



## 'REFORMATION IN PHYSIOLOGY CURRICULUM-FEW PROPOSITIONS'

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### ABSTRACT

The knowledge of Physiology provides base to the diagnosis of any disease. With time there are various changes including expanding knowledge in the field of Physiology and particularly a gap between clinical concepts and hard core physiology topics call for replanning of its curriculum. Extensive problem based integrated teaching module for Physiology has its own restraints for implementation in institutions but an approach linking Physiological concepts with clinical vignettes and interactive teaching are some of the methods, those are easy to apply and improve the overall scenario of understanding. This article is predominantly based on the short questionnaire based research, which will explore the need to reframe physiology curriculum for undergraduate.

### INTRODUCTION

Physiology being the science of body organ functioning needs to be introduced before the teaching of clinical subjects as it provides base to the diagnosis of any disease. In simple words all the basis of symptoms, signs, examination and investigation to find out what might have gone wrong, whorl around the knowledge of Physiology. There is lots of medical stream related vocabulary, that takes time to build up and thankfully physiology curriculum provides the opportunity before the new pupils step into the hard core clinical medicine.

However, there are certain challenges, physiology curriculum is facing now a days and **need a reform** due to various reasons.

Firstly, there is enormous (length as well depth) expansion in the field of Physiology. This growth is thought to be 8% - 9% per year, means doubling of information at every 8-9 yrs which have been studied by counting and comparing number of science journals and cited papers. Moreover the numbers of pages in physiology books read during 5-6 decades before and now have remarkably increased. Availability of information on internet on any particular topic has further intensified this problem of depth versus length.

Secondly, as compared to past duration of first professional, which was of 3 semesters, it has been reduced to 2 semesters only with much more content to be covered during these 2 semesters.

Thirdly, Physiology is a subject with multiple mechanisms those demand in depth and continuous attention from the students as well as teachers. Thus this subject in its capacious form is quite complex.

All the above stated factors have created a sense of loatheness in students for the subject as although they try hard but cannot imbibe each and every concept. They simply gather the information without knowing their applicability but since they pass the exams so they hardly care and conscious of their rote learning.

### What is the solution?

To find out some way out, a short questionnaire based research was carried out to find out opinion of the MBBS students (75 MBBS students of 5<sup>th</sup> semester, 75 MBBS students of 7<sup>th</sup> semester) who have cleared their first professional exam and 23 clinicians of different departments (Table 1, 2 and 3 and Fig 1.2 & 3).

**Table 1: Following 'close ended questions' and their answers were asked, as given in this table.**

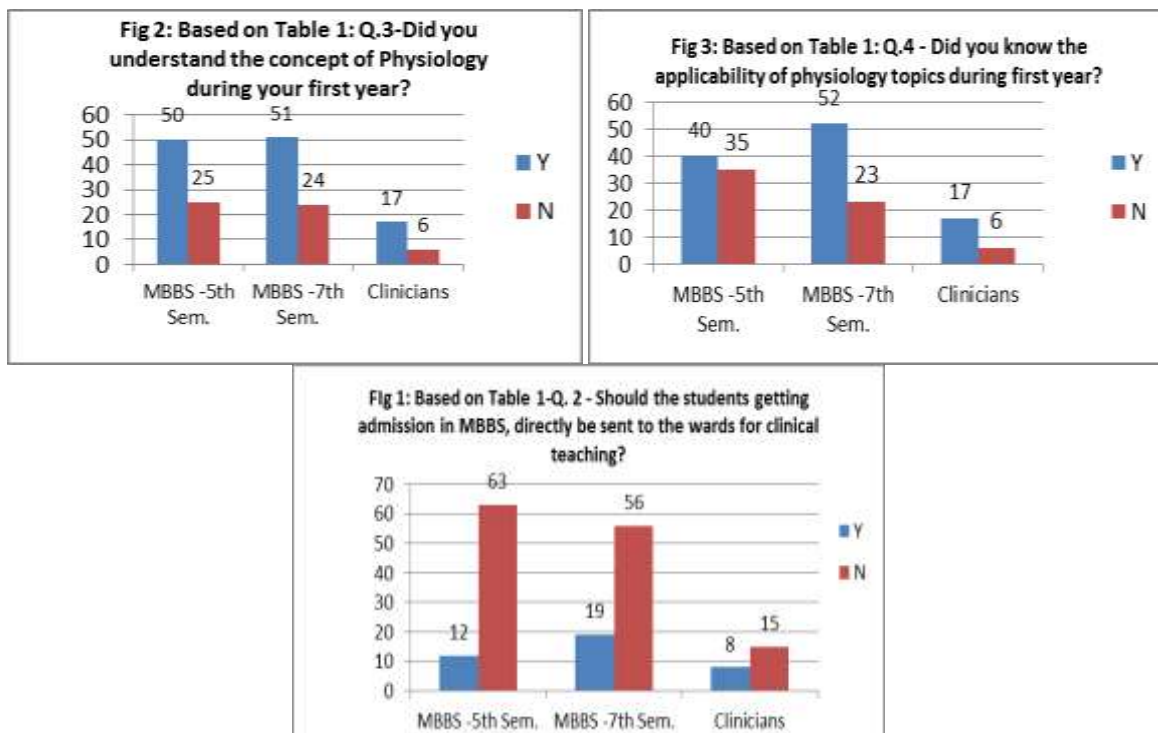
Participants→	MBBS- 5 <sup>th</sup> Sem.		MBBS - 7 <sup>th</sup> Sem.		Clinicians	
Questions↓	75		75		23	
1) Is Physiology important for MBBS curriculum?	Y(75)		Y(75)		Y(23)	
2) Should the students getting admission in MBBS, directly be sent to the <b>wards</b> for clinical posting?	Y(12)	N(63)	Y(19)	N(56)	Y(08)	N(15)
3) Did you understand the <b>concepts</b> of Physiology, during your first year of MBBS?	Y(50)	N(25)	Y(51)	N(24)	Y(17)	N(06)
4) Did you know importance of the <b>applicability</b> of Physiology topics during first year?	Y(40)	N(35)	Y(52)	N(23)	Y(17)	N(06)

