Monitoring and reporting gaps in spine surgery education through an international needs assessment survey [version 1; peer review: awaiting peer review]

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Abstract

Background
A critical step in curriculum development is conducting a needs assessment of learners. In spine surgery, the educational needs of trainees, and especially of practicing surgeons, evolve frequently due to changes in practice, technology, etc. To monitor these changes and adapt the educational offerings, organizations delivering continuing medical education (CME) and continuing professional development (CPD) periodically repeat needs assessments.

Methods
An international needs assessment in the form of a set of 15 online questions was designed and circulated in 2017 and in 2021 to the AO Spine community of members and registered users to gather input in five main areas: educational needs in spine pathologies and techniques, required improvements in practice, preferences for types of educational offerings, and profiling information.

Results
We received and analyzed 1,204 responses in English during the main reporting period in the 2017 needs assessment from residents, fellows, and practicing surgeons in orthopedics and neurosurgery, and 1,845 in 2021. Spine surgeons wish to improve their knowledge related to all the common pathologies, with some variability among regions and stage of career. Minimally invasive spine surgery (MISS) was the highest-rated need within surgical techniques in all regions (except North America) and all stages of career. Data show a strong preference for face-to-face courses with hands-on training, high

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demand for mentorship/fellowship/observership, and solid interest in online and blended education.

Conclusions
The needs assessment process pointed out general trends but also identified varying needs depending on the local situation and stage of career. For this reason, CME/CPD providers must adapt to the local situation to provide educational offerings that meet learner needs.

Keywords
Needs assessment, spine surgery, educational gaps
Introduction
Technology, surgical techniques, and patient demographics constantly evolve in spine care surgery. Navigation, computed-assisted surgery, robotics, minimally invasive spine surgery, and image-tracking systems are examples of recent advancements in spine care surgery. Therefore, trainees, practicing surgeons, and program directors must constantly review the educational gaps and needs and keep up to date regarding many topics, including the complications associated with the latest developments. Surgeons have different levels of expertise, different levels of education, and a different pace in acquiring the knowledge and skills, and this provides a challenge to plan education that addresses the gaps and to customize the topics to the required level and depth of information. Experienced spine surgeons are motivated to adopt a new technique after identifying their practices in where patient outcomes could clearly be improved or complications avoided. Formal curricula are established in most countries for training but not for continuing medical education (CME) and continuing professional development (CPD), which is one of the main mechanisms by which certified surgeons maintain and improve clinical performance. A cornerstone of planning to maximize the delivery of information is to perform a needs assessment. Methods of needs assessments include surveys, interviews, focus groups, utilization of the Delphi process, tests, literature searches, patient chart audits, and direct observations. These data can be used to complement evaluation data from past events where the level of achievement of the intended learning objectives can be reviewed and comments for future improvement are integrated.

AO Spine is a worldwide organization for spine surgery structured into regional and international education committees, with one overall curriculum and some subspecialty taskforces. It delivers around 120 educational events each year globally for residents and for practicing surgeons. Most of these events were face-to-face courses with hands-on practical exercises or anatomical laboratory procedures until the Covid-19 pandemic forced many cancellations or postponements. This situation also resulted in transformation to online formats for some events. Traditionally, the activities are designed according to three levels of expertise: principles (surgeons with up to 3 years of experience), advanced (3 to 10 years of experience), and masters (more than 10 years of experience in a topic). Needs assessments have been used by clinical divisions within AO for many years to identify surgeon needs and have helped specialties to design and offer the best educational programs and activities. The needs assessments are typically repeated every 4 or 5 years. This has become a valuable tool in planning events at international, regional, and local levels, and in designing educational curricula in both broad and specific topics. Combined with data from our comprehensive event evaluation and assessment system, where we identify the gaps between what surgeons think they know (what is) and what they are expected to know (what ought to be), this helps to assess the needs and interest in all topics. Since organizations must plan their schedule of events in advance in order to develop faculty and allocate resources, and since educators must be able to find strategies to motivate learners, both sets of data are essential and are enhanced when combined.

