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The Utility of Anatomy Assessment in Preclinical Undergraduate Medical Curriculum: A Scoping Review Protocol

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ABSTRACT

Anatomy has been taught predominantly in the preclinical years. However, little guidance exists for medical educators in designing appropriate assessments of anatomy knowledge. In general, medical schools implement and determine their own curricula and methods of assessment. The purpose of this scoping review is to examine the breadth of literature regarding the utility of anatomy assessments, which will be reported whether they have been investigated in terms of validity, reliability, practicality, feasibility, cost-effectiveness and educational impact in the included resources. This scoping review will be conducted using the Joanna Briggs Institute scoping review guideline, and its protocol is outlined to systematically map the utility of anatomy assessments in preclinical undergraduate medical curricula over the past 20 years. Primary data will be searched from relevant studies, review articles, and grey literature sources between 2002 and 2023. The resource searching will be performed using the three-step search strategy, namely review search, study selection and evidence charting, which will involve four electronic databases and two independent reviewers. As secondary research, this review does not require ethical approval. The review will not only permit better comparisons of anatomy assessment and foster meaningful evaluation of both medical students and teaching establishments to take place in the anticipation of ensuring the constructive alignment in anatomy education but also produce important

information on the quality of anatomy assessment in the context of the undergraduate medical curriculum. The findings will be disseminated through journals and conferences targeting anatomy educators worldwide.

Keywords: *Scoping review, anatomy assessment, assessment utility, assessment validity, reliability of assessment*

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INTRODUCTION

Assessment refers to the process of gathering and interpreting information about student learning achievement. In fact, it has been regarded as a powerful tool to influence students' learning. Assessments are categorised into different types, such as diagnostic, formative, interim and summative assessments, each of which has a unique purpose and focus. The diagnostic assessment is a form of pre-class assessment that identifies students' prior knowledge, skills or competencies. This assessment allows educators to plan and design their teaching according to the students' strengths and weaknesses (1). The formative assessment measures students' performance during the learning process and provides feedback for teachers to improve their teaching and for students to improve their learning (2). The interim assessment is a periodic assessment which is usually administered separately from the learning process to assess students' learning progress in a course of a program (3). The summative assessment refers to the evaluation at the end of a unit, course or program to evaluate students' learning according to established standards and furnish a final grade or mark (4).

Besides that, assessment is also categorised according to its function, namely assessment of learning (AoL), assessment for learning (AfL) and assessment as learning (AaL). AoL is a type of summative assessment that focuses on evaluating students' learning against predefined learning objectives or standards. The primary purpose of AoL is to measure what students have learned and provide a summary of their achievements (5). On the other hand, AfL reflects the aforementioned formative assessment that identifies the strengths and weaknesses of students during learning and provides feedback to improve the teaching and learning process. The primary goal of AfL is to instil motivation for learning and promote self-regulated learning (5). Likewise, the AaL is another form of formative assessment that engages students in the assessment process, allowing them to rate their own performance, reflect on their learning, set goals and develop self-monitoring skills. The primary goal of AaL is to help students become more active and reflective learners (5).

Drawing from the content-driven nature of the anatomy subject, it is known that anatomy educators face great challenges when designing anatomy assessments. The written summative assessment in anatomy sometimes lacks knowledge integration and can only assess lower-order cognitive skills (6). Given the fact that medical and allied health sciences curricula rely on outcome-based education, it is imperative to design anatomy assessments for competency measures and selection criteria for various professional reasons. There is increasing concern that the definitions of several terms, such as honour degrees, test formats, limits of scores and assessment tasks, should be rectified (7). Anatomy educators should not only design assessments that can validly measure students' competency achievement of specific learning

domains based on declared learning outcomes but also implement teaching methods to ensure constructive alignment in the anatomy curriculum (8). The competency-based assessment method is crucial to ensure students' readiness for clinical practice, as their competencies are measured against a defined set of standards or criteria (9). Hence, it is imperative for anatomy educators to evaluate the utility of different types of assessment methods to ensure that these methods are suitable and aligned with the educational objectives across all learning domains as outlined by the learning taxonomies (6).

