



Evaluation of a Multidisciplinary Clinical Module on Cardiology and Cardiovascular Surgery at Al-Baha University: Students and Academic Staff Perceptions

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ABSTRACT

Introduction: Al-Baha Faculty of Medicine is adopting an integrated system-based curriculum. In the basic sciences phase, integration was direct and system-based, while very challenging in the clinical phase. To develop a fully integrated system-based clinical module, it was necessary to revisit the clinical disciplines to be tailored in one common educational medium.

Methods: To develop a module on: Cardiology and Cardiovascular Surgery (CCVS), a committee was assembled including clinical disciplines. Intended learning outcomes (ILOs) were formulated. Varieties of teaching, learning and assessment strategies were adopted. Inferences of program evaluation were obtained from students and staff through self-administered questionnaires. **Results:** These efforts resulted in construction of students' study guide and approximately 20% of the content was allocated to basic sciences. The module was introduced to the fourth year students. The teaching activities consisted of 32 lectures: 32, 2 tutorials, 4 seminars, 8 problem-based learning (PBL) sessions, 4 self-directed learning (SDL) sessions, 5 skills laboratory sessions, 12 a day-long hospital-based clinical sessions, and 2 basic sciences practical sessions. Module ILOs were perceived as comprehensive by 23.3% and 86.7% of staff and students respectively. 23.3% of staff and students perceived the content as satisfactory. Perceived points of weakness were: imbalance between basic and clinical content and between medicine and surgery. **Conclusions:** Validity of integration in the clinical phase bridged the borders between different disciplines as the case in basic sciences. CCVS module can be seen as a prototype of integration between different areas of clinical sciences.

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Introduction

In 1985, Harvard Medical School created a hybrid curriculum, which combines problem based learning (PBL) with limited lectures and

laboratories in order to help students to develop an integrated knowledge base. It demonstrated that students could learn basic science in the context of clinical medicine while maintaining sufficient content mastery to pass the national

licensing examination with no decrement in basic science knowledge [1].

Globally, the current trend in medical curricula changed towards integration, both horizontal among the disciplines and vertical between basic and clinical sciences. [2, 3]. Information presented without robust cross links and ties to clinical applications, has proven difficult for students to recall after the transition to clinical clerkships [4, 5].

Having been established recently in 2004, Al-Bahah University (ABU) adopted modern curricula and up-to-date teaching technologies. Faculties undertake the development of student's skills and training them on different practical applications. In addition, they help students polish their talents, instil in them the spirit of creativity, and provide the society with qualified individuals.

The Faculty of Medicine of Al-Baha University (FMABU) was established in 2008 with an integrated system based curriculum. The curriculum at FMABU consists of three phases. In phase I (the preparatory phase), the basic natural sciences are taught in the form of an integrated module called pre-med module. In phase II (the pre-clinical phase) the basic sciences are taught in the form of non-system-based and system-based modules such as cardiovascular module. Phase III (the clinical phase), include system-based clinical modules in which the classical four disciplines and their subspecialties are melt and integrated within. In addition, special themes like medical safety, ethics and professionalism, research methodology, data management and medical reasoning courses are taught longitudinally.

FMABU is also adopting the triangular model of places for clinical teaching/learning and assessment. [13] Adel Abdelaziz concluded in his study that "After 3 years of implementing the Triangular model integrating clinical teaching and assessment at FMABU, the feedback from students, faculty, and community representatives has been very encouraging" [13]

In FMABU, there are different levels of integration where boundaries between comparable disciplines horizontally melted and boundaries between clinical and basic medical sciences nearly disappear vertically. As a result, the classical borders between different clinical disciplines disappear. For instance, Cardiology and cardiovascular surgery (CCVS) module is replacing the previous compartmentalised cardiology and cardiac surgery courses.

