

SUBJECT MATTER EXPERTS (SME)

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I. Background:

Any institutions or academic programs that conduct outcome-based medical education (OBME) must be familiar with the essential processes including needs assessment, desired learning outcomes, backward design curriculum, policy definition, performance level descriptor (PLD), defensible standard setting, minimally competent candidate (MCC), borderline learners, or pass scores. The subject matter experts (SMEs) are one of the most important components of OBME because the listed processes will be difficult to establish without SMEs.

II. SMEs and Outcome-Based Medical Education

Because SME is a broad field, the author will focus on the following topics: i) Essential components of the OBME; ii) The roles and responsibilities of SMEs in the development and implementation of OBME; and iii) The path to developing a group of SMEs.

1. Essential components of the OBME

The development of a content-based traditional medical curriculum consists of a forward-planning approach, with didactic course content and non-learner-centered teaching methods. This medical education model fulfills neither the health needs of society nor the expectations of the institutions, and the learners. and other stakeholders. Therefore, an overall global consensus is that it is no longer appropriate for the training of 21st-century healthcare providers.

In contrast, OBME starts with a backward design curriculum based on the analysis of extensive data on health needs, multisource feedback, evidence-based medicine, and professional practice gaps (PPG) to construct meaningful learners' desired outcomes.

Based on the Institution's policy definition (PD) of performance standards of each performance label such as Exceed expectations, Met expectations, and Unmet expectations, SMEs can develop transparent, well-defined, and specific performance level descriptor (PLD) for each level of the learners together with a defensible standard setting to ensure that the competent learners can attain the expected outcomes. Assessment methods, both formative and summative, are derived from the expected learning outcomes. The minimally competent candidates (MCC) or borderline candidates are those who were judged to be at the lowest acceptable level of competency, according to the PLD. (Please refer to Appendix Table 1 Example of Policy Definition)

To ensure the quality of the delivered curriculum and the Institution's or Program's commitment to learners and all stakeholders on the expected learning outcomes, the transparent standard setting and performance assessment are closely monitored by the learners and the Program.

PLDs are the foundation of performance assessment and are instrumental to the validity, reliability, and defensibility of the standard-setting process. PLDs describe the level of knowledge and skills required for each performance level and are crucial to determining where the cut scores are set.

However, a major issue in performance assessment continues to persist because in discussions of cut scores, or the minimum score value required of a performance level, the performance level descriptors are neither available nor referred to from the conversation.

(Please refer to Appendix Table 2 Examples of Performance Descriptors on Clinical Skills of US Medical Students Year 3)

2. The roles and responsibilities of SMEs in the development and implementation of the Backward Design Curriculum and OBME

a. Identify Desired Learning Outcomes

The SMEs play a key role in developing and implementing OBME. Following the principles of backward-design curriculum, SMEs will collaborate with other educators and specialists to review and analyze the extensive data of health needs, multisource feedback from current learners, alumni, teachers, peers, other professionals, and patients and families, as well as data of professional practice gaps, and quality assurance (QA) to establish and prioritize the desired program learning outcomes (PLO) for the Program graduates, and work backward to the Program entry level for each specific course learning outcomes (CLO), and session learning outcomes (SLO).

b. Determine Acceptable Evidence of Competency

Demonstration of performance assessment of the learners is critical in the next stage of backward design to demonstrate the concrete evidence that students can show they have achieved or attained the expected outcomes of the course. Since performance assessment is the backbone of OBME, the instructors need to consider two questions:

- How will we know if learners have achieved the expected outcomes?
- What will be the acceptable evidence of the learners' competency?

SMEs will collaborate with other educators in selecting the most appropriate standard-setting method and tools with high validity and reliability for each expected learning outcome. In addition, they also based on PLD to determine MCC and pass scores for summative and

high-stakes examinations. They pay particular attention to the results of educational impacts according to the Kirkpatrick model. SMEs collaborate with clinicians in reviewing and revising workplace-based assessment (WBA), as well as assisting the Office of Faculty Development in training assessors on rater error training (RET), behavioral observation training (BOT), performance dimension training (PDT), and frame of reference (FOR).

In medical education, the significance of setting an appropriate standard is critical as the decision based on the standard setting has the potential to alter the potential careers of examinees, and more importantly, to affect the lives of those whom examinees certified as competent would serve.

A practical procedure for determining the pass scores would be to specify the performance standard and develop a test to fit that standard, rather than apply a standard-setting procedure to an existing test. To do so, SMEs will train educators to develop test materials that can measure the performance of the MCC according to PLDs.

Because the higher the stakes associated with assessment, the greater the requirement for evidence of validity from multiple sources of assessment methods and tools. Therefore, SMEs collaborate with other educators, specialists, and especially, the Office of Faculty Development for training and incorporating different forms of assessment such as projects, term papers, high-order thinking MCQ, lab projects, short-answer questions, extended matching questions, objective structured clinical examination (OSCE), Mini-Clinical Evaluation Exercise (Mini-CEX), or direct observation of procedural skills (DOPS). SMEs assist the Testing Office in the validation process of examination materials and advise the educators in analyzing the item analysis for quality improvement. They collaborate with educators and other specialists in analyzing the results of educational outcomes and impacts for program evaluation and review; and assist other specialists in analyzing the Institution or Program to ensure human and financial resources are used efficiently in achieving the mission.

c. Design Meaningful Learning Experiences and Instruction

In the final stage of curriculum backward design, SMEs collaborate with instructional design specialists and educators in planning and designing the appropriate learning-teaching delivery methods that are learner-centered, succinct, and practical in providing meaningful learning experiences. SMEs also ensure horizontal and vertical integration and curriculum alignment of all delivered courses and sessions. SMEs assist the educators in answering the following questions:

- What essential knowledge and skills will students need to perform effectively and achieve desired results?
- What activities will provide students with the needed knowledge and skills?
- What will need to be taught and coached, and how should it best be taught, considering performance goals and expected outcomes?
- What materials and resources are best suited to accomplish these goals?

