

## ORIGINAL ARTICLE

# Developing a Bank of Faculty-authored, Valid and Reliable Objective Questions for Institutional Use: Sharing the Experience

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## ABSTRACT

**Introduction:** With the increasing number of institutions implementing competency-based education which demands to provide feedback to students at regular intervals, there is an increase in the frequency of assessments. For this purpose, the written examinations using multiple choice questions (MCQs) are the most feasible form of assessment. However, constructing MCQs is an arduous task and significantly adds to the work-load of the academic staff members. To ease this burden, the institutions may consider to develop banks of valid and reliable MCQs.

**Methods:** Based and built on our experience and literature review, the steps – relating to the process of constructing valid and reliable questions and development of question banks (QBs) – are the actions needed to develop new QBs or improve on the existing ones. **Results:** We have described ten practical steps for developing and banking of MCQs. The first five steps relate to the development of quality items and the remaining steps relate to the development of QBs, their maintenance, growth and safety and security. We have also established the criteria for selection and the frequency of reuse of questions. **Conclusion:** Using QBs will alleviate some of the burden of constructing novel quality questions needed for frequent assessments of students using 21st century teaching/learning approaches. The use of banked questions with known psychometric properties would allow the authorities to take charge and control of items' quality and overall examination standards.

**Keywords:** Question bank; Valid and reliable MCQs; Reuse of questions; Psychometric properties; Malaysia.

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## INTRODUCTION

A number of different tools are applied for assessment (both written and clinical) of students in medical schools. For written examinations different types of multiple choice and structured essay questions are used. To accomplish a goal of consistent and dependable assessment, these questions ought to be valid and reliable.

However, developing valid and reliable multiple-choice questions (MCQs) is a time-consuming and arduous task and significantly adds to the work-load of the already over-worked academic staff members. It requires a rigorous effort by (a) the planners of the curriculum to define the scope and modalities of assessment, (b) the content experts to verify the authenticity of the information being assessed, (c) the module coordinators

to see that it relates to the students' real experiences which may differ from the original expectation of the curriculum developers (d) the medical educators to provide technical support in the construction of items and to ensure constructive alignment (e) the representatives of other related disciplines (e.g. physicians or surgeons) to ensure relevance and vertical and horizontal integration and (f) the administration to bring all these individuals together at a specific time and for a specific duration.

It is, emphasise Sadaf et al (1), a major challenge for the question developers and an investment of resources and time to construct valid and reliable items aiming at assessing higher cognitive abilities of students and at the same time being compliant to item construction regulations and guidelines.

With multiple intake of students and increasing number of institutions implementing competency-based education (CBE) and programmatic assessment, the assessment policies in medical education are changing significantly. One of the effects is the increase in the frequency of assessments with the aim to provide

feedback to students at regular intervals (2-5). For this purpose, the written examinations are most suitable and feasible forms of assessment. As such, MCQs and structured essay questions (SEQs) play a prominent role in CBE and programmatic assessment (6). These and other types of written examination questions may be used to identify strengths and weaknesses of students to make recommendations about the level and type of assistance they need at that particular juncture of training or to make any changes in that particular course in terms of its contents or implementation (2).

The construction of items to make an adequate and meaningful assessment of students' knowledge and skills and produce consistent scores, challenges even the best educators (7,8). Even more so when one has to develop new items every semester or yearly to control the effects of possible content leakage (9,10). Often it is not possible to construct brand new items every time a written examination is conducted. Therefore, it is not uncommon for the staff members to have their own collection of questions which they tend to reuse repeatedly.

When testing large number of students, usage of MCQs is an efficient and cost-effective way of assessment. However, developing new questions for every new assessment while maintaining fairness and test validity and reliability, counterbalances the cost and efficiency (9).

To ease some of the burden associated with the construction of new MCQs on a regular basis, academic staff members and institutions may consider the use of question banks (QBs) (11). Existence of a bank of valid and reliable MCQs may provide a much-needed relief to the academic staff members and institutions especially at the times of un-expected urgencies e.g. to provide an alternate question paper in uncertain situations of confidentiality. More over adopting competency-based medical education with the use of e-examinations such banks are essential for efficient and dependable running of the programmes.