The main aims of this work are to:
- Outline a process for monitoring the educational needs of spine surgeons globally and for reporting the findings to help planning at international, regional, and local levels
- Identify the current main educational needs in terms of pathologies, procedures, and nontechnical skills, as well as preferences for each type of educational offering
- Identify any changes and trends in the areas of educational need and delivery preferences over the years and between countries and regions, as well as issues that might be barriers faced by surgeons in accessing offerings

Methods
An educational quality taskforce of four expert neurosurgeons and orthopedic surgeons was established by AO Spine in 2016 and met to define a needs assessment project supported by a curriculum developer from the AO Education Institute. Input was gathered from many other surgeons through the circulation of planning documents, questions, and pilot questionnaires over the following months to achieve the following phases.

Framework and question design
A framework for the overall needs assessment was proposed by the AO Spine education commission chairperson and input was integrated from the taskforce members to define the overall goals for improving patient outcomes by changing clinical practice. At the base of this framework, the key question is: What do surgeons want? (those starting practice and those already practicing after board certification). A needs assessment reaching out online to the entire AO Spine community of members and registered users was proposed and approved by the education commission, and resources allocated.

Questions to address the main areas in the framework were proposed and reviewed and finally structured into five main areas: educational needs in spine pathologies, educational needs in techniques, required improvements in practice, preferences for types of educational offerings, and profiling information. Questions from a 2013 project that included a needs assessment to enhance the AO Spine Curriculum were used as a starting point for pathologies and profiling questions. Profiling questions from the standard AO Spine evaluation and assessment process were also integrated: country of practice, specialty, years since graduation, type of hospital, case load, etc. (a total of 11 questions). Four different types of questions were to create an overall set of items and the aim was that responders would need just 5 minutes to complete all items: yes-no questions, multiple-choice questions, constant sum questions (using Likert scales), and open text questions. The questions for 2021 were reviewed by the education commission members and other key faculty, and were updated with additional questions regarding online education, pathologies, and procedures (a total of 16 questions).
Implementation and distribution
The questions were delivered using SurveyMonkey (www.surveymonkey.com; Palo Alto, California, USA) and a unique link was created for each language (English, Chinese, Spanish, Japanese, Portuguese, Korean, and Russian in 2017 and English, Chinese, and Spanish versions in 2021). An email-based communication was circulated to the AO Spine members and registered users worldwide (n~28,000) with two reminders over the following 3 weeks. The invitation was also posted on social media. The questions were left open for 3 months in 2017 (June to August) and for 6 weeks in 2021 (late January to mid-March). Responses were anonymous and voluntary, and an incentive was offered in both years in the form of a draw for prizes of AO Spine books and places at the AO Spine Global Spine Congress (random draw from completed responders who opted in).

Data reporting, analysis, and statistics
All raw data were reviewed in SurveyMonkey and extracted to make visual charts in presentations to share with the international commission, regional committees, and national councils or educational groups. Each report summarized the data as well as showing the source of the responses. The local reports also included all the optional text responses. Each group receiving a report was asked to analyze the data and to define actions for their planning of face-to-face and online events for the next year. They were also asked to identify any other actions related to resources, faculty, or future priorities for their audiences. Descriptive statistics of the data for the hit report were calculated using standard methods to calculate means and percentages. Rankings of the self-reported preferences of responders were added for some variables.

Ethical approval
According to the Canton Zurich Ethical commission this study does not require an authorization from the ethics committee; Req-2022-00181. On the questionnaire, we included a statement of purpose which disclosed the use of the data: “The information you provide will be anonymized and made available to the education planning groups in aggregate form. The data may be used for research purposes.”

Results
We received in total 2,863 responses in the 2017 needs assessment (1,738 in English, 699 in Simplified Chinese, 213 in Spanish, 85 in Japanese, 71 in Portuguese, 30 in Korean, and 27 in Russian) and 2,011 responses in 2021 (1,845 in English, 105 in Spanish, and 61 in simplified Chinese). The six countries with the most responses including all languages in 2017 were China (750), India (299), Japan (121), Egypt (110), the USA
(110), and the Philippines (101). And in 2021, they were China (167), the USA (122), Turkey (118), India (111), South Korea (88), and Japan (84). The average time spent by a responder was 6 minutes 36 seconds and 84% completed all questions.

