |

|                                            |            |            |           |           |           |           |           |
|--------------------------------------------|------------|------------|-----------|-----------|-----------|-----------|-----------|
| Evaluation by hospital                     | 132 (20.2) | 64 (16.4)  | 24 (51.1) | 8 (20.5)  | 10 (17.2) | 19 (22.9) | 7 (18.9)  |
| Responsibility of<br>Developing curriculum |            |            |           |           |           |           |           |
| Governing body                             | 168 (25.6) | 73 (18.7)  | 17 (36.2) | 23 (59.0) | 18 (31.0) | 23 (27.7) | 14 (36.8) |
| University                                 | 125 (19.1) | 66 (16.9)  | 24 (51.1) | 4 (10.3)  | 1 (1.7)   | 26 (31.3) | 4 (10.5)  |
| Head of Department                         | 254 (38.7) | 169 (43.2) | 19 (40.4) | 13 (33.3) | 20 (34.5) | 26 (31.3) | 7 (18.4)  |
| Program Director                           | 288 (43.9) | 157 (40.2) | 14 (29.8) | 21 (53.8) | 6 (10.3)  | 52 (62.7) | 35 (92.1) |
| No Curriculum                              | 65 (9.9)   | 41 (10.5)  | 0 (0)     | 3 (7.7)   | 16 (27.6) | 5 (6.0)   | 0 (0)     |

Table 5: Percentage of typical day spent by trainees in various activities. Data are presented as number of respondents (percentage of respondent to that question).

|                                              | Overall    | East Asia | South Asia | Africa    | Europe and Middle East | Latin America | US, Canada |
|----------------------------------------------|------------|-----------|------------|-----------|------------------------|---------------|------------|
| In OR operating or assisting                 |            |           |            |           |                        |               |            |
| Less than 10%                                | 68 (14.9)  | 24 (12.8) | 3 (10.3)   | 7 (20.0)  | 24 (21.4)              | 8 (11.3)      | 2 (9.1)    |
| 10-30%                                       | 177 (38.7) | 66 (35.1) | 15 (51.7)  | 13 (37.1) | 60 (53.6)              | 19 (26.8)     | 4 (18.2)   |
| 31-50%                                       | 129 (28.2) | 56 (29.8) | 4 (13.8)   | 12 (34.3) | 24 (21.4)              | 27 (38.0)     | 6 (27.3)   |
| More than 50%                                | 83 (18.2)  | 42 (22.3) | 15 (24.1)  | 3 (8.6)   | 4 (3.6)                | 17 (23.9)     | 10 (45.5)  |
| Other educational activities                 |            |           |            |           |                        |               |            |
| Less than 10%                                | 204 (44.6) | 87 (46.3) | 13 (44.8)  | 9 (25.7)  | 52 (46.4)              | 34 (47.9)     | 9 (40.9)   |
| 10-30%                                       | 167 (36.5) | 72 (38.3) | 14 (48.3)  | 13 (37.1) | 33 (29.5)              | 22 (31.0)     | 13 (59.1)  |
| 31-50%                                       | 63 (13.8)  | 23 (12.2) | 2 (6.9)    | 11 (31.4) | 16 (14.3)              | 11 (15.5)     | 0 (0)      |
| More than 50%                                | 23 (5.0)   | 6 (3.2)   | 0 (0.0)    | 2 (5.7)   | 11 (9.8)               | 4 (5.6)       | 0 (0)      |
| Non educational activities                   |            |           |            |           |                        |               |            |
| Less than 10%                                | 119 (26.0) | 46 (24.5) | 13 (44.8)  | 16 (45.7) | 15 (13.4)              | 25 (35.2)     | 4 (18.2)   |
| 10-30%                                       | 166 (36.3) | 71 (37.8) | 10 (34.5)  | 8 (22.9)  | 35 (31.3)              | 29 (40.8)     | 13 (59.1)  |
| 31-50%                                       | 87 (19.0)  | 39 (20.7) | 2 (6.9)    | 8 (22.9)  | 28 (25.0)              | 9 (12.7)      | 1 (4.5)    |
| More than 50%                                | 85 (18.6)  | 32 (17.0) | 4 (13.8)   | 3 (8.6)   | 34 (30.4)              | 8 (11.3)      | 4 (18.2)   |
| Percentage of scrubbed cases trainee operate |            |           |            |           |                        |               |            |
| Less than 10%                                | 109 (25.1) | 55 (30.2) | 3 (10.7)   | 7 (22.6)  | 33 (31.4)              | 10 (14.5)     | 1 (5.0)    |
| 10-30%                                       | 117 (26.9) | 50 (27.5) | 16 (57.1)  | 8 (25.8)  | 14 (13.3)              | 19 (27.5)     | 10 (50.0)  |
| 31-50%                                       | 108 (24.8) | 45 (24.7) | 4 (14.3)   | 8 (25.8)  | 32 (30.5)              | 14 (20.3)     | 5 (25.0)   |
| >51%                                         | 101 (23.2) | 32 (17.6) | 16 (17.9)  | 8 (25.8)  | 26 (24.8)              | 26 (37.7)     | 4 (20.0)   |