Though the reuse of written exam questions may provide practical solution in health professions educational programmes, there is a risk of examination content being leaked from one cohort to the next cohort of examinees (6).

At the end of their study Joncas et. al. (6) concluded that using an item  $\geq$  three times within a span of five years may endanger its psychometric properties (difficulty and discrimination indices) and thus the standard of the assessment. They suggest that the pooling of items from many institutions or alternatively an assessment based on automatically generated/selected questions from the QB may help in restricting the reuse of questions within a short span of time. However, Menghin et.al. (9) state

that the quality of assessment will not inevitably decline if a low ratio of randomly selected questions is reused. Developing a large National Question Bank of valid and reliable items may provide a useful resource to member institutions for their frequently scheduled assessments as well as to Professional Regulatory Bodies of the Country to organise their Licensure Examinations (1).

Generally, questions generated by institutions are specific for their curriculum and are meant for testing at a specific stage/level of progression in the course. These questions may not be suitable for sharing across the institutions. However, for exit examinations, where common standards are required at national level, pooling of questions may be desirable. Freeman et. al. (12) argue that even across the world, the minimum standards should be the same as medical knowledge is mostly universal.

Usually the institutions, for their banks, select questions which have been shown to have good psychometric properties in the previous examinations (13). The reuse of such items would allow the institutions to maintain the good quality of questions and overall examination standards.

Freeman et. al. (12) further innumerate the advantages of using assessment materials from sources outside the school. The specific advantages include as broad curriculum coverage, comparison of students' performance on items from contributing institutions and thus developing a performance benchmark, and above all spreading the load of constructing assessment materials. However, at times some modifications and tweaking may be needed before the questions from other sources can be reused.

There are a number of QBs available on line – whereby questions are authored by students or faculty or both. Generally, there is no assurance about the good quality of these questions in terms of structure, level of assessment, validity and reliability. However, some students' authored QBs have been developed after proper vetting and review sessions and are used mainly for students practice or formative assessments (14). Question developers may select items from these banks and improve on and modify them to meet the needs and requirements of their institution/s. Reports in literature inform about selecting and modifying questions from other sources to enhance an institution's QB (12).

In this communication we will describe the process of developing a QB in a Faculty of Medicine (FoM) in Malaysia with following features:

1. Questions are authored by the academic staff members; extensively vetted; tested in real examinations; analysed based on the students' performance in terms of difficulty and discrimination indices.
2. The validity and reliability of the questions is

ensured.

3. Questions are added in the repository only after a strict scrutiny by a committee based on the criteria set by the Faculty.
4. Questions are stored using a systematic approach under different categories.
5. The academic staff can get access to these questions only after getting approval from the relevant authorities – following a standard operative procedure.
6. The security and confidentiality of these questions is ensured.
7. The questions can be retrieved by using different selection criteria e.g. the discipline, the difficulty index, the level of question based-on e.g. Bloom's taxonomy.
8. The information about the questions e.g. psychometric properties is updated regularly after every use.
9. The new questions are added after every assessment and thus QB is constantly growing.
10. Questions are regularly modified / improved to match the latest advancements in the field of medicine so that the items are "age appropriate".
11. QB is controlled and managed by Examination Division of the University.
12. Question are to be reused for institutional examinations only and are not accessible by students.

We define QB as a repository of pre-tested, valid and reliable questions with known psychometric properties which are stored systematically under different categories and can be retrieved conveniently and quickly by teachers and examiners for reuse in examinations.

In the following pages we describe a stepwise process of developing and storing valid and reliable questions for written assessment in an integrated curriculum. The process ensures the constructive alignment of assessment and security and confidentiality of the items.