To answer the above questions, SMEs together with other specialists and the Office of Faculty Development will provide additional training to the instructors for various instructional modalities such as large group discussion, flipped classroom, team-based learning (TBL), audience interactive response system (AIRS), or project/problem-based learning (PBL).

3. The path to developing a group of SMEs.

An institution will rely not only on one SME but a group of SMEs for developing and implementing OBME. However, there is a chance that an institution may not have an onsite SME. In that scenario, one can have a few approaches to seeking help from SMEs.

a. Short-term plan:

Collaborate with other local, regional, national, or international institutions that have SMEs. In this scenario, the SMEs are not familiar with the institution's needs assessment, desired outcomes, learner's and educators' abilities as well as the local policies-procedures to function effectively.

b. Long-term plan:

Collaborate with other institutions to establish the onsite SME training program. The institution will need an advanced Faculty Development Unit/Office with multiple trained educators in OBME, simulation-based medical education (SBME), standard setting, psychometrics, and backward design curriculum. The institution will also collaborate with an institution with an established SME program for additional assistance and technical support.

III. Training program for SME

A medical education Subject Matter Expert (SME) is an individual who possesses comprehensive and authoritative knowledge in the domain of modern medical education, performance assessment process, psychometrics, and curriculum development. Their level of expertise makes them the 'go-to' person for consultation, guidance, SWOT analysis, quality assurance, and problem-solving in their specific areas. The training program for SMEs will include:

- **Comprehensive faculty development program:** adult learning, oral presentation, public speaking skills, evidence-based medicine, literature appraisal, simulation-based education, faculty mentoring, writing high-order thinking MCQ, leadership development, OBME, OSCE, curriculum mapping, and workplace-based assessment.

- **Advanced faculty development:** defensible standard setting, psychometrics, writing performance level descriptors, writing policy definition, determination of borderline candidates, pass scores, item analysis, classical test theory, item response theory, generalizability theory, and test equating.

- **Advanced training** in biomedical statistics and epidemiology, and skills in using various statistical packages.

IV. Conclusions: Subject Matter Experts are essential for the development, implementation, and sustaining of an effective Outcome-Based Medical Education program. The institution must give high priority and provide resources to establish a training program for the SMEs.

References:

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EXAMPLES OF POLICY DEFINITION

Level 3/Proficient OR Exceed Expectations

Consistently demonstrate ability to analyze data and integrate evidence-based medicine in making critical decision. Solid academic performance in each assessed area of learning outcome. Students consistently have demonstrated competency over several challenging subject matter, including medical knowledge, application of EBM to real-world situations, and analytical skills to make appropriate critical decision.

Level 2/Competent OR Met Expectations

Apply knowledge and analyze data effectively in making clinical diagnoses. Satisfactory academic performance in several assessed area of learning outcomes. Students have demonstrated acceptable competency over essential subject matter, including application of medical knowledge, analytical skills, and use of EBM to make reasonable decision.

Level 1/Unmet Expectations

Inadequate academic performance in many assessed areas of learning outcomes. Students did not demonstrate expected competency over essential medical subjects, including knowledge, application of such knowledge to real-world situations, and analytical skills to make clinical decisions.

Table 1: Example of Policy Definition

Proficient OR Exceed Expectations

Medical student Y3 performing at the Proficient level should be able to effectively function and execute all requirements of the Competent level. In addition, these students can consistently demonstrate the ability to apply principles of EBM in reasoning and approaching a tentative diagnosis. They should display mastery in the use of all basic diagnostic tools and some other instruments such as ophthalmoscope, Snellen chart, monofilament etc. The students are expected to perform well in all OSCE stations, simulation activities and clerkship activities including CPR, IPE; draw logical conclusions and justify answers and solution processes by explaining why, as well as how, they were achieved.

Competent Level OR Met Expectations

Medical student Y3 performing at the Competent level should be able to effectively function and execute all requirements of the Basic level. In addition, these students can demonstrate the ability to apply knowledge obtained in prior year to explain the clinical findings, to obtain more accurate and complete medical history including; perform accurately and efficiently bedside physical examination and use all basic diagnostic instruments appropriately; analyze the results of laboratory tests to determine whether the results are normal or abnormal. They should have a conceptual understanding of preliminary diagnosis; be able to communicate effectively with patients and their families. Students performing at the competent level should apply EBM and employ problem-solving strategies such as identifying and using appropriate information.

Basic Level OR Minimally Competent Candidate (MCC)

Medical students Y3 performing at the Basic level should be able to obtain pertinent facts to perform simple patient medical history; show understanding of patient's chief complaints; past medical history and review of the system; and obtain accurate vital signs. (pulses, respiratory rate, temperature, blood pressure, and BMI). At the end of this level, students should be able to apply the basic bedside skills to perform physical examination of the body systems including cardiovascular, pulmonary, gastro-intestinal tract, locomotor, central and peripheral nervous system, and skin and tegument.

Table 2 Example of Performance Level Descriptors on Clinical Skills of US MS Year 3