

## ORIGINAL ARTICLE

# Quantitative Analysis of Competency Levels in Medical Interns of a Tertiary Care Hospital in India – A Questionnaire Based Cross Sectional Study

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## Abstract

**Context:** The MCI has laid down a basic framework for interns, which it expects all prospective doctors to be well versed in. Asking students to demonstrate their understanding of the subject, ability to think critically, analyze, infer and act accordingly is imperative to the learning process.

**Aims:** To assess competency levels in medical interns post internship via a questionnaire developed based on MCI framework and departmental expectations of clinical capabilities.

**Settings and Design:** This descriptive cross-sectional study was done in a tertiary care hospital involving 74 interns nearing end of internship in the year 2017.

**Methods and Material:** A questionnaire consisting of core competencies such as professionalism, communication skills, learning competency, clinical problem solving amongst others was provided to each and competency levels were assessed against a pre-defined scale. Answers were graded as Poor, Average, Good and Excellent with corresponding numerical equivalents 0, 1, 2 and 3 respectively.

**Statistical analysis used:** The values obtained were analysed using Weighted Sum technique through Microsoft Excel tool.

**Results:** An ideal average competency score was initially established and overall competency of each intern was adjudged against the same. Out of 74 candidates that answered the questionnaire, a vast majority of 50 were found at below average competency. Cardio pulmonary resuscitation was known only to 13 students. Around 50 students were severely lacking with regards to knowledge about the use of preferred antibiotic in sepsis and seizures.

**Conclusions:** There seems to exist significant disconnect in the expectations of MCI on one hand and actual knowledge and skill acquisition of the doctors on other. A departmental wise curriculum and exams at the end of each departmental posting which is more skill based will enable a well-trained doctor with reasonable skills and knowledge to obtain his license to practice.

## Introduction

Approximately 6000 MBBS doctors pass out each year out of the MCI approved medical colleges in India.<sup>1</sup> MCI has laid down general guidelines for colleges to train their doctors.<sup>2</sup> Though all colleges follow these guidelines, there exists a deficit in the fundamental knowledge of students across the country, exposing their practical inadequacies. This study aims to assess competency levels of medical interns post internship. Objectives were to develop a questionnaire based

on MCI framework and departmental expectations of clinical capabilities and then use it to gauge the ability of the interns with respect to its knowledge-based application, required for a clinical establishment. Thus, quantitatively estimating competency levels against a pre-defined scale.

## Subjects and Methods

### Ethical approval

Approval from the Institutional Ethics Committee was obtained prior to commencement of this study.

### Subjects

95 interns who completed their internship in February 2017 (regular batch) and those in August 2017 (casual batch) were chosen as candidates for this study, excluding one intern who completed four years of MBBS outside India. Out of the 95 subjects, 75 consented and answered the questionnaire. One incomplete questionnaire was discarded amongst the submitted answers. Thus, 74 anonymous complete questionnaires were considered for evaluation. Interns were chosen as sample population as they not only reflect the entire undergraduate training program but also represent the future practicing doctors, considering not all may pursue further education in different specialties.

### Questionnaire

A questionnaire consisting of 45 questions was developed as per the following framework<sup>3,4</sup> depicted in Figure 1.

### Grading of the questions

- Q1- Q15 (Except Q14): Graded as per self-evaluated ratings of each individual subject
- Q14: Grading of Q14 is as shown in table 2 below.
- Q16 to Q45: These questions have multiple choice options. Each question could have multiple right choices. The highest attainable

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score per question is 3. These were graded as follows:

- o Each correct choice equaled 3 divided by the number of correct options. The total value for each question was then sum of all the correct choices marked by the subject.
- o Each incorrect choice equaled deduction amounting to 1/3<sup>rd</sup> of the corresponding value of the chosen option.
- o A positive final score was rounded off to the nearest grade, while a negative final score was considered as zero to match the grading system of 0 to 3.

**Statistical analysis**

Specific competencies in each of the categories tested and a few highly weighted questions were assessed and evaluated. The final competency score for each individual was determined via a Weighted Sum Technique,<sup>5,6</sup>

amalgamating all the questions. An Analytical Hierarchy Process matrix was developed to assess the weight of each question and the specific category of questions relative to other questions and categories. This was undertaken by two senior doctors, experts in the field of Medicine and Pharmacology respectively. A baseline AHP matrix was thus developed based on the experience and knowledge of the faculty. An iterative approach using eigen vectors was adopted to derive consistent weight values.