## MATERIALS AND METHODS

### Step 1: Faculty development

In FoM all the academic staff members are expected to

construct different types of questions (including MCQs) for assessment of students at various levels of training including exit examinations. To make this process smooth and efficient and to produce valid and reliable questions (15) all faculty members are provided training in the construction and evaluation of MCQs through frequent workshops conducted by medical educationists with special interest in student assessment.

In these hands-on workshops the staff members from different disciplines (including both basic sciences and clinical specialities) are grouped together and are required to develop questions on the spot which are presented to all the participants for their comments. The discussion is moderated by the facilitator of the workshop. This process also highlights the common flaws in developing questions and different ways are discussed and demonstrated to address these flaws.

### Step 2: Examination blueprint / Table of specification

While requesting faculty members to construct MCQs, provision of clear directions and precise information about the context and level of questions is very helpful for the question developers. The drawing of a matrix, apart from addressing the essential components, ensures broad coverage of the content and avoids duplication of assessment areas (16). In FoM the medical education unit develops a table of specification as follows:

1. Based on the total number and type of questions required for a particular assessment, the questions are distributed/divided among the relevant disciplines according to the duration/hours of their teaching/input during the term.
2. Suitable methods of assessment and types of questions are chosen in relation to the topics, teaching/learning methods and outcomes e.g. MCQ; SEQ; MEQ; OSPE; OSCE etc. (constructive alignment) (Tables I, II & III).
3. Effort is made to include questions from all the teaching/learning sessions and assess knowledge, skills and attitude by appropriate approaches.
4. Before selecting the topics for MCQs, the areas and the aspects assessed by clinical examinations or practical demonstrations and by structured essay

Table I : Examination Blueprint – Table of Specification End of Module (EoM) and Preclinical Professional Examination (PCPE) Cardiovascular System (CVS)

Module	Sessions	Discipline	No of LEC/DSL	Type and Number of Questions									
				MCQ		SBA		SAQ/SEQ		EMQ		MEQ	
				EoM	PCPE	EoM	PCPE	EoM	PCPE	EoM	PCPE	EoM	PCPE
CVS (5 weeks)	Lec-37	Anatomy	05	2(2.4)	4(3.4)		1	1	1	1	1	✓	✓
	CSL- 05	Physiology	14+1*	7(7.3)	10(10)	1	1		1			✓	✓
		Biochemistry	02	1(0.9)	1(1.4)		1			1		✓	✓
	IDS-02	Pathology	06	3(2.9)	4(4.1)	1	1	1	1			✓	✓
	PBL-02	Microbiology	01	1(0.5)	1(0.7)							✓	✓
		Pharmacology	07	3(3.4)	4(4.7)		1	1	1		1	✓	✓
DSL-1*	Comm Med	01	1(0.5)	1(0.7)							✓	✓	
<b>Total</b>			<b>37</b>	<b>18</b>	<b>25</b>	<b>2</b>	<b>5(5)</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>

LEC – Lecture; CSL – Clinical Skills Lab; IDS – Interdisciplinary Seminar; PBL – Problem-based Learning; DSL – Directed Self learning  
 MCQ – Multiple Choice Question; BAQ – Single Best Answer Question; EMQ – Extended Matching Question; SAQ – Short Answer Question;  
 MEQ – Modified Essay Question

**Table II : Examination Blueprint – Question Specification according to the Topic and the Type of Assessment Instrument for CVS Module**