**Table 2: Frequent answers of the 'open ended question'– 'Should the students getting admission in MBBS, directly be sent to clinical teaching'?**

Questions	Should the students getting admission in MBBS, directly be sent to clinical teaching?Why?
<b>Answer was 'No' and the reasons are given below</b>	
<ul style="list-style-type: none"> <li>▪Eyes see what the mind knows –without theoretical knowledge of basic sciences, the students will not earn any knowledge by mere standing in clinics.</li> <li>▪The students will not know, what is to be seen or observed in clinics.</li> <li>▪There should be prior knowledge of various mechanisms to understand symptomatology.</li> <li>▪Simultaneous knowledge of basic sciences during clinical exposure will be too much to handle.</li> <li>▪Even in 3<sup>rd</sup> Semester, we did not know much about the diseases and without the support of teachers, sort of lost in wards.</li> <li>▪Students will be confused and stressed out.</li> <li>▪Certain vocabulary and mechanisms are prerequisite to step into wards and to correlate things clinically.</li> </ul>	
<b>Answer was 'Yes' and the reasons are given below</b>	
<ul style="list-style-type: none"> <li>▪Basic science knowledge needs to be correlated with clinical sciences on daily basis to understand basis of disease.</li> <li>▪Theoretical teaching is quite boring. Theoretical teaching is quite boring and thus to create interest.</li> <li>▪More time will be available for skill development-more exposure, more learning.</li> <li>▪To understand patho-physiology of signs and symptoms.</li> <li>▪To learn theory of physiology/functioning through symptoms.</li> <li>▪The more you see, the more you learn.</li> <li>▪To know the value of Physiology in clinical practice.</li> <li>▪ Although straight to the clinical setting, but teaching should be by physiology specialists.</li> <li>▪Students themselves will conclude how to learn and imbibe Physiology during the theoretical classes.</li> <li>▪It provides side by side demonstration of applicability of basic science knowledge.</li> <li>▪ This way, they will get a holistic approach to medicine practice rather than a fractioned subjects facts.</li> </ul>	

**Table 3: Frequent answers of the 'open ended question'– 'Give few tips to reform curriculum of Physiology'?**

Question	Give few tips to reform curriculum of Physiology
<b>Answers</b>	
<ul style="list-style-type: none"> <li>▪Use of chalk - board conceptual teaching with related videos show are important ways.</li> <li>▪Teach and assess only the concepts and applicability of Physiology.</li> <li>▪Mechanisms should be taught by dynamic models, videos.</li> <li>▪Current method is good.</li> <li>▪Clinical understanding based book should be prescribed.</li> <li>▪ With Physiology subject book, a symptoms &amp; signs based book also be prescribed.</li> <li>▪ Only interactive mode of teaching should take place.</li> <li>▪ Common clinical diseases must be discussed in detail explaining their patho-physiological basis.</li> <li>▪ Switch to more integrated form of teaching.</li> <li>▪ Regular written tests should be done.</li> <li>▪ Students should be shown tests (NCV, , AFT, ECG, PFTs, EEG and Evoked potentials not only in normal subjects but in patients as well.</li> <li>▪Physiology with clinical case setting should go hand in hand.</li> </ul>	



### Solutions in different Areas

1. Curriculum Development Plan
2. Faculty development
3. Quality control of Medical Education Centre

### 1. Curriculum Development Plan Curriculum

Curriculum typically encompasses the learning objectives to acquire knowledge and skills of the students, planning contents, duration and schedule for teaching (syllabus), mention of teaching materials (books, journals, presentations etc) and method of evaluation i.e. formative and summative assessment scheme.