Weights for each question obtained through the AHP matrix were entered in the Pugh matrix and the grades obtained by each intern were noted against them. A sum-product of the grades and the weights resulted in each subject’s overall competency score. Similarly, category wise competency was calculated considering only those questions specific to each category. The AHP and Pugh matrices were developed in Microsoft Excel.

**Results**

**Overall competence**

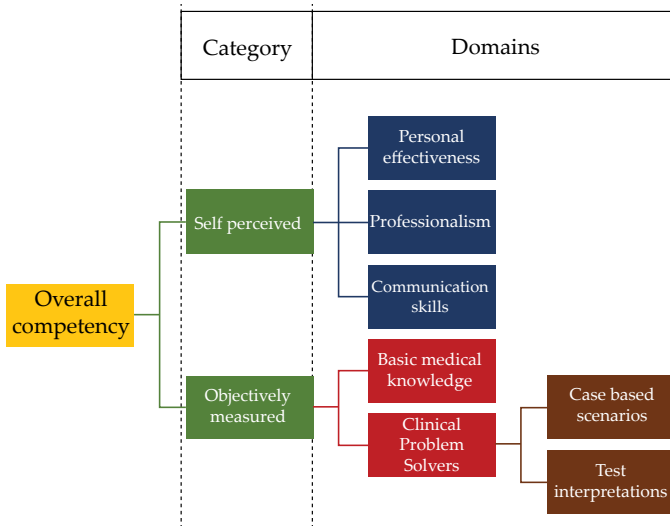
An ideal average score of 153.41 was calculated that separated the average competent interns from the below average ones. This was done by assigning a score of 1 to those questions that weighed less than 2.5% and a score of 2 for those that weighed 2.5% and above. The results are as shown below in Figure 2.

**Category wise competency**

All 74 interns seemed confident about possessing the requisite general skills including history taking to application of undergraduate content for a holistic treatment approach. They also claimed to possess important interpersonal qualities such as professionalism, personal effectiveness and communication skills. However, only 13 interns performed average to above average when objectively measured.

**Specific competencies**

Assessment of those questions that weighed more than 2.5% was conducted



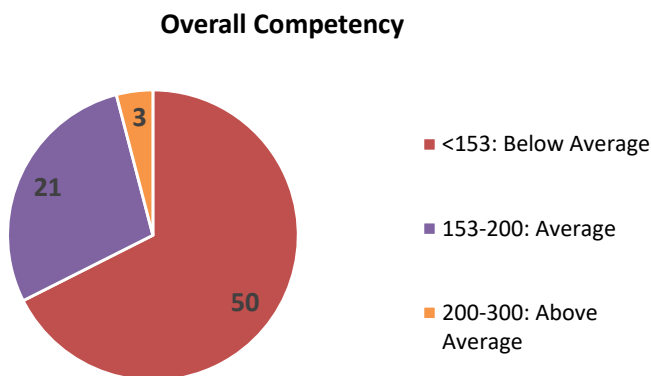
**Fig.1: Categories of questions**

**Table 1: Question categories and corresponding grading system**

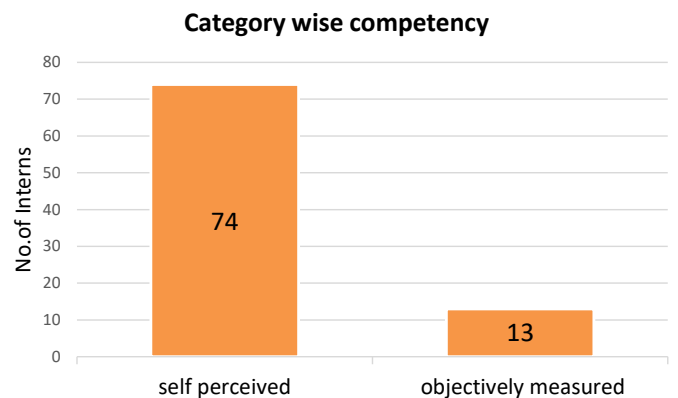
Type of Competency	Question numbers	Grading System
Self-perceived competency	Q1 to Q15, except Q14	Poor: 0
		Average: 1
		Good: 2
Excellent: 3		
Objectively assessed	Q16 to Q45	0 to 3