Method

In order to implement a module of CCVS we went through an interventional study to design a study guide that passed the following steps:

Under the supervision of the academic directorate, quality assurance and medical education development unit a module committee was assembled including an internist, paediatrician, surgeon, community physician and three members from the basic sciences (anatomy, physiology and pathology). This group had participated in the discussion about the contents of the module, teaching methods and activities and the level of integration. An extensive review to the literature was performed looking for similar experiences in the implementation of similar modules in contents and integration levels.

The intended learning outcomes related to the basic sciences as well as the clinical sciences were formulated and grouped. The core group listed and organized the module contents according to the intended learning outcomes. Varieties of teaching and learning methods are then listed. Methods for student's assessment were carefully selected to suit the program and the faculty regulations.

The input of the focus group and the output of the literature review were put together to formulate learning objectives of the CCVS module. These objectives were revised extensively to align with outcomes of the undergraduate curriculum of the FMABU. (11).

The themes were chosen for this module and distributed over four weeks period. The module activities and objectives were regrouped around the themes. So lectures, practical sessions, self-

directed learning topics and problem-based learning cases were employed to cover different selected themes as a week guides based on the timetable illustrated in Table 1.

Table 1: One week timetable:

Time Day	8-9	9-10	10-11	11-12	1-2	2-3	3-4
Sat.	L11: Investigations and management of IHD	L12: Coronary artery bypass graft	L13: Generation, conduction & ionic basis of cardiac impulse	L14: arrhythmias types and manifestations	PBL2: session 1:		L15: Cardiac arrest
	L. Room	L. Room	L. Room	L. Room	PBL Room		L. Room
Sun	Hospital Based Clinical Teaching / King Fahad Specialized Hospital				L 16: Acute Rheumatic fever	L 17: Valvular heart disease	L 18: heart failure
	Clinical Departments				L. Room	L. Room	L. Room
Mon.	Hospital Based Clinical Teaching / King Fahad Specialized Hospital				Seminar 2: Pericardial disease		SDL2: Non cardiac surgery with heart diseases
	Clinical Departments				Seminar Theatre		Seminar Theatre
Tue.	Hospital Based Clinical Teaching / King Fahad Specialized Hospital				Revision of the clinical work And orientation for evaluation methods		A-V malformations
	Clinical departments				L. Room		L. Room
Wed.	L19: Heart valve surgery	L 20: nfective endocarditis	PBL2: 2 nd session : debriefing		Data management		L5 : Medical Ethics in CCVS
	L. Room	L. Room	PBL Room		Longitudinal Course/L. Room		L. Room

The core committee did several consultations with academic, quality assurance and medical education units which add to the module by subtraction or addition. Before implementation meetings including all those who share in the teaching take place, teachers are advised about the development, themes and the objectives of the module and as well they asked to note their perceptions.

All the above qualitative measures which took place for program evaluation and development were followed by quantitative measures through studying students and academic staff perception. Inferences of the program evaluation quantitatively were obtained through self-administered staff and student's questionnaire which include questions about, ILOs, teaching/

learning methods, module duration, subject matter and student's assessment methods.

Result

Module development:

These efforts resulted in the development of Cardiology and Cardiovascular Surgery (CCVS) Module. The students study guide which includes all the components of the module was constructed. All details of the teaching and learning processes that will be used in the module were stated clearly. These include: the ILOs, Teaching/learning methods and Assessment methods. All these are shown in Tables 2 and 3.

Table 2: Module pre- requisites' and ILOs

Items that were revised by the students before CCVS	<ul style="list-style-type: none"> • Anatomy of the heart • Generation ,conduction & ionic basis of cardiac impulse • Normal electrocardiogram • Anatomy and histology blood vessels • Embryological development of the heart and vascular system.
Aims of the CCVS	<ul style="list-style-type: none"> • Provide students with the knowledge and understanding of the diseases of the cardiovascular system in all age groups • Enable the students to acquire and become efficient in basic clinical skills as history taking • Enable the students to interpret diagnostic investigations
ILOS of the CCVS	<ul style="list-style-type: none"> • Recall the anatomy and physiology of cardiovascular system. • Discuss the causative factors and patho-physiology of cardiovascular diseases. • Discuss the epidemiology and prevention of cardiovascular diseases. • Describe the pathological changes (macroscopic and microscopic) in cardiovascular diseases from both medical and surgical aspects. • Outline the natural history progression and complications of cardiovascular diseases. • Obtain a relevant history and perform a physical examination to elicit signs pertaining to cardiovascular diseases. • Understand the clinico-pathological correlation of cardiovascular diseases. • Determine the appropriate investigations and interpret the results to arrive at a diagnosis. • Discuss the pharmacological rationale of drugs used in cardiovascular diseases. • Discuss the management of cardiovascular diseases and complications. • Recognize and manage cardiovascular emergencies. • Understand and critically analyze research publications and conduct a simple research project.