Various designs of curriculum planning have been put forward time to time and each has its strengths and weaknesses:

1. The architect design: This approach is more based on the clear cut architect of the students' 'learning outcomes' on which then a concrete preparation of curriculum is laid down.
2. The mechanic approach: This approach is more based on the 'teaching methods and educational policies' to the extent curriculum objective might not meet effectively.
3. The railway time table design: This approach is more based on the duration and scheduling part of curriculum followed by other components.

4. The cookbook design: This approach is more based on the specifics of the syllabus units and quantity of each unit incorporated.

### An approach to plan a curriculum in present scenario

Based on its components, discussion can be continued as follows:

#### a) Learning objectives and outcomes

These need to be very clear and few examples are as follows:

- Main objective should be to understand 'core concepts of physiology' for example – in case of topic – 'Physiology of Language' – the core concept is as follows-

Language may be spoken or written →  
 Each component has sensory and motor division →  
 For sensory division - auditory cortex/visual cortex is to perceive sound/image and then to 'Association area for Language' (Wernicke's area) to comprehend sound/image stimulus by processing →  
 For motor division- impulses project from Wernicke's area to Broca's speech area through arcuate fibers. After further processing in Broca's area, impulses reach to motor cortex for coded serial movement of larynx, tongue and lips (vocalization).

- Understanding of 'integration in the functioning' of different systems of Physiology: All the systems in the body are working in harmony and in interdependent manner, so development of this notion is very imperative. (e.g. CNS is responsible to send an unabated respiratory drive for continuance of life, but this very

system is functioning on the source of abounding oxygen, made available by respiratory system).

▪Understanding of **'integration of Physiology with other subjects'**: Goal of teaching of all the subjects is to aid in treatment of a patient for better outcome. So while a student starts stepping to learn Physiology, he should be made oriented that how this information is in continuity with other subjects to develop a bird's eye view. (e.g. While teaching functions of different cortical regions of brain, he should be told simultaneously that with this knowledge, he must be well oriented with the anatomical aspects as well i.e. location and numbering by Brodmann. The functioning of one of these regions may go wrong, which then will signal a symptom at a particular site that becomes a guide for a physician to diagnose the disease.)

▪ Understanding of the **'applied aspects of the learned concepts'**:

The ultimate goal of Physiology knowledge is to be able to think in terms of chain of causes and consequences where learnt mechanisms seem to be deviated from normalcy (e.g. in context to previously discussed example of 'language' → if a patient presents with inability to understand the said or written words but otherwise fluent in speaking → student can very well understand that sensory component of speech is defective causing sensory aphasia → the probable cause being the lesion in Wernicke's Area).

#### b) Contents - Syllabus

With the available torrent of information in physiology (both length and depth wise), it is very important to guide students for the content required for them and genuine source (from textbooks rather than non-verified internet information) to acquire them.

Keeping in mind the duration for obtaining physiology information (quite less) and later on requirement of future physicians, we should try to confine the syllabus to understand the core concepts of Physiology. (e.g. There are enumerable number of neurotransmitters in CNS, for the teaching of students we should restrict on to know mechanisms of some very common neurotransmitters that they will come across during their future clinical postings).

#### Example of syllabus formulation of Neurophysiology Whole Neurophysiology should be taught with the help of thematic diagrams and flow charts

Total lessons (Lectures) number to be taken = 25 hrs.

#### Units in CNS

- Introductory Physiology of nervous system: 04hrs
- Sensory Physiology: 05hrs.
- Motor Physiology: 08hrs.
- Higher brain Physiology: 08hrs.