Table 6a: How often do you as a trainee do following as a regular method of training in operation room of your hospital. Data are presented as number of respondents (percentage of respondent to that question) (Trainees survey)

|                                         | Overall    | East Asia  | South Asia | Africa    | Europe and Middle East | Latin America | US, Canada |
|-----------------------------------------|------------|------------|------------|-----------|------------------------|---------------|------------|
| By observing faculty                    |            |            |            |           |                        |               |            |
| Never/Rarely                            | 40 (9.3)   | 6 (3.3)    | 0 (0.0)    | 1 (3.2)   | 25 (24.0)              | 5 (7.2)       | 3 (15.0)   |
| Sometimes                               | 136 (31.5) | 49 (27.2)  | 9 (32.1)   | 9 (29.0)  | 46 (44.2)              | 13 (18.8)     | 10 (50.0)  |
| Very often/Always                       | 256 (59.3) | 125 (69.4) | 19 (67.9)  | 21 (67.7) | 33 (31.7)              | 51 (73.9)     | 7 (35.0)   |
| Operate without faculty scrubbed in     |            |            |            |           |                        |               |            |
| Never/Rarely                            | 171 (39.5) | 87 (48.3)  | 2 (7.1)    | 3 (9.7)   | 50 (47.6)              | 22 (31.9)     | 7 (35.0)   |
| Sometimes                               | 121 (27.9) | 50 (27.8)  | 9 (32.1)   | 11 (35.5) | 32 (30.5)              | 11 (15.9)     | 8 (40.0)   |
| Very often/Always                       | 141 (32.6) | 43 (23.9)  | 17 (60.7)  | 17 (54.8) | 23 (21.9)              | 36 (52.2)     | 5 (25.0)   |
| Senior trainee instructs junior trainee |            |            |            |           |                        |               |            |
| Never/Rarely                            | 127 (29.4) | 57 (31.7)  | 5 (17.9)   | 0 (0)     | 37 (35.6)              | 26 (37.7)     | 2 (10.0)   |
| Sometimes                               | 112 (25.9) | 50 (27.8)  | 7 (25.0)   | 9 (29.0)  | 17 (16.3)              | 20 (29.0)     | 9 (45.0)   |
| Very often/Always                       | 193 (44.7) | 73 (40.6)  | 16 (57.1)  | 22 (71.0) | 50 (48.1)              | 23 (33.3)     | 9 (45.0)   |
| Assist before operating                 |            |            |            |           |                        |               |            |
| Never/Rarely                            | 25 (5.8)   | 19 (10.5)  | 0 (0.0)    | 0 (0.0)   | 4 (3.8)                | 2 (2.9)       | 0 (0)      |
| Sometimes                               | 62 (14.3)  | 32 (17.7)  | 0 (0.0)    | 5 (16.1)  | 8 (7.6)                | 13 (18.8)     | 4 (20.0)   |
| Very often/Always                       | 347 (80.0) | 130 (71.8) | 28 (100.0) | 26 (83.9) | 93 (88.6)              | 54 (78.3)     | 16 (80.0)  |
| Perform in simulator before operating   |            |            |            |           |                        |               |            |
| Never/Rarely                            | 290 (67.0) | 92 (51.1)  | 20 (71.4)  | 27 (87.1) | 80 (76.2)              | 58 (84.1)     | 13 (65.0)  |
| Sometimes                               | 84 (19.4)  | 46 (25.6)  | 4 (14.3)   | 4 (12.9)  | 18 (17.1)              | 7 (10.1)      | 5 (25.0)   |
| Very often/Always                       | 59 (13.6)  | 42 (23.3)  | 4 (14.3)   | 0 (0.0)   | 7 (6.7)                | 4 (5.8)       | 2 (10.0)   |