The utility of assessment can be evaluated using several criteria, namely validity, reliability, practicality, feasibility, cost-effectiveness and educational impacts (10). The validity of an assessment refers to the extent to which it measures what it is intended to measure. A valid assessment accurately measures the intended learning outcomes that represent students' knowledge and skills. Validity is essential to ensure that the assessment results are meaningful and can be used to make informed decisions about students' learning (11). The reliability of an assessment refers to the consistency and stability of the assessment results over time and across different contexts, whereby it produces a similar pattern of results when used to measure the same learning outcomes; and thus, this reduces the likelihood of measurement errors (12). The practicality of an assessment refers to its ease of use, administration and scoring, all of which should be straightforward and efficient without requiring significant time or resources (10). Likewise, the feasibility of an assessment refers to its practicality in terms of resource requirements, including time, money and human resources. A feasible assessment can be implemented within the constraints of available resources without compromising the quality or validity of the assessment results (13). The cost-effectiveness of an assessment refers to its ability to produce valid and reliable results at a reasonable cost. Cost-effective assessments provide value for money, balancing the costs of developing and administering the assessment against the benefits of the assessment results (14). The educational impact of an assessment refers to its ability to improve student learning outcomes and inform instructional decision-making. Assessments with high educational impact provide useful feedback to students and teachers, leading to improved learning outcomes and more effective instructional practices (15).

By considering the elements of assessment utility when designing an anatomy assessment, anatomy educators can develop and implement valid and reliable assessments that support student learning and make informed instructional decision-making. Nevertheless, a lack of published evidence is found on the assessment utility in anatomy education. Hence, a scoping review will be conducted to identify the knowledge gap and investigate the scope of literature on the assessment utility in anatomy education in preclinical undergraduate medical students. Resources that describe the validity, reliability, practicability, feasibility, cost-effectiveness and educational impact of anatomy assessment in preclinical medical curricula will be included in this scoping review.

METHODS AND ANALYSIS

This protocol was developed according to the Joanna Briggs Institute (JBI) guideline for scoping reviews (16). The review process will be conducted from April 1, 2023, to May 31, 2023. The protocol is registered with the Open Science Framework (<https://osf.io/tzpe5>). Any modifications to the methodological approach will be updated and described in the final scoping review report.

Review Team

The reviewer team is comprised of five anatomists from five different medical institutions in Malaysia (SNH, RA, CKW, WKH and AA), who have more than five years of experience in not only teaching gross anatomy, histology, embryology and neuroanatomy but also conducting anatomy assessment to the preclinical year medical students. One reviewer (SNH) is also an anatomy educationist with a doctorate degree in Medical Education.

Inclusion Criteria

Types of participants

The scoping review will examine published primary research, review articles and grey literature sources that describe the utility of anatomy assessments being practised on undergraduate medical students. Given the fact that anatomy is mainly taught as a formal course during the first two years of medical studies in many countries, this review will be confined to resources that describe the assessment practice conducted on undergraduate preclinical medical students only. "Undergraduate preclinical medical students" refers to those who undertake anatomy as a core subject during the preclinical phase of their medical studies. Resources that will be excluded from the review are those which describe anatomy assessment from the perspective of dental and health sciences undergraduate students, postgraduate students, anatomy lecturers and institutions.

Concept

This scoping review will include resources which identify the validity, reliability, practicality, feasibility, cost-effectiveness and educational impact of anatomy assessment in the preclinical medical curriculum. The validity of an anatomy assessment refers to the extent to which the assessment correctly measures the anatomy competency construct it intends to measure. The validity of assessment can be represented by several main domains, namely the assessment content (content validity); reaction processes (face or response process validity); internal structure (internal consistency, stability and dimensionality), connection to other variables and consequence validity (17). Likewise, the reliability of anatomy assessment reflects the ability of the assessment to consistently produce the same outcomes when used with the same set of individuals or within the same situation. In other words, reliability could be represented by consistency, stability, dependability and accuracy of the assessment outcomes (18).

The practicality of anatomy assessment refers to how the assessment technique works and relates to the course learning outcomes. It also describes the appropriateness of the instructor's workload while preparing and conducting the assessment, whereby the assessment must be simple to create and evaluate without jeopardizing its validity (19). In other words, anatomy

assessment should adhere to the necessary time limitations and be simple to be administered with proper evaluation techniques. On the other hand, the feasibility of the assessment relates to whether the anatomy assessment can be fulfilled within its budget, time and performance restrictions (19). The cost-effectiveness of anatomy assessment refers to how the assessment provides value for money, which balances the costs of developing and administering it against the benefits of its results. Finally, the educational impact of anatomy assessment refers to the implication of this assessment on students' learning, particularly on what, how much and how effectively they have learned (20).

