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Invited Commentary

Clinical Competence: Knowledge or Skill or Both?

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George Miller proposed the now well-known Miller pyramid,[1] which marked a departure from an emphasis on knowledge-based assessments to an assessment of clinical performance. Miller's pyramid views the development of clinical competence in four hierarchical stages, viz. knows, knows how, shows, and does. The knowledge component forms the base of the pyramid; the next tier comprises understanding and application of knowledge; moving on to competence and finally to performance. Written tests assess the first and second levels; the third by clinical examinations, simulations, and standardized patients; the fourth level is assessed by direct observation in real-life clinical settings. By placing observable behavior at the top, the Miller pyramid seems inclined towards a behaviorist rather than a cognitivist approach to learning.[2]

The Miller pyramid has been the backbone of assessing clinical competence for many years; in fact, no assessment plan is made without reference to it and without categorizing the assessment methods into one of the four tiers. Over a period of time, especially with the introduction of competency-based education, competence came to be equated with performance – leading to the design and development of many tools for performance assessment (OSCE, SP, simulations, etc.). Most of these assessments made use of standardized checklists to provide a certain degree of objectivity in assessment. The fascination with objectivity grew to such an extent that anything not objectively assessable was not considered worth assessing.[3] The then-popular myth that all knowledge becomes obsolete in five years added to the popularity of methods assessing skills rather than knowledge.[4] Knowledge assessment was relegated further down the hierarchy by being at the base of the pyramid and the newfound 'love' for skills and performance. This also impacted student learning (assessment drives learning!!), with skills getting more (and more) importance at the cost of knowledge. MCQs made their mark – from classroom tests to high-stakes entrance examinations - and became increasingly popular; however, the need to stick to a "200 questions- 3-hour format" (in an Indian context) meant all questions had to be of recall/ recognition type, which could be answered in less than a minute each,[5] thus excluding case-based, scenario-based and application-oriented questions, relegating a very useful tool to the lowest level of knowledge assessment. Standard setting (defensible!) remains unheard of in the Indian context.

While these changes to assessment were taking place, there was also parallel research that questioned many of these foundations. Research into the nature of expertise revealed that experts are experts because they know more rather than because they have some exceptional skills.[6] A further damper came in the form of content specificity, meaning thereby that skills are not so generic and proficiency in one doesn't translate into proficiency in another.[7] Norman succinctly likened it to cracks appearing in the pyramid, indicating that the position of knowledge and skills may not represent their actual importance.[4]

The conflict continues. Since the end point of competency-based medical education is the ability to perform, it stands to reason that more emphasis is laid on the assessment of skills. In this line of thought, knowledge assessment assumes a secondary position; even its validity may be questioned by some people. Proponents of this line of thinking also argue that emphasizing skills assessment will drive students towards learning and acquiring skills, possibly due to the steering effect of assessment.

There is another side of the coin, however. Does a better score on skill assessment mean a better performance in practice? After all, the student must use all her skills in the practice environment and not in the laboratory only. Davis et al. used a model to predict future peer-reviewed practice performance in physicians with possible problems with competence.[8] The predictive utility of multi-station OSCE in this study was 0.46, while that of an MCQ test was 0.60. MCQs seemed to be predicting peer-reviewed competence better than skills assessed by checklist-based OSCE. It was also reported that after controlling other variables, the mortality rate of myocardial infarction treated by board-certified (using MCQs!) specialists was 19% lower than those not certified.[9] Many other reports are available in the literature to suggest that knowledge scores stand out as a better predictor of future work as a physician than skill scores.[10]

Another study reported in 2014 also provides some useful input. Students were given an MCQ test to cover 14 common clinical practical procedures which were taught to them. The pass rate on the MCQ test related to these procedures was less than 39% on most skills by Angoff defined (indicating teachers' expectations) pass marks. Knowledge also had a positive correlation with self-perceived competence, indicating the role of knowledge in improving self-efficacy and leading to better performance.[11] The effect of self-efficacy beliefs on performance is very well supported by Bandura's theory of planned behavior.[12] The role of cognition in acquiring clinical skills has been described elsewhere also.[13]

Nothing suggests that performance assessment, being at the top of the pyramid, is inherently superior in predicting clinical competence.[4] It has been reported – and is common knowledge - that students being overburdened by work often resort to selective learning, focusing only on what is assessed.[14] Neglecting knowledge assessment because of its lower position in the pyramid will have unwanted consequences. We need to see knowledge as the "base" of clinical competence rather than as something that is lower in the hierarchy. The fact that the pyramid tends to get narrow at the top should also indicate that 3–4 units (or even more) of relevant knowledge may be required for a unit of performance.

Competence combines knowledge and skills – both clinical and communication – and attitudes and behavior.[15] The first step in treating a patient is to accurately diagnose the problem.[16] Making a diagnosis is a complex interplay of knowledge, communication, analytical skills, and physical examination skills. Making a diagnosis is largely a cognitive process.[2] It requires integrating and applying different types of knowledge, weighing evidence critically, and reflecting on the process.[17] With recognition of its increasing importance, diagnostic reasoning is being increasingly included in most competency-based curricula; however, the assessment is often in the form of OSCE. We know for sure that OSCE was not designed for the assessment of cognitive processes. At best, OSCE, as a surrogate, can provide the output of this but provides no information on the process followed to arrive at a diagnosis. OSCE performance does not align with diagnostic skills.[18] Unsurprisingly, an observational assessment method can't evaluate a covert and complex cognitive skill. New modifications of MCQs, viz., extended matching questions, key feature tests, script concordance tests, etc., as part of the toolbox for assessing clinical competence have been described earlier[17,19] and are very useful to assess the clinical reasoning process.

Clinical reasoning, by nature of its importance, requires more emphasis to be given to the cognitive elements of the Miller pyramid. The lower two levels are considered useful during the early part of the curriculum, but knowledge assessment must not stop or be attenuated after that. Diagnostic reasoning assessment needs to be included in the upper two levels of Miller's pyramid, both at the laboratory and real clinical level.

I am tempted to narrate an incident that happened in a municipal council meeting of city A over implementing a new security plan. Being a controversial issue, it generated a lot of heated discussions. The mayor, trying to reach a decision, said that city B had also tried to put a similar plan but failed and we should learn from their mistakes. There was a commotion in the house, and finally, a voice was heard saying that we are mature enough to make our own mistakes; why should we learn from someone else's mistakes? Norman aptly says that those unaware

of the past are doomed to repeat it.[4] Going a step ahead, should we not learn from what others have done rather than insist on "making our own mistakes"? It is worthwhile remembering that unlike poor clinical decisions, which manifest immediately, the effects of poor educational choices take years to show.

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