**Table 2: Grading system specific to Q14**

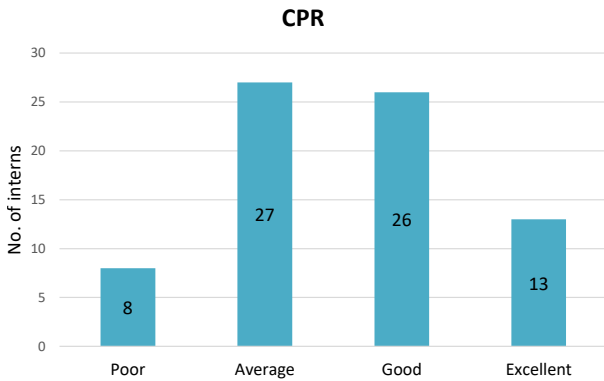
Number of conferences attended	Grade
0	0
1, 2	1
3, 4	2
5 and above	3



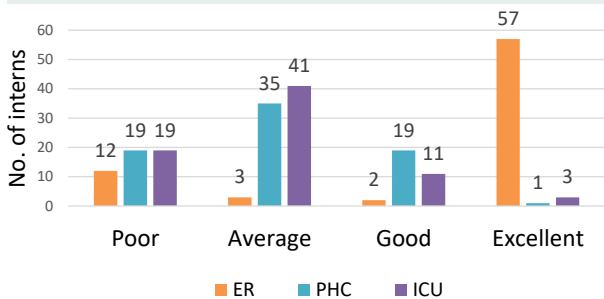
**Fig. 2: Overall competence of subjects**



**Fig. 3: Category wise competency of subjects**



**Fig. 4: Results of Cardio Pulmonary Resuscitation technique**



**Fig. 5: Competence of subjects in different health settings. ER: Emergency Room; PHC: Primary Health Centre; ICU: Intensive Care Unit**

with a view to highlight necessary frontages and are elaborated below in descending order.

**CPR**

The technique of Cardio Pulmonary Resuscitation (CPR) was known perfectly to only 13 out of the 74 as shown below.

**Situational management**

Figure 5 shows the competency of interns in different health settings. Here a case of poisoning that reported to Emergency Room (ER) was diagnosed appropriately as caused due to organophosphorus compound by 57 subjects (Q31). Subjects were assessed with respect to the management of Myocardial Infarction (MI) at a Peripheral Health Centre (PHC) and Intensive Care Unit (ICU) of a tertiary hospital. Only 1 subject was capable of timely referral from PHC to a tertiary care after rendering first level of treatment (Q44). 14 subjects did select the appropriate treatment plan for MI in ICU (Q45).

**Basic knowledge**

It is imperative to have adequate knowledge of common as well as essential drugs. However, barring paracetamol (Q34, Q42) and treatment of Bronchial Asthma (Q39) in which

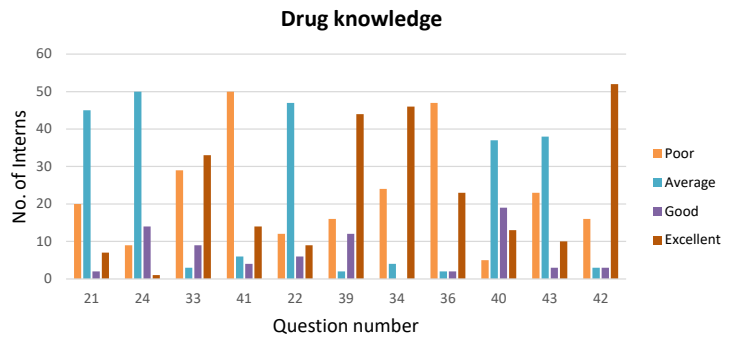
majority performed exceptionally well, knowledge of most subjects seemed poor to average regarding drugs for common chronic disorders like diabetes (Q21, Q24), hypertension (Q33, Q41, Q22) and drugs requiring gradual withdrawal (Q40) amongst others. This is depicted in figure 6.