The following analysis is only of the responses in English. The responses were received mainly from practicing orthopedic surgeons, followed by neurosurgeons, orthopedic spine fellows, orthopedic residents, and neurosurgery residents (Table 1). The distribution among hospital setting and regions was similar in both 2017 and 2021 sets (Table 1). Both sets suggest spine surgeons wish to improve their knowledge regarding the common pathologies, with degeneration and spinal trauma as the most frequent options (Table 2). Minimally invasive spine surgery (MISS) was the highest-rated need from the options offered in the surgical techniques section in both 2017 and 2021, and cervical techniques was second in 2017 while spinal instrumentation techniques was second in 2021 (Table 2). In the open text comments, responders were asked to suggest other topics for their education. The most frequently mentioned ones in 2021 were endoscopic surgery, spinal cord trauma, robotics, tumor, navigation, and new techniques. Table 3 shows the percentages of surgeons who report practice challenges and improvements needed in several specific areas of their practice (these questions were presented as yes or no options). The main challenges were teaching and mentoring and online practice development (telemedicine), while the main areas for improvement were reducing complication rates and improving patient satisfaction (Table 3).

The responders report a strong preference for face-to-face courses with hands-on training in 2021 (Table 4). Mentorship/fellowship and observership is the second most preferred

| Table 1. Profile of the responders for both the 2017 and 2021 needs assessments (comparison of main responses gathered in English). |
|-------------------------------|-------------------|-------------------|
| **AO Spine region** | 2017 (N=1,204) | 2021 (N=1,845) |
| Asia Pacific | 26.9% | 34.1% |
| Europe and Southern Africa | 27.8% | 30.8% |
| Latin America | 3.8% | 11.3% |
| Middle East and Northern Africa | 26.1% | 14.1% |
| North America | 10.5% | 7.9% |
| Africa | 4.1% | - |
| Other | 0.8% | 1.7% |
| **Current positions (specialty training and level)** | | |
| Orthopedic surgeon | 45.3% | 52.2% |
| Orthopedic spine fellow | 10.2% | 8.7% |
| Orthopedic resident | 11.5% | 6.8% |
| Neurosurgeon | 19.5% | 22.5% |
| Neurosurgery spine fellow | 2.8% | 1.8% |
| Neurosurgery resident | 5.2% | 3.0% |
| Other or not specified | 4.8% | 4.3% |
| **What is your main practice location?** (More than one option was possible in 2021) | | |
| Level 1 trauma center | 22.9% | 49.0% |
| Level 2 trauma center | 16.5% | 26.7% |
| Local or community hospital | 13.2% | 13.7% |
| University hospital | 31.8% | 33.7% |
| Private practice | 13.3% | 23.9% |
| Other | 2.2% | 1.9% |
Table 2. Ranking of new areas of spinal surgery knowledge and new skills wanted over the next two years.

| Question from needs assessment | 2017 (N=1,204) | 2021 (N=1,845) |
|-------------------------------|----------------|----------------|
|                               | Ranking | %             | Ranking | %             |
| On which of the pathologies listed below would you be likely to seek new medical knowledge in the next 2 years? (Select ALL options that are important to you) | Degeneration | 1 | 71% | 1 | 69% |
|                               | Spinal trauma | 2 | 64% | 3 | 57% |
|                               | Adult deformity | 3 | 62% | 2 | 58% |
|                               | Oncology | 4 | 52% | 4 | 45% |
|                               | Pain | 5 | 48% | 6 | 40% |
|                               | Pediatric deformity | 6 | 43% | 8 | 32% |
| On which of the surgical techniques listed below would you seek new knowledge in the next 2 years? (Select ALL options that are important to you) | Minimally invasive spinal surgery (MISS) | 1 | 70% | 1 | 77% |
|                               | Cervical techniques (2017) Spinal instrumentation techniques (2021) | 2 | 62% | - | 2 | 57% |
|                               | Spinal deformity correction | 3 | 61% | 3 | 56% |
|                               | Failed back/revision surgery | 4 | 53% | 4 | 54% |
|                               | Radical tumor resection | 5 | 40% | 5 | 39% |

