

Predictive validity of basic science examination score for predicting pre-internship examination score

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ABSTRACT

Background It is known that basic science and general courses play a vital role in training of medical students. The medical students' comprehensive basic science examination (CBSE) scores seem to be a potential tool for predicting their comprehensive pre-internship examination (CPIE) scores.

Purpose To evaluate the predictive validity of medical students' CBSE scores for predicting their CPIE scores.

Methods We conducted a cross-sectional study on 103 medical students of Rafsanjan University of Medical Sciences registered for the first time as medical student in 1988, 1992 and 1996. We used a regression analysis to study the predictive validity of these students' CBSE mean scores for predicting their CPIE mean scores.

Results Fifty-two students were male and 51 students were female. CBSE mean scores were 121.22 ± 15.8 for all of the students, 119.70 ± 14.82 for the female students and 122.71 ± 16.71 for the male students. The Pearson correlation coefficient between CBSE and CPIE mean scores was 0.598. Simple linear regression showed that CBSE mean score had 0.358 predictability for CPIE mean score; however, the results showed that correlation coefficient and predictive validity progressively decreased during the period between 1988 and 1996.

Conclusion Our results reflected the usefulness of CBSE mean score for predicting CPIE mean score. This should be confirmed in studies in other medical universities.

Keywords PREDICTIVE VALIDITY, COMPREHENSIVE BASIC SCIENCE EXAM, COMPREHENSIVE PREINTERNSHIP EXAM

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Introduction

In Iran, Medical education curriculum consists of four phases:

- 1) Basic sciences and general courses (the first five semesters)
- 2) Semiology and pathophysiology
- 3) Clerkship in clinical courses
- 4) Internship in clinical courses plus completing a dissertation

It is known that basic sciences and general courses play a vital role in training of medical students. The comprehensive basic sciences examination (CBSE) scores of the medical students seem to be a potential tool for predicting their comprehensive pre-internship examination (CPIE) scores.

Bella showed that there is no significant correlation between students' knowledge about anatomy and their skills in diagnosis of neurological diseases (1). Although medical students spend two and half years to study basic sciences and general courses, students of programs leading to an MD degree show little interest in further courses of basic sciences. A pervious research demonstrated that only 1.5% of medical students preferred further basic science courses (2).

Medical students have to pass two undergraduate comprehensive examinations:

- 1) comprehensive basic science examination
- 2) comprehensive pre-internship examination

This study has focused on evaluation of predictive validity of medical students' CBSE

scores for predicting their CPIE scores and measurement of correlations between these two scores.

Materials and Methods

This cross sectional study included 103 medical students (52 male, 51 female) of Rafsanjan University of Medical Sciences who enrolled as a medical student in 1988, 1992 and 1996. These students were selected from those who passed CBSE and CPIE successfully on their first attempts. The nominal data examined was gender, the year students began their study, comprehensive basic science examination score and comprehensive pre-internship examination score. These data were compiled in a database, and analysis was performed using SPSS statistical software.

Pearson correlation coefficient was calculated for examining correlation between CBSE score and CPIE score and if this had revealed any significant correlation between these two scores, simple linear regression analysis would have been performed to indicate the predictive validity of CBSE score for predicting CPIE score. Independent variable was CBSE score (X) and dependant variable was CPIE score (Y). We calculated slope (B1) and intercept (B0) for all 103 students as a whole and by their year of enrollment (1988, 1992, 1996) separately. CPIE

score as dependant variable can be predicted by using $[Y = B0 + B1X]$ equation.

Statistical significance was defined as $P < 0.05$ and all P values were two-tailed. All correlations (r) and regression coefficients (r^2) were statistically significant at $P < 0.05$. Mean values were calculated as $[\text{Mean} \pm \text{SD}]$.