Table 3: The module contents and tuition methods

Methods of delivery	Topics
Lectures	Cardiovascular Symptoms , Chest radiograph , Coronary angiography , Anatomy of the heart , Ischemic heart disease (IHD), Epidemiology of ischemic heart disease (IHD),Coronary artery bypass , Generation ,conduction & ionic basis of cardiac impulse , Cardiac arrhythmias , Valvular heart disease, Prevention & epidemiology of rheumatic heart disease , Anatomy and histology of arteries and veins , Introduction to occlusive arterial disease , Acute Limb Ischemia , Chronic Limb Ischemia , Aneurysm , Arterio-venous fistula , Surgical treatment of aneurysm and arterio-venous fistula , Varicose veins , Epidemiology of hypertension , Hypertension & Hypertensive medications, cyanotic and acyanotic congenital heart disease.
Tutorials	Surgical treatment of deep vein, Cardiovascular diseases in pregnancy
Seminars	Open heart surgery, Rheumatic fever, Deep vein thrombosis, hypertensive emergencies.
PBL	Heart failure , Infective endocarditis, shunt dependent cyanotic heart disease, pericardial effusion
SDL	Causes and management of cardiac arrest , myocarditis, cardiomyopathy, surgical management of congenital heart disease.
Skill lab Sessions	Normal and Abnormal ECG, Echocardiography , Holter monitoring, Embryology of the circulatory system, cardiovascular history & examination, cardiac murmurs.
Hospital-based clinical sessions.	Ischemic heart disease, Heart failure, Acute rheumatic fever, Valvular heart disease, Acute limb ischemia, Chronic limb ischemia, Deep vein thrombosis, Hypertension,
Practical Sessions	CVA, Congenital heart diseases , Pericardial disease, CVS therapeutics round Performing and reading ECG, Echo and Holter monitoring

The main clinical departments that contributed in the development, as well as the teaching process included: Internal Medicine, Adult Cardiology, Pediatrics Cardiology, General Pediatrics, General Surgery, Pediatrics Surgery, vascular surgery, obstetrics and gynecology, and community medicine.

The departments of the basic sciences (Anatomy, Physiology, Pathology) as well contributed in the teaching as the modules structured to allocate 20% of the contents to the basic sciences.

This module was introduced to be studied by fourth year in the second semester, and the pre-requisite modules are history taking and physical examination modules.

The final structure of the module activities is shown in Table 3 and 4. The activities include all modalities of theoretical, practical and clinical teaching.

Table 4: Module Activities.

Activity	Number	Contact hours
Lectures	32	32
Tutorials	2	4
Seminars	4	8
PBL	8	32
SDL	4	-
Skill lab Sessions	5	10
Hospital-based clinical sessions.	12	48
Basic sciences practical sessions	2	4

Module perception by the staff:

The staffs were requested to evaluate eight items as mentioned in Table 5 and Figure 1. They perceived the module objectives as excellent (23.3%), very good (50%), good (23%), acceptable (3.3%) and none of the staff perceived the objectives and outcome as weak.

They also positively perceived the syllabus-excellent (26.6%), very good (30%), good (40%), acceptable (3.3%) and none perceived it as weak.

Theoretical concepts and subject matters of the module were positively perceived by the faculty staff ranging from acceptable to excellent. Only 3.3% of the staff rated these two items as weak.