**Selection of antibiotics**

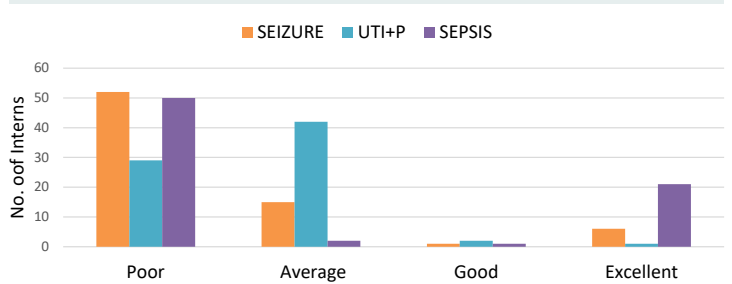
Subjects were also tested on their knowledge of choice of antibiotics preferred in sepsis (Q38), urinary tract infection in pregnant mothers (UTI+P) (Q35) and antimicrobials to be avoided in seizures (Q20). It was observed that only a minority performed above average in all 3 cases.

**Problem Based Learning (PBL)**

- Case based scenarios: Subjects were tested not just with direct questions but also scenarios where they would have to make a diagnosis and/or give adequate treatment. A casualty scenario was presented where a patient indicated severe spasm of the neck. This was to be diagnosed and treated (Q37). 49 subjects performed poorly at this, while 22 did excellent. Questions 16 and 17 were cases diagnostic of meningitis and fever with rash and majority performed in the average range.



**Fig. 6: Variation in knowledge of common drugs**



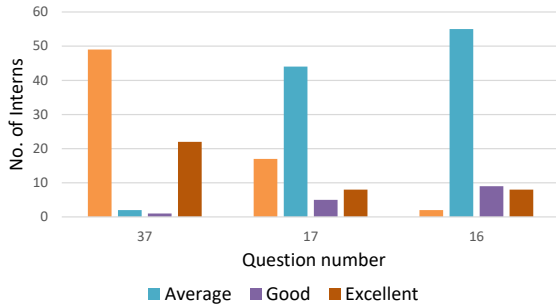
**Fig. 7: Antibiotic preference in clinical settings. UTI+P: urinary tract infection in pregnancy**

- Interpretation of tests: Although most subjects rated their clinical skills based on history, physical examination and relevant investigations to be assessed as above average to excellent, it was not translated in this section of the questionnaire. Correct interpretation of tests such as Complete hemogram, electrocardiogram and liver function tests (LFT) seemed to range mostly between poor to average as shown in figure 9.

**Discussion**

Internship is an essential rite of passage in an environment that facilitates active learning and reinforces the theoretical knowledge obtained in classrooms and books by executing it in actual bedside situations. This aids in re-encoding the afore mentioned information to last a long time, thereby preparing a medical graduate to assess, control and treat patients independently. It was thus decided upon to evaluate the competency of interns.

These 45 questions when evaluated, revealed that though every intern felt efficacious in performing the duties of a doctor at personal and professional

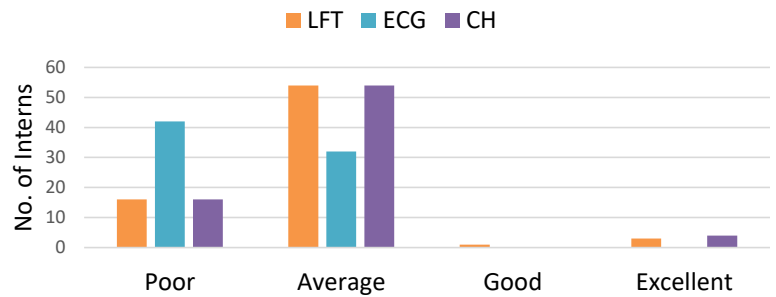


**Fig. 8: Results of case-based scenario**

level, the same did not hold true when knowledge and clinical problem solvers were measured. Studies done in few countries of Africa<sup>7</sup> and USA<sup>8</sup> showed a drop, although minor, in objectively measured versus self-perceived competency. The reason claiming to be either lack of exposure to clinical practice or the apprehension of committing a mistake. In contrast, the institution where the study was performed revealed a much larger drop. Accordingly, implementation of serious measures to bridge this gap considerably is the need of the hour.