Table 6b: How often does a trainee do following as a regular method of training in operation room of your hospital. Data are presented as number of respondents (percentage of respondent to that question) (Educator survey)

|                                         | Overall    | East Asia  | South Asia | Africa    | Europe and Middle East | Latin America | US, Canada |
|-----------------------------------------|------------|------------|------------|-----------|------------------------|---------------|------------|
| Watch without assisting                 |            |            |            |           |                        |               |            |
| Never/Rarely                            | 352 (51.5) | 269 (66.7) | 10 (18.9)  | 10 (25.0) | 17 (29.3)              | 23 (25.3)     | 23 (60.5)  |
| Sometimes                               | 169 (24.7) | 83 (20.6)  | 15 (28.3)  | 15 (37.5) | 27 (46.6)              | 19 (20.9)     | 10 (26.3)  |
| Very often/Always                       | 162 (23.7) | 51 (12.7)  | 28 (52.8)  | 15 (37.5) | 14 (24.1)              | 49 (53.8)     | 5 (13.2)   |
| Assist before operating                 |            |            |            |           |                        |               |            |
| Never/Rarely                            | 28 (4.1)   | 22 (5.5)   | 1 (1.9)    | 0 (0.0)   | 0 (0)                  | 2 (2.2)       | 3 (7.9)    |
| Sometimes                               | 90 (13.2)  | 66 (16.4)  | 1 (1.9)    | 8 (20.0)  | 4 (6.9)                | 6 (6.6)       | 5 (13.2)   |
| Very often/Always                       | 565 (82.7) | 314 (78.1) | 52 (96.3)  | 32 (80.0) | 54 (93.1)              | 83 (91.2)     | 30 (78.9)  |
| Perform in simulator before operating   |            |            |            |           |                        |               |            |
| Never/Rarely                            | 385 (56.3) | 207 (51.4) | 35 (64.8)  | 31 (77.5) | 46 (79.3)              | 53 (58.2)     | 13 (34.2)  |
| Sometimes                               | 175 (25.6) | 106 (26.3) | 7 (13.0)   | 5 (12.5)  | 8 (13.8)               | 30 (33.0)     | 19 (50.0)  |
| Very often/Always                       | 124 (18.1) | 90 (22.3)  | 12 (22.2)  | 4 (10.0)  | 4 (6.9)                | 8 (8.8)       | 6 (15.8)   |
| Senior trainee instructs junior trainee |            |            |            |           |                        |               |            |
| Never/Rarely                            | 228 (33.3) | 176 (43.7) | 2 (3.7)    | 2 (5.0)   | 25 (42.4)              | 15 (16.5)     | 8 (21.1)   |
| Sometimes                               | 167 (24.4) | 96 (23.8)  | 8 (14.8)   | 8 (20.0)  | 16 (27.1)              | 25 (27.5)     | 14 (36.8)  |
| Very often/Always                       | 290 (42.3) | 131 (32.5) | 44 (81.5)  | 30 (75.0) | 18 (30.5)              | 51 (56.0)     | 16 (42.1)  |

Table 7: Training in surgical education. Categorical data are presented as number of respondents (percentage of respondent to that question) and continuous data are presented as Media (Interquartile Range).