Most of the faculty staff perceived the module structure and the balance between theoretical, practical and clinical activities as excellent, very good, good or acceptable. Where (3.3%) only evaluated these two items as weak.

Most of the staff thought that the learning and teaching methods in this module encourage active participation as they evaluate this item as excellent (16.7%) very good (36.7%), good (33%), acceptable (10%) and weak (3.3%).

Regarding the assessment methods used in this module the opinions obtained from the staff was encouraging as they state it as excellent (20%), as very good (36.7), good (33%) and acceptable (10%). None of the staff evaluate the methods of assessment as weak.

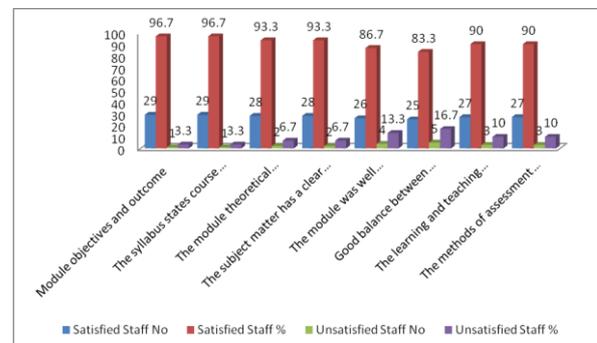


Figure 1: Academic staff general evaluation results

Module perception by the students

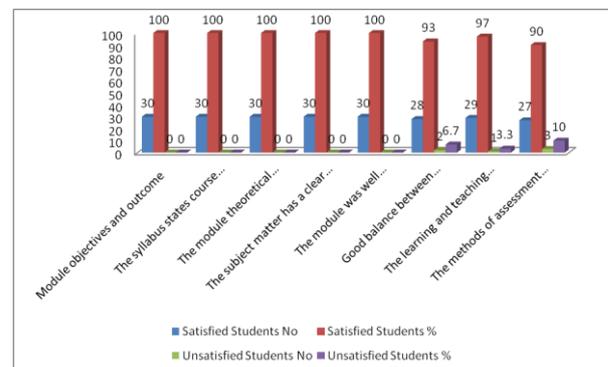


Figure 2: Students general evaluation.

As shown in Table 5 and Figure 2, 26 (86.7%) of the students perceived the module objectives and module outcome as excellent and few of the perceived it as very good (10%) and good (3%). None of the students evaluate the module objectives and outcome as acceptable or weak.

The syllabus and the theoretical concepts of the module were perceived as excellent, very good and good by the students showing good satisfaction as none of them evaluate these two items as acceptable or weak.

The subject matter and the module structure as well gained high marks from the students as 53.3% perceived the subject matter as excellent

and 53.3% perceived the module structure as very good.

Regarding the balance between the theoretical, practical and clinical activities none of the students evaluate it as weak and 2 (6.7%) evaluates it as acceptable where most of them perceived it as excellent and very good 16,(40%) and 16, (40%) respectively.

The students perceived the assessment methods as excellent (30%), very good (46.7%), good (13%), acceptable (10%) and none perceived it as weak.

Table 5: Staff and students evaluation.

Item	Excellent, %		V. good, %		Good, %		Acceptable, %		Weak, %		Total	
	Staff	Students	Staff	Students	Staff	Students	Staff	Students	Staff	Students	N	%
Module objectives and outcome	23.3	86.7	50	10	23	1	3.3	0	0	0	30	100
The syllabus states course objectives and required skills	26.7	26.7	30	66.7	40	2	3.3	0	0	0	30	100
The module theoretical concepts with real world application	10	30	43.3	56.7	37	4	6.7	0	3.3	0	30	100
The subject matter has a clear relationship with other units	16.7	53.3	33.3	40	40	2	6.7	0	3.3	0	30	100
The module was well structured to reach module outcomes	16.7	20	43.3	53.3	23	8	13	0	3.3	0	30	100
Good balance between lectures, practical and clinical	20	40	33.3	40	27	4	17	6.7	3.3	0	30	100
The learning and teaching methods encourage active participation	16.7	30	36.7	43.3	33	7	10	3.3	3.3	0	30	100
The methods of assessment were reasonable	20	30	36.7	46.7	33	4	10	10	0	0	30	100

Discussion

In medical education the medical curricula are continually developing to satisfy the specific needs and the unique situation using the available resources. This development must be

well planned and applying innovative ideas to reach the contemporaneous student's needs. The clear build-up of the curriculum and the vertical and horizontal integration of subjects have significantly achieved in this module.