Specifically, common consensus is that CPR is an indispensable technique to all doctors. This is re-established in this study owing to the high weight values associated with the CPR question. Therefore, knowing its fundamentals is crucial and allows the right execution. In Delhi and this study, less than a quarter of the subjects tested as part of the study sample knew CPR techniques, which is quite alarming.<sup>9</sup> Kumar et al<sup>10</sup> found medical graduates themselves lack this knowledge; hence to rectify it, proposed the curriculum to incorporate frequent training sessions. This was reiterated by Zaheer and Haque.<sup>11</sup>

Similarly, another case study-based question about Organophosphorus is important. This compound is an easily available, highly efficacious and equally cheap insecticide available in India. Acute poisoning cases have been reported quite frequently in hospitals of India. For suicidal purposes alone in 2007, a rate of 19.7%<sup>12</sup> was noted in National Crime Bureau of India reports with mortality rates reaching limits of 70%<sup>13,14</sup> as well. However early diagnosis and effective management improves survival outcomes.<sup>15</sup> It was for this reason that the interns' ability to detect such a case was tested upon. The results were a pleasing 77%.



**Fig. 9: Interpretation of tests**

The next two scenarios were to test treatment of AWMI (Anterior wall Myocardial Infarction) in two different settings. One in ICU of a tertiary care hospital where the best modalities are available and the other in a peripheral health centre where one must provide best care possible within limited resources, whilst deciding upon timely referral in case of intervention. Given that only less than 20 subjects performed above average in each setting, this raised concerns as prompt treatment can improve prognosis of the most serious MI of them all.

From what appears to be a poor performance by the subjects in almost all PBL questions, modification of the existing internship and general undergraduate curriculum seems necessary for a more practice-oriented learning approach. A study conducted amidst first year foundation students from three different types of medical schools (traditional, reformed and PBL), showed that PBL model along with Objective Structured Clinical Examination (OSCE) for evaluation, enhanced their practical as well as learning skills, imbibed professionalism and personal effectiveness in them and also allowed scope for improvement, as those areas needing focus emerged clearly.<sup>16-18</sup>

In order to be able to act effectively, knowledge is essential, but in its entirety. Misdiagnosis or incorrectly prescribed medicines, especially with regards to antibiotic usage can not only result in no alleviation of condition but instead worsen the ever-growing resistance. Even in the field of common chronic disorders like diabetes and hypertension, the questionnaire results were less than satisfactory. This throws light on the need to master basic prerequisites for common disorders before diving into the complex medical conditions of the human anatomy.

### Strength

It is the first study ever to be conducted that objectively assessed competency amongst medical interns in this state. Secondly, the use of AHP matrix had a two-fold benefit. In this study, it helped rank each question as per importance by assigning definite quantitative values to various intangible attributes such as professionalism and interpersonal skills. It also helped affinitize the qualitative questions with the relatively objective type questions. Lastly, being the major teaching hospital in the state, any intervention brought about here affects all its medical graduates directly.

### Limitation

Intellectual background and difficulty level of questions were not accounted for while determining overall competency. Lastly, error states or margins due to the above-mentioned factors were not accounted for.

### Conclusion and future work

Having understood that the knowledge and skills acquired by the individuals during internship are far from the expectations of MCI and the institution, conducting skill-based exams like supervising during patient history taking and examination seems like a logical step. Further, even OSCE along with oral exams or written multiple choice questions which are a mix of factual as well clinical scenarios like in the questionnaire itself, on pertinent topics at the end of each departmental posting will ensure a standard and acceptable level of expertise in each intern. Also, inculcating this along with a professional and personal values code as part of the medical undergraduate curriculum will help concrete the learned practice, behavior and knowledge.<sup>19</sup> The programme needs to be structured meticulously and modified as per the ever-evolving needs

of the population and the perceptions of the medical fraternity as internship is a crucial process in producing complete, competent and confident future doctors.

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