	Topic	TYPE OF INSTRUMENT									
		End of Module					Preclinical Professional Examination				
		MCQ	BAQ	EMQ	SAQ	MEQ	MCQ	BAQ	EMQ	SAQ	MEQ
<b>ANATOMY</b>											
AL1	Anatomy of the Heart & Pericardium	✓			✓		✓	✓			✓
AL2	Development of CVS			✓			✓				
AL3	Blood and Nerve Supply of the Heart	✓							✓		
AL4	Histology of Cardiac Muscle & Blood Vessels						✓				
<b>BIOCHEMISTRY</b>											
BL1	Lipoprotein oxidation	✓						✓			
BL2	lipoprotein Metabolism			✓			✓				✓
<b>PHYSIOLOGY</b>											
PL1	Circulation: General Principles	✓					✓				
PL2	Pressure & Flow in Different Segments of CS						✓		✓		
PL3	Regional Circulation: General Principles & Coronary Circulation		✓				✓	✓			
PL4	Regional Circulations: Cerebral, Cutaneous, Splanchnic	✓				✓					
PL5	Electrical/Mechanical Properties Cardiac muscle	✓					✓				
PL6	Origin & Spread of Cardiac Impulse	✓								✓	
PL7	Electrocardiography					✓					
PL8	Cardiac Cycle	✓					✓				
PL9	Heart Sounds and Murmurs										
PL10	Cardiac Output	✓				✓	✓				
PL11	Regulation of Blood Volume						✓				
PL12	Neural Cardio-vascular Regulatory Mechanisms	✓					✓				
PL13	Regulation of Arterial Blood Pressure										✓
PL14	Pathophysiology of Cardiac Failure						✓				
<b>PATHOLOGY</b>											
PAL1	Atherosclerosis									✓	✓
PAL2	Ischemic Heart Disease						✓				
PAL3	Vascular Disorders: Aneurysm, Inflammation, Tumour	✓					✓				
PAL4	Hypertensive Vascular & Heart Diseases		✓				✓				
PAL5	Cardiomyopathy				✓		✓				
PAL6	Heart Failure	✓						✓			
PAL7	Rheumatic & Other Valvular Heart Diseases	✓					✓				
<b>MICROBIOLOGY</b>											
MCL1	Infective endocarditis	✓					✓				
<b>PHARMACOLOGY</b>											
PHL1	Pharmacology of Hypolipidaemic Dgs					✓	✓			✓	
PHL2	Adrenoceptors and their Agonists & Antagonists	✓						✓			
PHL3	Pharmacotherapy of Ischaemic Heart Disease				✓		✓				
PHL4	Antihypertensive Drugs	✓							✓		✓
PHL5	Pharmacotherapy of Hypertension						✓		✓		
PHL6	Pharmacotherapy of CCF	✓					✓				
<b>COMMUNITY MEDICINE</b>											
MSL1	Epidemiology of Hypertension					✓					
MSL2	Epidemiology of Cardiovascular Dis	✓			✓						
<b>INTERDISCIPLINARY/INTEGRATED</b>											
IDS1	Thromboembolism					✓					
IDS2	Hypertension										✓

MCQ – Multiple Choice Question; BAQ – Single Best Answer Question; EMQ – Extended Matching Question; SAQ – Short Answer Question;

MEQ – Modified Essay Question

AL – Anatomy lecture; BL – Biochemistry lecture; PL – Physiology lecture; PAL – Pathology lecture; MCL – Microbiology lecture; PHL – Pharmacology lecture;

MSL – Community medicine lecture; IDS – Interdisciplinary seminar

questions are excluded from the list. This helps to choose appropriate methods of assessment in line with constructive alignment and avoid duplication (Table IV).

### Step 3: The Process of vetting of questions

The vetting of questions aims at (a) aligning the assessment with learning outcomes and teaching/learning methods; (b) checking the authenticity of the information being assessed; (c) determining the relevance of assessment to the real experiences of the students; (d) scrutinising for the appropriate level of questions (e.g. based on Bloom's taxonomy); (e) checking on the technical structure of

**Table III : Linking Question with Learning Outcomes and Mode of Delivery of the Topic**

Discipline: Physiology		CVS			
Topic Title: Congestive Cardiac Failure					
Topic Learning Outcomes:					
<ul style="list-style-type: none"> <li>Describe the compensatory mechanisms in cardiac output in a patient with congestive cardiac failure.</li> <li>Describe the physiological basis of clinical manifestations of cardiac failure.</li> </ul>					
Mode of Delivery:	LEC	✓	DSL	PBL	IDS
In congestive cardiac failure, low cardiac output leads to					
A.	exercise intolerance.				
B.	decreased urinary output.				
C.	increased baroreceptor discharge.				
D.	pulmonary hypertension.				
E.	systemic hypotension.				