Resources that evaluated validity evidence, including response process and reliability measures of the practicality, feasibility and cost-effectiveness of assessment methods in the preclinical medical curriculum, will be included in this review. This review will also include articles that explore the educational impact of these assessment methods on students learning. Resources that do not explicitly report the utility indices will be excluded from this review.

Context

The context of this review will be in the settings of anatomy assessment in the preclinical year medical curriculum. The components of anatomy assessment are reflected based on the competency assessed (i.e., cognitive, psychomotor and affective components), the function of the assessment (i.e., formative assessment, summative assessment, assessment of learning, assessment for learning and assessment as learning) and assessment tools (i.e., written test, practical test, dissection assignments and viva voce). Resources that involve interventions conducted in conjunction with other basic sciences subjects or extend beyond the preclinical medical curriculum will be excluded.

Sources

This scoping review will include both quantitative and qualitative primary research and all types of secondary reviews, which is not limited to narrative review, scoping review, systematic review and meta-analysis, as well as published grey literature—limited to conference proceedings, thesis and dissertations, working papers, preprints and protocols— that is related to the assessment utility in anatomy context of the preclinical medical curriculum. This review will include articles in English or Malay language published over a span of 20 years, from January 1, 2002, to December 31, 2022. Unpublished literature, websites and blog post will not be included in this review to ensure the authenticity and reliability of the resource data.

Search Strategy

This review will be conducted using the three-phase search strategy based on the recommendation of the JBI Scoping review guideline (21). The initial keywords are identified and selected based on the words contained in the title and the index terms to describe relevant reviews. The keywords will be identified using the Medical Subject Headings (MeSH) and

Education Resources Information Centre (ERIC) databases and will be tested with several search terms using the Boolean combination. These search terms will be refined accordingly after multiple test searches. The initial keyword search terms will be "assessment*" OR "exams*" OR "test*" OR "competency measure*") AND ({assessment utility OR {validity} OR {reliability} OR {practicality} OR {feasibility} OR {cost effectiveness} OR {educational impact}) AND ALL ({Anatomy curriculum} OR {Anatomy course} OR {Anatomy module} OR {Gross Anatomy} OR {Histology} OR {Embryology} OR {Neuroanatomy} OR {Developmental anatomy} OR {surface anatomy}) AND ("Preclinical medical curriculum" OR "Preclinical year*" OR "Preclinical students" OR "Preclinical medical students"].

A second search using all identified keywords and index terms will be performed across all included databases, namely Scopus, PubMed and EMBASE. Grey literature will be searched using the Grey Literature Report (<http://www.greylit.org/>), customized Google search engines and consultation with content experts. The third phase includes searching the reference list of all included reviews.

Selection of Sources

All the identified sources, including grey literature, will be exported into Microsoft Excel, and duplicates will be removed. The record selection will be performed using the predefined inclusion criteria. A pilot testing will be conducted prior to the selection process, whereby two researchers will independently screen the titles and abstracts of the included records. Any disagreement will be resolved through discussion among the research team members. Once the reviewers are familiar with the selection process, the title, abstract and full-text articles of the included record will be screened using the inclusion criteria. Likewise, the selection process will be conducted by two researchers independently, and any disagreement will be resolved by the involvement of the third reviewer. Records that do not fulfil the inclusion criteria will be excluded from this study, and the reasons for exclusion will be documented. The search profile of the selection process will be reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) flow diagram.

Extraction of Data

The data of included records will be extracted using the data extraction form (Appendix 1). The data of interest that will be extracted include title, authors, year of publication, geographical distribution, types of anatomy assessment, components of competency assessed, evidence of assessment utility and outcomes of the study. The data extraction will be independently conducted by two reviewers to reduce the risk of error. To ensure the reliability and consistency of the data extraction process, the involved reviewers will need to discuss their extraction strategy and conduct the data extraction process of five records as piloting.

Presentation of Result

The extracted data will be presented in tabular form with frequency and percentage of geographical distribution, types of anatomy assessments, components of competency assessed and utility indices. The components of assessment utility will be mapped to the included studies, types of anatomy assessment and the competency assessed. A narrative summary of each utility index will be included to provide an overview of the current assessment practice with regard to assessment utility.

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