Each subunit needs to be further specified topic wise duration of teaching. For example;

#### Introductory Physiology of nervous system:

▪General organization of nervous system 01  
▪Neuronal synapses - definition, types, structure, synaptic potentials, 01

#### Synaptic transmission

▪Properties of synaptic transmission 01  
▪Neurotransmitters: Noradrenaline, Acetylcholine, Dopamine, 01  
Serotonin, GABA, Glycine

#### Syllabus for Practicals

Students always express their preference towards the **'hands-on exercises'** based learning when compared with the computer based practicals. It is a very good idea to discuss a clinical case to understand and to link importance of acquiring practical skill. So it will be much better to include practical exercises from different units of physiology as far as possible for student's understanding. In addition to routine hematological and clinical examination, practical demonstrations on assessment of, nerve conduction function, autonomic functions, ECG, EEG, Evoked potentials, cognitive functions and audiometry etc can be included. Practical teaching should also include discussions of case scenario for a particular exercise.

#### c) Teaching Methods

Following teaching methods are to be included to teach physiology.

Didactic lectures should totally be stopped. Small group interactive teaching based protocols incorporating animations, diagrams and e-learning need to be made ready for teaching various systems in Physiology. Tutorials, seminars, quizzes, problem based questions solving can also be included

Practical classes in hematology and clinical laboratories with the aid of pro simulator 'hands on' based practices and visual aid should be emphasized.

#### d) Assessment

##### Formative

Periodicity-Monthly

Pattern- MCQs, FIB, SAQs, Reason based Q, Applied aspect based Q Figures drawing

##### Summative

Periodicity-End Semester Exams-02

Final Professional Exam

Pattern- MCQs, FIB, SAQs, Reason based Q, Applied aspect based Q

## 2. Resource development

### Faculty training

Physiology is not only tough for the students but also cumbersome to teach. To make subject understandable by the students, a teacher needs hard work, continuous reading, updating and analysis. Even though a teacher may have good knowledge but he or she should also know to deliver it to the students with sequential explanations to make it more intriguing for them. For developing learning for future applicability in students, certain topic based clinical scenario modules need to be formed for teaching particular on clinical setting to link physiology to medicine (e.g. for teaching physiology of memory, we can formulate a scenario as follows, that will be the basis of 'Case vignette interactive lectures'.

### Clinical case (Amnesia)

Anita was living with her mother aged 65 years in a flat in a society of 200 flats for about past 10 years. One day she noticed that her mother is returning quite late from evening walk with one of her neighbors who told her that her mother was sitting in the park in that society and shouted at her to call and told that she was unable to locate her flat.

Anita was stunned to know this, as since last 2-3 years she was already observing that her mother forgot the locations of the common household articles and the commonly used words while speaking and did not show much interest even in her favorite TV programs, although she was still quite good in telling her old stories to Anita's kids.

Learning Objectives (Physiology of Memory knowledge) relating to above clinical vignette

- Understand different aspects of memory i.e. its definition, types, stages, processing.
- Identify various brain regions concerned with memory formation and storage.
- Analyze the causes and patho-physiology of most important cause.

Questions for interactive discussion/self learning assessment

- 1) Explain the physiological basis of the symptoms of this old lady?
- 2) Why this old lady could recollect old memories?
- 3) What are neurodegenerative disorders?

Physiology teaching faculty members need to have frequent interactive group discussions. Brain storming on selective topics can aid in innovating teaching methods for students. Active participation in the institutional workshops organized by medical education cell also broadens the thought process for improvement. They can also access to medical education websites such as 'MedEd World' that allows active participation in webinars, special interest groups, and availability of current and archives journals.

The attitude of Faculty should undertake the roles of instructor and mentor rather than bosses to students.

### Residents' Training

Residents should also be trained as to become effective future teachers. A regular clinical exposure in context to teaching to undergraduate students should be a part of their PG training. They should be asked to present clinical cases periodically.

Smaller group interactive teaching should involve at least one fifth part of their training program.

## 3. Quality control of Medical Education Centre

In India, medical colleges run by private sector are nearly 4-5 decades old. Managing a medical college is an economically heavy, demanding and challenging task. Although government regulatory bodies keep a very strict control over the standard of newly opened government and private medical colleges, still ascertaining quality control of the students is difficult at these places.

Specific training programs are really required at different levels of these colleges to set definite norms to be regulated.

## CONCLUSION

Overall trend of response to questionnaire reflects, that clinical case setting based education even in first year should begin at least in some form. Although implementing in a proper manner is more challenging to get the consistency in quality. We are perhaps teaching Physiology to our students and we need to shift to 'basics of clinical teaching'.

We know that curriculum reformation is not an abrupt event as it continues to evolve with time depending on need of hour. There is definitely a need to bring world together for the restructuring to bring balance in expansion and requirement of information in medical field and that may begin from home.

**Conflict of interest:** None.

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