Table 3. Percentages of responders reporting specific challenges and areas for improvement over the next 2 years (ranked).

| Question from needs assessment | 2017 (N=1,204) | 2021 (N=1,845) |
|-------------------------------|----------------|----------------|
|                               | Ranking | %             | Ranking | %             |
| What practice challenges do you expect to see in the next 2 years? (Yes or No. Select ALL that apply) | Teaching and mentoring | 1 | 54% | 2 | 51% |
|                               | Working in teams | 2 | 51% | 4 | 40% |
|                               | Practice management | 3 | 52% | 3 | 43% |
|                               | Health policy | 4 | 40% | 6 | 30% |
|                               | Online practice development (telemedicine) | - | - | 1 | 58% |
|                               | Team leadership and communication | - | - | 5 | 37% |
| What improvements in clinical practice are needed in your practice in the next 2 years? (Yes or No. Select ALL that apply) | Improved patient satisfaction with treatment | 1 | 71% | 2 | 61% |
|                               | Reduced complication rates | 2 | 64% | 1 | 63% |
|                               | Improved patient access to treatment | 3 | 49% | 4 | 49% |
|                               | Meeting hospital metrics and recertification | 4 | 28% | 6 | 26% |
|                               | Improved patient knowledge on spinal problems and treatment alternatives | - | - | 3 | 50% |
|                               | Remote patient management (telemedicine) | - | - | 5 | 31% |
educational type and there is a strong interest in the other types of delivery, and only a moderate interest for face-to-face courses without hands-on training (Table 4). The most important factors influencing the responders’ decision to attend a course are content that is relevant to practice, quality and scope of hands-on training, quality of the faculty, convenience or ease of access, and cost (Table 4).

More detailed examination of the data from 2021 suggests there is high interest in trauma, degeneration, adult deformity, and oncology pathologies across all regions (Table 5). Pediatric deformity seems to be of higher interest for MENA (46%) than for other regions, and pain more relevant for LA (53%) (Table 5). The variability between the regions seems less than the variability between current position (Table 5). The most relevant for orthopedic residents are trauma (81%) and degeneration (75%) and trauma (54%) (Table 5). Pain seems to be more relevant for neurosurgeons than for orthopedics (Table 5). A continued interest is shown in all represented surgical techniques, especially MISS (on average 77%) (Table 6). A consistent preference for face-to-face courses with hands-on practical exercises is shown across all regions and current positions (on average 85%) (Table 6). A large preference for mentorships and fellowships exists across many regions (on average 58%) with higher interest expressed by residents (68% and 67%), and a strong interest in online and blended activities was expressed by many (Table 6).

Individual country reports were generated in both 2017 and 2021 for international review by the education commission, regional review by education committees, and for local review by national councils when there were 30 or more responses. The national reports also included all the open text responses for interpretation at the local level. Those reports, not presented here, detected further variability at a local level. An example of the variability among the 10 countries with the most responses in 2021 are shown in Figure 2–Figure 5.

| Question from needs assessment | 2017 (N=1,204) | 2021 (N=1,845) |
|-------------------------------|---------------|---------------|
|                               | Ranking %     | Ranking %     |
| **What type of educational offerings do you want in the next 2 years?** (Please select ALL options that are important to you) | | |
| Face-to-face courses | 1 | 81% | - | - |
| Face-to-face courses (with hands-on training) | - | - | 1 | 85% |
| Face-to-face courses (without hands-on training) | - | - | 5 | 39% |
| Mentorship/fellowship/observership | 2 | 73% | 2 | 58% |
| Online resources | 3 | 54% | 3 | 52% |
| Webinars | 4 | 38% | 4 | 43% |
| **Which of the following factors are important in choosing to attend an AO Spine, spine society, or industry-sponsored course?** (1 = least important, 5 = most important in 2021, and a different scale used in 2017 - top value was 3 = very important) | | |
| Content relevant to practice | 1 | 2.86 | 1 (joint) | 4.32 |
| Key opinion leaders on the faculty | 2 | 2.57 | 4 | 3.89 |
| Convenience or ease of access | 3 | 2.51 | 3 | 3.92 |
| Cost | 4 | 2.46 | 6 (joint) | 3.75 |
| Not too much time away from practice | 5 | 2.32 | - | - |
| Quality and scope of hands-on training | - | - | 1 (joint) | 4.32 |
| Availability and quality of training online | - | - | 6 (joint) | 3.75 |
| Non-biased content | - | - | 5 | 3.80 |
| Pandemic safety measures | - | - | 8 | 3.44 |