We were thinking that this new applied module despite of all efforts in its development we should find a way to evaluate it pre- and post-implementation, to answer this question we planned a survey for both students and faculty members to test their satisfaction with the module through both qualitative and quantitative methods.

This module level of integration was unique in addition to horizontal and vertical integration the new concept added here is melting and mixing both surgical and medical conditions in one matrix.

This melting of borders of the classical disciplines in one system will add to the experiences of integration and its success will help others to follow.

Susan *et al*, in their study in 2009 concluded that the integrated lecture-based cardiovascular module was successfully developed and implemented and resulted in improved students and faculty satisfaction, the same happened in this module with addition in that the surgical components were added and the same level of satisfaction was gained (6).

The overall students' satisfaction in this study was ranging between 83.3 % to 96.7% which much higher than that seen in study by **Ayuob *et al*** which was 72.7 % in study done at King Abdelaziz University in 2012 (7). These results again are higher than those seen in Mehr *et al* (8).

The student's satisfaction generally is higher in all studies modules implemented with interdisciplinary integration this seen in this study and was in agree with study done by Ayoub *et al* and in agreement with results obtained by Klement *et al* (9).

This high staff and student satisfaction which obtained in this study may not be the case always and there may be some exceptions in some subjects, Harvard medical school test the students satisfaction in 2011 in a course of Preventive Medicine and Nutrition comparing the new integrated module with old non-

integrated one. The students show less satisfaction with integrated course in both quality and quantity.

As the case in all integrated modules the number of lectures should be decrease and other teaching modalities take place instead, in this module still the number of lectures is high as the staff resist to reduce it this seen in so many results as described in Ayuob *et al* and Ho *et al* (7, 10).

One of the main challenges face us in the developing this module is the resistance of the staff to the changes from the old methods that they used to apply, the module committee overcome this obstacle by through and detailed explanation of the whole process and share with the staff the expected results and showing them the degree of success of similar modules in different medical schools.

The staff as well were not well trained in methods like SDL and PBL and difficult to be convinced with the value of this methods in the process of medical education, this lead the module committee, academic affairs, quality assurance and medical education units to organize multiple training workshops which lead to a favorable results among the staff as they being convinced and well trained which reflected in the improvement of overall outcomes in other similar modules.

It was quite difficult even for the module committee to merge both medical and surgical problems in one module and to avoid repetition, here the quality assurance played an outstanding role as the unit kept all topics taught in other modules and recommend either to omit them or to teach them from the aspects that not taught and filling gabs only. In this issues the committee and quality assurance were much helped by a report by Issenberg *et al*. (12).

These changes led to more integration and coordination between the clinical departments in the same level and more coordination between the clinical and the basic, in addition to their subspecialties.

Medical Education issues in Saudi Arabia are in continues development as a large number of medical schools are established, hence reporting and sharing experiences with local and international institutions is very helpful.

Conclusion

In this study despite of the difficulties faced the developer of the cardiology and cardiovascular surgery module but, it showed the validity of integration in the clinical phase in which all borders between clinical disciplines are removed and full integration between basic and clinical sciences achieved with co-operation between related disciplines from one site and specific units in the faculty.

Another level of integration is achieved by mixing both medical and surgical problems of the cardiovascular system in one matrix.

Both students and academic staff are well perceived the module and its outcomes, more over they indicated an important points of weakness which will be avoided in the next time. We conclude that the development of multidisciplinary integrated system-based module in clinical medicine is achievable and as well satisfy both student and faculty staff members.

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