Detailed Methods for the Iterative Process to Develop the EPA and Procedural Skills lists, Definitions, Milestone Mapping, and Graduation Targets

EPAs

An initial pre-defined list of preliminary EPA titles was derived from the EPA titles for anesthesiology training developed by the Royal College of Physicians and Surgeons of Canada[19] and those developed for anesthesiology training in the Netherlands.[17] Although the use of an initial list could bias expert opinion, the combined list was comprehensive and served only as a starting point. The Delphi process allowed the experts to add or delete items to the list during each round of review.

In the first round, the group of experts was given written instructions which included the goal of reaching a final list of EPAs, with much less than 70 deemed to be more "manageable." This instruction was based on extensive personal communications with the leaders of EPA implementation in Canadian Anesthesiology programs that a list of 72 EPAs was unwieldy.[1] No further instruction regarding a goal for the final EPAs was given. For each round of the survey, the experts were asked to include or exclude each item in the list on a 7-point Likert scale (1 = *definitely keep*, 7 = *definitely eliminate*). A free-text comment box was provided for participants to add comments. An additional free text box was provided to allow participants to add suggested EPAs to the list.

Following the first round, four researchers leading the group of experts (leadership committee) reviewed the results (AM, RM, PT, GW). EPAs were retained on the list if

the mean score for the EPA was less than or equal to 2, the expert group determined cutoff value.[2] Suggested EPAs to add to the list from expert comments were added to the list if the EPA did not appear in a prior round. EPAs were eliminated from the list if the mean score was greater than or equal to 5. Some EPAs were consolidated into a single EPA based on expert comments and similarity of titles. The results of the round were summarized and sent to the experts and a teleconference was conducted to discuss the next Delphi round. Since many of the EPAs were similar and only distinguishable by a designation of the American Society of Anesthesiologist physical status score, the experts agreed to consolidate these EPAs into a single EPA with two versions, simple and complex. Following each subsequent round, the leadership committee reviewed the list of EPAs for completeness and consideration of adding EPAs to the next survey round. The process was repeated until no changes were made to the list during a survey round.

At the end of the first round, 53 of 110 items had a mean score of less than or equal to 2 and were retained. No new EPAs were suggested in the comments. In the follow-up survey on the items that had a mean score that was between 2 and 5, two additional EPAs had a revised mean score less than or equal to 2 and were retained. One additional item was suggested in the comments and added to the list. At the conclusion of the second round, 56 EPAs remained on the list.

Many of the EPAs were similar and only distinguishable by a designation of the American Society of Anesthesiologist physical status score, thus, before conducting the

third round, these EPAs were consolidated into a single EPA with two versions labeled *simple* and *complex*. Following the consolidation of simple and complex EPAs into a single item in the list, 30 EPAs remained and were submitted in the third-round survey. After the end of the third round, 20 EPAs had a mean score of less than or equal to 2 and were retained. No new EPAs were suggested in the comments. Following the third round, the leadership committee reviewed the list for completeness and the potential addition of EPAs. After review, no new items were added to the list by the leadership committee. In a follow-up survey on the items that had a mean score that was between 2 and 5, no additional items were retained.

EPA Definitions and Milestone Mapping

Once the list of EPAs was finalized, a teleconference was held to discuss the results and to provide instructions for the creation of EPA definitions. The *simple* and *complex* versions would account for patient and surgical factors that could affect the difficulty of performing an EPA. The definitions for each EPA would include guidance and descriptors that would categorize the EPA as simple or complex. Each expert was provided a copy of the Association of American Medical Colleges toolkit for developing and defining EPAs.[3] The toolkit describes the elements required in an EPA definition including key functions, behaviors requiring a corrective response, developing behaviors, and expected behaviors for a learner. Each expert was provided with a

sample EPA definition developed by the leadership committee and a blank template to use to document the EPA definition.

The list of EPAs was equally divided amongst the group of experts. The EPA definitions developed by each expert were reviewed by the leadership committee. The leadership harmonized the language in each EPA for consistency. The defined EPAs were sent to the entire group of experts for comment. A second round of editing was performed by the expert assigned to develop the initial definition with subsequent review by the leadership committee and the entire group of experts. The process was repeated until no further comments were received.