Table 4. Types of education preferred over the next 2 years and factors influencing the decision to attend courses.
Table 5. Pathologies and surgical techniques for which responders are “likely to seek new medical knowledge in the next 2 years” (percentages overall for 2021 and per region and current position). AP = Asia Pacific, ESA = Europe and Southern Africa, LA = Latin America, MENA = Middle East and Northern Africa, NA = North America. Ortho = orthopedics, Neuro = neurosurgery.

| Pathology                  | Region | Current position |
|----------------------------|--------|------------------|
|                            | Overall| AP | ESA | LA | MENA | NA | Ortho | Ortho fellow | Ortho resident | Neuro | Neuro fellow | Neuro resident |
| N (%)                      | 1,845  | 52% | 50% | 53% | 53% | 55% | 160 (9%) | 126 (7%) | 415 (22%) | 34 (2%) | 55 (3%) |
| Trauma (%)                 | 57%    | 60% | 54% | 61% | 53% | 55% | 50% | 81% | 54% | 63% | 64% |
| Degeneration (%)           | 69%    | 71% | 73% | 65% | 68% | 69% | 74% | 56% | 73% | 75% | 75% |
| Adult deformity (%)        | 58%    | 57% | 61% | 73% | 65% | 60% | 46% | 51% | 47% | 40% |
| Pediatric deformity (%)    | 32%    | 35% | 46% | 18% | 38% | 33% | 42% | 19% | 22% | 23% |
| Oncology (%)               | 45%    | 51% | 46% | 47% | 38% | 42% | 33% | 62% | 34% | 75% |
| Infection (%)              | 37%    | 39% | 39% | 32% | 37% | 38% | 36% | 34% | 34% | 47% |
| Inflammatory spondyloarthropathy (%) | 19% | 19% | 17% | 21% | 22% | 19% | 18% | 19% | 22% | 25% |
| Spinal fragility fractures (%) | 44% | 47% | 40% | 35% | 48% | 45% | 45% | 42% | 39% | 44% | 45% |
| Pain (%)                   | 40%    | 39% | 53% | 27% | 35% | 40% | 37% | 50% | 56% | 58% |

Surgical technique

| Surgical technique          | Region | Current position |
|-----------------------------|--------|------------------|
|                            | Overall| AP | ESA | LA | MENA | NA | Ortho | Ortho fellow | Ortho resident | Neuro | Neuro fellow | Neuro resident |
| Spinal instrumentation (%)  | 57%    | 59% | 52% | 57% | 56% | 55% | 58% | 71% | 55% | 69% | 66% |
| MISS (%)                    | 77%    | 75% | 79% | 78% | 64% | 75% | 84% | 79% | 80% | 72% | 81% |
| Revision techniques (%)     | 54%    | 57% | 51% | 53% | 59% | 57% | 54% | 36% | 53% | 50% | 43% |
| Spinal deformity correction | 56%    | 55% | 54% | 57% | 65% | 62% | 57% | 49% | 46% | 53% | 45% |
| Radical tumor resection (%) | 39%    | 33% | 44% | 42% | 43% | 34% | 31% | 28% | 50% | 38% | 74% |

Discussion

The analysis of the needs assessment data show that all core pathologies in spine surgery education remain needed in 2021 by surgeons in almost all regions, with degeneration, adult deformity, and trauma the highest needed (69%, 58%, and 57% on average respectively). Some variations in regional and current position were detected (e.g., 81% of orthopedic resident have a need for trauma education). Minimally invasive spine surgery (MISS) continues to be the highest requested of the selected topics in 2021 in all regions. More than 80% of responders who are orthopedic fellows and neurosurgery residents as well as neurosurgeons reported this need. Endoscopic techniques are also requested.