|                                                                             | Overall    | East Asia  | South Asia | Africa    | Europe and Middle East | Latin America | US, Canada |
|-----------------------------------------------------------------------------|------------|------------|------------|-----------|------------------------|---------------|------------|
| Published a paper on surgical education                                     | 163 (25.1) | 73 (18.7)  | 12 (27.3)  | 13 (34.2) | 17 (31.5)              | 26 (31.7)     | 21 (56.8)  |
| Number of papers                                                            | 3 (1-8)    | 3 (1-6)    | 3 (2-6)    | 3 (2-5)   | 2 (2-6)                | 4 (2-10)      | 5 (3-10)   |
| Received formal training in education research                              | 146 (22.5) | 64 (16.4)  | 20 (45.5)  | 8 (21.1)  | 16 (27.6)              | 24 (29.3)     | 14 (37.8)  |
| Participated in formal training in surgical education:                      |            |            |            |           |                        |               |            |
| No training experiences                                                     | 270 (41.6) | 193 (49.4) | 16 (36.4)  | 8 (21.6)  | 19 (32.8)              | 26 (31.7)     | 8 (21.6)   |
| Postgraduate degree                                                         | 126 (19.4) | 50 (12.8)  | 15 (34.1)  | 7 (18.9)  | 5 (9.3)                | 29 (35.4)     | 10 (27.0)  |
| Departmental training courses                                               | 134 (20.6) | 134 (20.8) | 10 (22.7)  | 8 (21.6)  | 11 (19.0)              | 18 (22.0)     | 15 (40.5)  |
| Institutional training courses                                              | 126 (19.4) | 125 (19.4) | 16 (36.4)  | 10 (27.0) | 13 (22.4)              | 13 (15.9)     | 15 (40.5)  |
| National organization training course                                       | 188 (29.0) | 187 (29.0) | 5 (11.4)   | 18 (48.6) | 13 (22.4)              | 14 (17.1)     | 20 (54.1)  |
| International organization training course                                  | 47 (7.2)   | 46 (7.1)   | 3 (6.8)    | 9 (24.3)  | 15 (25.9)              | 3 (3.7)       | 4 (10.8)   |
| Industry sponsored training courses                                         | 66 (10.2)  | 66 (10.2)  | 1 (2.3)    | 2 (5.4)   | 8 (13.8)               | 13 (15.9)     | 3 (8.1)    |
| Who paid for the training?                                                  |            |            |            |           |                        |               |            |
| Free of cost                                                                | 63 (16.6)  | 25 (12.4)  | 5 (19.2)   | 5 (17.2)  | 10 (26.3)              | 13 (23.2)     | 5 (17.2)   |
| Industry                                                                    | 12 (3.2)   | 7 (3.5)    | 0 (0.0)    | 1 (3.4)   | 2 (5.3)                | 2 (3.6)       | 0 (0)      |
| Employer                                                                    | 92 (24.2)  | 59 (29.2)  | 4 (15.4)   | 3 (10.3)  | 3 (7.9)                | 13 (23.2)     | 10 (34.5)  |
| Self                                                                        | 202 (53.2) | 105 (52.0) | 16 (61.5)  | 20 (69.0) | 22 (57.9)              | 25 (44.6)     | 14 (48.3)  |
| Others                                                                      | 11 (2.9)   | 6 (3.0)    | 1 (3.8)    | 0 (0.0)   | 1 (2.6)                | 3 (5.4)       | 0 (0)      |
| The training was useful in shaping teaching performance                     | 341 (90.9) | 178 (90.4) | 25 (96.2)  | 25 (86.2) | 38 (100)               | 48 (85.7)     | 27 (93.1)  |
| Would pursue further training to enhance their skills as surgical educators | 563 (87.4) | 325 (83.5) | 42 (100)   | 37 (100)  | 54 (94.7)              | 75 (91.5)     | 73 (89.0)  |
| Topics would like to get training                                           |            |            |            |           |                        |               |            |
| Teaching in the OR                                                          | 402 (71.7) | 231 (71.1) | 30 (75.0)  | 25 (67.6) | 42 (77.8)              | 53 (70.7)     | 21 (70.0)  |
| Performance assessment                                                      | 348 (62.0) | 197 (60.6) | 30 (75.0)  | 27 (73.0) | 32 (59.3)              | 42 (56.0)     | 20 (66.7)  |
| Curriculum development                                                      | 303 (54.0) | 152 (46.8) | 32 (80.0)  | 29 (78.4) | 33 (61.1)              | 40 (53.3)     | 17 (56.7)  |
| Feedback                                                                    | 299 (53.3) | 182 (56.0) | 23 (57.5)  | 22 (59.5) | 23 (42.6)              | 30 (40.0)     | 19 (63.3)  |
| Education Research                                                          | 298 (53.1) | 157 (48.3) | 31 (77.5)  | 27 (73.0) | 29 (53.7)              | 41 (54.7)     | 13 (43.3)  |
| Use of Simulation                                                           | 296 (52.8) | 153 (47.1) | 23 (57.5)  | 28 (75.7) | 30 (55.6)              | 28 (37.3)     | 19 (63.3)  |

Table 8: Major needs of trainees and educators across various regions.

|           | East Asia                                                                                                                     | South Asia                                                                                                                          | Africa                                                                                         | Europe and Middle East                                                                                       | Latin America                                                  | US, Canada                                                                                         |
|-----------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Trainees  | <ul style="list-style-type: none"> <li>• More operative experience</li> <li>• Mostly learning by observing faculty</li> </ul> | <ul style="list-style-type: none"> <li>• Simulation</li> <li>• Work hour regulation</li> <li>• More operative experience</li> </ul> | <ul style="list-style-type: none"> <li>• Simulation</li> <li>• Work hour regulation</li> </ul> | <ul style="list-style-type: none"> <li>• Protected time for education</li> <li>• Simulation</li> </ul>       | <ul style="list-style-type: none"> <li>• Simulation</li> </ul> | <ul style="list-style-type: none"> <li>• Management of clinical and administrative work</li> </ul> |
| Educators | <ul style="list-style-type: none"> <li>• Compensation</li> <li>• Assessment</li> </ul>                                        | <ul style="list-style-type: none"> <li>• More educators</li> <li>• Dedicated budget</li> </ul>                                      | <ul style="list-style-type: none"> <li>• More educators</li> <li>• Dedicated budget</li> </ul> | <ul style="list-style-type: none"> <li>• Protected time for education</li> <li>• Dedicated budget</li> </ul> | <ul style="list-style-type: none"> <li>• Simulation</li> </ul> | <ul style="list-style-type: none"> <li>• Protected time</li> </ul>                                 |