Entrustment Scale

Several entrustment scales have been described in the literature. The leadership committee identified published entrustment scales and sent a list of options to the entire group of experts for comment. Two prevailing options include the use of prospective (theoretical) supervisory language (e.g. “the trainee may carry out the activity independently,” or “I would entrust the trainee to perform independently”) and the use of real-time (actual) language (“I directed the trainee constantly,” or “the trainee performed independently”).[4-6] The ACGME utilizes a third type of language for entrustment consisting of only the level of supervision required (e.g. direct or indirect supervision).[5] Based on comments from the experts, a proposed entrustment scale was developed by the leadership committee which combined the use of ACGME language with real-time language in a simple-to-use format. This scale was sent to the experts for comment and

was revised until consensus was reached on a final scale. The committee elected to adopt a modification of the Ottawa Clinical Assessment scale.[6]

The final step in the EPA definition process was to map each EPA, both simple and complex versions, and each level of entrustment to the Anesthesiology competencies and milestones.[7-11] The same expert that was charged with developing the initial definition of the EPA was provided a sample EPA mapping to milestones developed by the leadership committee and a template that included all of the Anesthesiology Milestones. The expert was instructed to mark each level of entrustment for the EPA if the milestone would be highly likely to be achieved. The experts were advised that if they were in doubt, the milestone should not be marked as achieved. The milestone mappings developed by the individual experts were reviewed by the leadership committee and edited for consistency. If 80% of experts marked the milestone as achieved for a specific level of entrustment within a similar group of EPAs, the milestone was marked for all of the similar EPAs. The mapped EPAs were sent to the entire group of experts for comment. A second round of editing was performed by the expert assigned to develop the initial mapping with subsequent review by the leadership committee and the entire group of experts. The process was repeated until no further comments were received.

Procedural Skills List

A modified Delphi method was used to reach consensus on a list of procedural skills to include for competency assessment in US Anesthesiology Residency Training. For

each round of the survey, the experts were asked to include or exclude each item on the list. A free-text box was provided for participants to add comments. An additional free-text box was provided to allow participants to add suggested procedural skills to the list. Survey participants were not given instructions to attempt to narrow the list, as was done for EPAs. On the contrary, participants were given instructions to create a comprehensive list of procedural skills for which graduating residents would be expected to be competent in or skills for which achieving competency would be considered aspirational. The group of experts agreed that inclusion of aspirational items in the list would allow future collection of data on which procedures graduating residents are gaining competency. The initial list of procedures included in the first survey was developed by the leadership committee.

Following each round, the leadership committee reviewed the results. Procedural skills were eliminated from the list if fewer than 80% of participants voted to include the procedural skill. Suggested procedural skills for addition to the list from expert comments were added if the procedural skill did not appear in a prior round. The results of the round were summarized and sent to the group of experts along with the survey for the next round. The process was repeated until no changes were made to the list by the experts.

Graduation Targets

For each simple and complex EPA and each procedural skill, the experts were tasked with defining the level of entrustment that would be expected of a graduating resident.

For example, it might be reasonable to expect a graduating resident to reach "independent practice" as the level of entrustment for providing perioperative care for a simple pediatric case; however, a lower level of entrustment such as "reactive supervision" might be the graduation target for the perioperative care of a complex neonatal surgical case as these anesthetics are usually performed by fellowship-trained pediatric anesthesiologists.

The experts were provided the final list of all EPAs and procedural skills. The experts were asked to mark the level of entrustment on the five-point scale that a graduating resident would be expected to achieve. The results were summarized, including mean graduation target score, standard deviation, and assigned graduation target by rounding up from 0.5 and above (e.g., 3.5 rounded up to a score of 4). The summarized results were sent to the entire group along with a new survey that asked participants to confirm the graduation target score or reduce or increase the score by no more than one level of entrustment. The results were adjusted if 80% of participants voted to adjust the score by one level of entrustment in one direction or the other. The process was repeated until no further changes were made to the scores.

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