The data also show that the most wanted educational format is face-to-face courses with hands-on exercises (85% globally and even over 90% in some regions). This seems to be an increase from 2017; however, the question was less specific in that year. Only 39% want face-to-face events without hands-on. There is a strong interest in mentorship/fellowship/observership and there is interest in online and blended learning formats from around half of the responders. We must note the timing of the 2021 needs assessment in early 2021 was following a year when most of the planned face-to-face events with exercises had been cancelled due to the Covid-19 pandemic. Therefore, the demand may be higher than at other times. Online and blended learning have been discussed for many years and multiple articles have proposed expansion due to the benefits. The European Society of Cardiology recently published their vision as a Digital Educator stating “it is clear that digital CME provides opportunity for learners (and educators and communicators) but it is likely that it will not entirely replace in-person learning. In planning for the future, we regard
Table 6. Types of educational offerings responders “want in the next 2 years” (percentages overall for 2021 and per region and current position). AP = Asia Pacific, ESA = Europe and Southern Africa, LA = Latin America, MENA = Middle East and Northern Africa, NA = North America.

| Educational type                                                                 | Region          | Overall | AP  | ESA | LA  | MENA | NA  | Ortho | Ortho fellow | Ortho resident | Neuro | Neuro fellow | Neuro resident |
|----------------------------------------------------------------------------------|-----------------|---------|-----|-----|-----|------|-----|-------|-------------|----------------|-------|-------------|----------------|
| Face-to-face courses with hands-on exercises                                      |                 | 85%     | 78% | 89% | 91% | 89%  | 84% | 83%   | 85%         | 92%            | 86%   | 82%         | 85%            |
| Face-to-face courses with cases and presentations (no hands-on component)        |                 | 39%     | 37% | 42% | 41% | 34%  | 37% | 42%   | 37%         | 36%            | 35%   | 39%         | 38%            |
| Online courses                                                                   |                 | 46%     | 49% | 41% | 53% | 43%  | 41% | 42%   | 42%         | 50%            | 51%   | 43%         | 60%            |
| Webinars/webcasts                                                                |                 | 43%     | 38% | 46% | 46% | 41%  | 51% | 40%   | 38%         | 46%            | 49%   | 39%         | 46%            |
| Online resources (videos, Surgery Reference, etc.)                                |                 | 52%     | 51% | 55% | 44% | 46%  | 60% | 51%   | 50%         | 56%            | 50%   | 50%         | 59%            |
| Mentorship, fellowship, observership                                             |                 | 58%     | 54% | 57% | 67% | 64%  | 49% | 59%   | 60%         | 68%            | 51%   | 54%         | 67%            |
| Online mentorship                                                                 |                 | 20%     | 21% | 18% | 20% | 24%  | 16% | 19%   | 23%         | 26%            | 16%   | 21%         | 31%            |
| Online study groups                                                               |                 | 26%     | 27% | 23% | 25% | 31%  | 17% | 26%   | 26%         | 25%            | 25%   | 31%         | 25%            |

How attractive are each of the following methods for your own learning? (1 = least attractive, 5 = most attractive)

| Method                                                                 | AP  | ESA | LA  | MENA | NA  | Ortho | Ortho fellow | Ortho resident | Neuro | Neuro fellow | Neuro resident |
|------------------------------------------------------------------------|-----|-----|-----|------|-----|-------|-------------|----------------|-------|-------------|----------------|
| Webinars/webcasts                                                     | 3.24| 3.24| 3.21| 3.34 | 3.14| 3.45  | 3.19         | 3.36           | 3.27  | 3.27        | 3.41           | 3.29 |
| Online courses for self-directed learning                              | 3.31| 3.34| 3.28| 3.57 | 3.21| 3.09  | 3.27         | 3.29           | 3.31  | 3.39        | 3.39           | 3.40 |
| Blended learning: online learning activities followed by interactive online event | 3.49| 3.58| 3.41| 3.60 | 3.41| 3.40  | 3.56         | 3.75           | 3.56  | 3.75        | 3.75           | 3.50 |
| Blended learning: online followed by face-to-face                      | 3.91| 3.92| 3.86| 4.13 | 3.87| 3.72  | 3.86         | 3.93           | 4.00  | 3.90        | 4.14           | 3.96 |
| Hybrid: some participants online, some face to face                    | 3.69| 3.75| 3.64| 3.73 | 3.66| 3.57  | 3.70         | 3.73           | 3.67  | 3.59        | 3.89           | 3.63 |
| Online diploma program with asynchronous and live parts covering AO Spine curriculum | 3.78| 3.71| 3.76| 4.05 | 3.85| 3.56  | 3.68         | 3.87           | 4.05  | 3.74        | 4.19           | 3.96 |