**Table IV : Process of selecting topics to be assessed by using MCQs**

1.	Make a list of all areas / aspects of areas to be assessed (knowledge based).	▼
2.	Strike out the areas / aspects of areas that would be assessed in clinical examinations (long case; short cases; OSCE) e.g. management of a patient with nephrotic syndrome.	▼
3.	Strike out the areas / aspects of areas that will be assessed through structured essay questions (MEQs, short essay questions) e.g. assessment and management of a patient with acute dehydration.	▼
4.	List out the remaining areas / aspects of areas that would be assessed through multiple choice questions (Single best answer questions; Extended matching questions)	

the question; (f) ensuring the validity and reliability of the questions; (g) assessing the feasibility of usage of assessment tools and the resources required; (h) ensuring that the items are in line with the overall objectives of the curriculum (1).

At FoM the vetting is done at three levels:

1. Discipline: The Heads of the Disciplines (HoDs) after receiving request from the Medical Education Unit according to the table of specification (Table I, II & III), instruct their staff members to develop questions which

then are vetted at the discipline level. The questions where horizontal and vertical integration is required are vetted at the module level. Apart from preparing original questions, the staff members may use different sources including online QBs to choose questions and modify them accordingly. This vetting mainly addresses points (b) and (c) (as given above).

2. Faculty vetting committee: This committee comprises of heads of relevant departments and is chaired by a medical educationist, thus providing input from multiple disciplines to enhance the validity of the items. During this vetting points (a), (d), (e) and (f) (as given above) are addressed.

3. Dean/Deputy Dean: This vetting is attended by medical educationist, phase coordinators and examination coordinators – some of them are also members of the Faculty vetting committee. At this level, apart from checking for any duplication, mainly points (g) and (h) are addressed.

Along with questions the model answers are also vetted. At all of the above levels of vetting if any clarification or modification is required the assistance is sought from the relevant HoDs. The staff members are advised not to keep the copies of the selected questions with them to maintain the confidentiality of the examination. The final questions are sent to the Examination Division of the University for further processing and safe keeping.

### Step 4: Difficulty and discrimination Indices

Previously used questions have the advantage of their psychometric properties such as difficulty and discrimination indices known and documented (13). The difficulty index is the mean percentage of students who answered the question correctly. A higher value means a relatively easy question. Whereas the discrimination index represents the corrected point-biserial correlation – i.e. the higher values indicate better discrimination between an academically good and a poor student.

Carefully selected and extensively vetted questions are put to test during examinations. Students performance is a real feedback about the clarity and relevance of questions to the actual exposure of the students. The difficulty and discrimination indices help in selecting the most appropriate, valid and reliable questions. Our criteria for selection of questions for banking includes a difficulty level of between 30 to 70% along with discrimination index of  $\geq 0.2$ . However, apparently easy and less discriminating questions may still be banked-in based on their clinical relevance and importance.

### Step 5: Reviewing the questions

The questions which are not selected during the process of vetting due to various reasons or do not meet the criteria of difficulty and discrimination indices after being used in the examination are returned back to the relevant disciplines with positive feedback for improvement. After review by the relevant authors and

disciplines, these questions go through the usual process of vetting again before being deemed fit for banking.

#### **Step 6: Storing questions in the bank**

The questions should be stored in the bank using a software that can sort out the items based on the following attributes:

1. Discipline
2. Organ system
3. Type of question (e.g. single best answer or extended matching type)
4. Years of first and subsequent uses
5. Difficulty index on first and subsequent uses
6. Discrimination index on first and subsequent uses
7. Date of last review
8. Level of questions based on – Millar's pyramid or Bloom's taxonomy

Alternate or additional attributes for storage could be: Clinical presentations; Disease process; Learning outcomes; Specific objectives based on the teaching/learning philosophy of the institution (17).

#### **Step 7: Maintenance of question bank**

The maintenance of QB ought to be an ongoing/continuous process. The two major challenges are maintaining the standards of banked questions and their confidentiality. With the increasing level of knowledge and changing teaching/learning methods, the relevance of banked questions may become questionable.

Examination coordinators assigned to select items from QB are in the best position to point out outdated items, redundancies and deficiencies. They can recommend construction of new questions on the missing areas. They can also identify items for review and revision. Sadaf et al. (1) recommend that, to ensure content and construct validity, each item should be reviewed critically at least every five years in the light of new developments and information. Each discipline may be requested to review their questions after regular intervals to determine the frequency of re-use, the change in difficulty and discrimination indices over time and the relevance of the items in the light of latest advancements. The involvement of coordinators, subject experts and medical educationist in this critical review can be very valuable. The difficulty and discrimination indices after each use of each item are recorded into the QB. This update adds another characteristic feature to developing valid and reliable assessments (18).

Maintaining the confidentiality of the questions is of utmost importance. We recommend only one repository of the items. The staff members are urged not to keep the copies of items that have been selected through the process of vetting. The access to the QB is strictly controlled through a standard operative procedure whereby the staff member must get approval from the designated authorities (e.g. the Registrar of the

University) before they are allowed to view the items in the QB. Every access to the QB must be properly recorded and saved.

#### **Step 8: Growth of question bank**

The QB must grow continuously and steadily. Not only the discarded questions need to be replaced, the new questions need to be added. Pooling of questions in collaboration with other institutions has many advantages apart from growth in number of items. It broadens the scope of assessment and brings new dimensions and variety in the assessment materials.

A group of willing staff members may be given a task of developing new items on regular basis. This group may meet on weekly basis to share and discuss their questions and later on may put up those items for formal vetting. The members may be rewarded in different ways.

In FoM, only a small proportion of total number of questions are borrowed from the QB. Majority of the questions are brand new and are added to the question bank after each assessment. This practice will go on till we have a sizable number of items in our bank.

#### **Step 9: Use of questions from a bank**

Re-using questions has its potentially leakage/disclosure risks (19-21) which are likely to compromise the validity and reliability of the assessment in the long run (22).

Joncas et. al. (6) concluded that using an item  $\geq 3$  times within a span of five years may significantly compromise its difficulty and discrimination indices and thus the quality of assessment. They showed that mean difficulty index increased from 79.8% on first use to 85.2% on fourth use (3rd reuse). The mean discrimination index decreased from 0.17 to 0.16, 0.14, 0.14 on first, second and third reuse respectively. The impact of increase in difficulty index was more pronounced than decrease in discrimination index. This phenomenon of changes in the psychometric properties has been termed as Item Parameter Drift (IPD) (23).

Therefore, a large pool of questions is needed to avoid the excessive use of the same items. Developing a common bank sharing items from other institutions would definitely help in this respect. Moreover, using automatic selection of items with restriction of frequent reuse may help to maintain the quality of questions. Rephrasing one or more options may significantly modify a previously used question which then may be considered as a new question. Using a "washout" period – that is not to use the same question for two consecutive years/assessment – may also help to maintain the psychometric properties of the question (23).

There are no reports on exactly what percentage of questions in a particular paper can be chosen from the QB without significantly compromising the quality

of assessment. A study conducted in a Canadian undergraduate medical education programme using problem-based learning curriculum reported a reuse of 25 to 60% of questions in their assessment of students (6). A study from Austria (9), after reusing 30 to 45% items in written tests, concludes that it is mainly the items assessing the application of knowledge which become easier on reuse whereas items assessing recall of knowledge do not help students who seek to benefit from studying the reused items. In FoM, the number of questions to be reused was restricted to a maximum of up to 20%.

The items selected from the QB cannot be used unvetted. They must be assessed for relevance and construct alignment based on learning outcomes. To achieve and maintain reliability, the existing information in the vignette should be modified, thus creating variation in the MCQs to be used to re-test the same concept.