Figure 2. Comparison of areas of spinal surgery knowledge wanted over the next 2 years in the 10 countries with the most responses in 2021.
the provision of digital CME as central to fulfilling our mission to reduce the burden of cardiovascular disease. AO Spine has published its first experiences with online education where three online blended courses were designed as six-week asynchronous activities followed by a 3- or 4-day synchronous (live) online part (12 hours) because the planned face-to-face courses could not take place in 2020 (Acaroglu et al., 2021). Participants’ gaps pertaining to all learning objectives decreased and their assessment scores increased after both the asynchronous and synchronous parts, suggesting a fully online blended learning course can be effective. In addition, post-course evaluation showed high participant and faculty satisfaction rates. On the other hand, the commitment asked to participants, and especially to faculty in terms of time for online blended courses, was high and cannot be offered for all courses. It is therefore crucial that each organization offering CME and CPD regularly collect and examine the needs and preferences of their target audiences so that faculty can optimize planning and delivery. Still, further research is required to identify the exact formats and conditions for optimal delivery in spine surgery audiences.

Each organization must select the most appropriate needs assessment tools. We chose an online questionnaire that takes

Figure 3. Comparison of areas of surgical techniques wanted over the next 2 years in the 10 countries with the most responses in 2021.

Figure 4. Comparison of areas of the educational offerings wanted over the next 2 years in the 10 countries with the most responses in 2021.
around 6 minutes to complete because it allows collection of
a lot of responses and complements well expert faculty opin-
ion (planning committee) and evaluation data from past edu-
cational events. Based on our experience a successful needs
assessment process should demand minimum time for both
contributors and reviewers. This requires reports that are easy
to analyze by planning committees. In addition, monitor-
ing data on a regular basis is important and we repeat the needs
assessment every four years.

In is important to consider that spine surgery is an example of a
clinical specialty where the different healthcare systems around
the world along with different training programs and career
pathways through orthopedics and neurosurgery result in
varying needs for CME and CPD depending on the local situ-
ation. Therefore, providing information at a national level is
essential and each country must review the data for their local
planning and to guide other educational decisions such as
number of fellowships, etc.

Limitations
The main limitations for this report are: lack of proof that the
responses represent the needs of all surgeons (potential sample
bias from those in contact with our organization), predefined
“closed” options in many questions and with different answer
options between the 2 years in some items (although no major
new themes were proposed in the open text responses), the
data are reported without separating faculty responses (although
our faculty are also learners in our masters-level events), and
possibly the timing of administration (during a global pan-
demic, which might be a strength of the needs assessment and
reporting).

Conclusions
AO Spine successfully gathered comprehensive needs assessment
data in 2017 and 2021 to identify the educational gaps and
educational delivery preferences across regions. All regions
and most countries were reached in substantial numbers of
responses. The data were compiled based on profile information
(region, current position, etc.) for international, regional, and
local analysis to help plan future educational activities, comple-
menting planning committee, expert opinion and experience,
and past evaluation data.

Data availability
Underlying data
Dryad: Educational needs’ assessment for Spine surgeons
https://doi.org/10.5061/dryad.tqjq2bw1r

This project contains the following underlying data:
- AO_Spine_Needs_Assessment_2017_Raw_Data.csv (Sur-
vey responses for 2017)
- AO_Spine_Needs_Assessment_2021_Raw_Data.csv (Sur-
vey responses for 2017)

Data are available under the terms of the Creative Commons
Zero “No rights reserved” data waiver (CC0 1.0 Public domain
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