### **Step 10: Safety and security of question bank**

All the possible steps should be taken to ensure the safety of QB. The physical steps may include making people responsible, installing CCTV, using a computer with no internet connections, safe location, minimising the possibility of accidents etc.

Using industry best practices for cyber security such as cloud computing, encryption of documents with physical keys, strong passwords that should be changed frequently, 2FA (two factor authentication), biometric security, limiting access to databank using IP filtering and limiting access to authorised devices can ensure safety and security of QB.

## **RESULTS**

Developing QBs need a concerted effort and determination. We have described ten practical steps for developing and banking of objective questions. The first five steps relate to the process of development of quality item and the remaining steps relate to the development of question bank, its maintenance, growth and safety and security. We have also established the criteria for selection of the questions to be banked-in and also how to choose questions from the bank and modify them, if needed, before reuse. We have also given the guidelines on the frequency of reuse of questions.

## **DISCUSSION**

The relatively newer approaches to teaching/learning such as CBE emphasise on frequent feedbacks to students. These feedbacks may be based on a number of tasks and events such as communication with the patients during clinical teaching or students' presentations to their peers in the class rooms. The feedback on the knowledge component usually requires some kind of written assessment – hence the use of MCQs. Advantages of using MCQs include cost effectiveness, efficiency, easy

to mark and analyse especially while dealing with large cohort of students (1) joining from multiple entries.

However, construction of novel quality MCQs for assessing higher order thinking skills and decision-making abilities for each of the frequently conducted assessments, without compromising on the quality, validity, reliability and structure of questions while conforming with the strict rules and regulations, is a tall order for the academic staff (7,8). Hence developing QBs of good quality questions and reusing these questions with proper precautions is the logical solution (11).

Disclosure of the questions to the subsequent cohort of students is a real setback for reuse of questions and it has been shown that frequent reuse may compromise the difficulty and discrimination indices and thus the overall quality of assessment (6). The answer lies in interinstitutional cooperation to create a large pool of good quality questions and practising automated selection of items for reuse while imposing restrictions on the frequent reuse of the same items. Another approach is modifying some of the statements in the questions before reuse without changing the domains being assessed.

To keep the question relevant and “age appropriate”, in the face of rapid increase in knowledge and introduction of newer methods of teaching and assessment, the questions need to be reviewed at regular intervals – at least every five years according to some authors (1). This can be achieved by asking the relevant HoDs, programme coordinators and medical educationist to play an active role in the review process.

To replace the discarded questions and to increase the repository of questions, the QBs need to grow steadily and continuously. This objective can be achieved by using a mix of new and old questions in frequently conducted written assessments. The new questions, after their use and based on their psychometric properties should become the part of the QB. However, to construct quality items, there is a need to (a) train the staff members (1), (b) put in place an exhaustive vetting process, (c) draw an “attribute list” for selection of questions, and (d) use an examination blueprint to select the topics and appropriate type of questions following principles of constructive alignment. Safety of the QB is an obvious priority and use of physical and technological advancement can assure the security.

Created and constructed based on our own experience of developing a question bank at a Faculty of Medicine in Malaysia and literature review, we have proposed 10 steps for constructing quality questions and developing a safe and secure QB from which the items can be retrieved using defined criteria for quick reuse either at institutional or national level.

## CONCLUSION

Teachers in medical schools are overworked with their multiple and diverse responsibilities such as providing services in hospitals, conducting research and administrative errands apart from teaching and assessment of both undergraduate and postgraduate students. Using QBs will alleviate some of the burden of constructing novel quality questions under strict guidelines and rules for each assessment which need to be conducted so frequently in 21st century teaching/learning approaches such as competency-based education and programmatic assessment. The use of banked questions with known psychometric properties would allow the medical school administrators and faculty members to take charge and control of items' quality, overall examination standards, validity and reliability. Based on our experience and literature review we have described ten practical steps which can help in establishing a new QBs or improve the existing ones.

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