Results

CBSE mean scores were 121.22 ± 15.8 for all of the students, 119.70 ± 14.82 for the female students and 122.71 ± 16.71 for the male students as shown in Table 1. CPIE mean scores were 118.47 ± 15.13 for all of the students, 118.21 ± 16.81 for the female students and 118.73 ± 13.45 for the male students (Table 2). These results demonstrated that there was no significant difference in CBSE mean scores between female and male students and also no significant difference in CPIE mean scores between the two genders.

Although the male students' CBSE mean score was significantly greater than the female students' CBSE mean score ($P = 0.0026$) in the group of students entered in 1988, there was no significant difference in CPIE mean scores between the two genders. In the group of students entered in 1992, the female students' CBSE mean score and CPIE mean score were significantly greater than the male students' CBSE mean score and CPIE mean score. ($P = 0.001$, $P = 0.004$).

TABLE 1 CBSE MEAN SCORES OF THE STUDENTS

| First year of entrance | Male | Female | Total (Male & Female) | P value |
|------------------------|--------------------|--------------------|-----------------------|---------|
| 1988 (n=50) | 126.13 \pm 17.11 | 115.57 \pm 16.54 | 121.70 \pm 16.87 | 0.026 |
| 1992 (n=27) | 112.66 \pm 15.23 | 133.25 \pm 13.40 | 121.81 \pm 17.60 | 0.001 |
| 1996 (n=26) | 129.12 \pm 9.43 | 115.50 \pm 0.50 | 119.69 \pm 11.87 | 0.004 |
| Total (n=103) | 122.71 \pm 16.71 | 119.70 \pm 14.82 | 121.22 \pm 15.80 | 0.337 |

TABLE 2 CPIE MEAN SCORE OF THE STUDENTS

| First year of Entrance | Male | Female | Total (Male & Female) | P value |
|------------------------|--------------------|--------------------|-----------------------|---------|
| 1988 (n=50) | 123.93 \pm 11.24 | 118.03 \pm 11.48 | 121.48 \pm 11.60 | 0.078 |
| 1992 (n=27) | 110.80 \pm 13.55 | 131.33 \pm 20.23 | 119.92 \pm 19.49 | 0.004 |
| 1996 (n=26) | 114.75 \pm 13.45 | 109.61 \pm 14.53 | 111.19 \pm 14.14 | 0.403 |
| Total (n=103) | 118.73 \pm 13.45 | 118.21 \pm 16.81 | 118.47 \pm 15.12 | 0.862 |

TABLE 3 CORRELATION COEFFICIENTS AND PREDICTIVE VALIDITIES IN THE STUDENTS WHO ENTERED IN EACH YEAR

| Entrance year | Correlation coefficient | Predictive validity | P value |
|---------------|-------------------------|---------------------|---------|
| 1988 | 0.694 | 0.481 | 0.000 |
| 1992 | 0.685 | 0.469 | 0.000 |
| 1996 | 0.352 | 0.124 | 0.039 |

In those entered in 1996, although the male students' CBSE mean score was significantly greater than the female students' CBSE mean score ($P=0.0004$), there was no significant difference in CPIE mean score between male and female students.

The Pearson correlation coefficient between CBSE and CPIE mean scores was 0.598. Simple linear regression showed that CBSE mean score had 0.358 predictability for CPIE mean score. It means that 35.8 % of variance of CPIE mean score can be predicted by using CBSE mean score. Intercept (B0) for CPIE score (dependant variable) was 49 (30.48-67.52) and regression coefficient (B1) was 0.598 (0.422-0.755). CPIE mean score can be predicted by using the following equation:

CPIE mean score = $49 + (0.598 \times \text{CBSE mean score})$

The Pearson correlation coefficient between CBSE mean score and CPIE mean score was 0.513 for male students and 0.696 for female students. CBSE mean score had 0.263 predictability for CPIE mean score in male students and 0.485 predictability for CPIE mean score in female students.

Regression coefficient between CBSE mean score and CPIE mean score was 0.513 (0.217-0.609) in male students and 0.696 (0.0556-1.023) in female students. Intercept (B0) for CPIE score (dependant variable) was 68.08 (43.75-92.37) in male students and 23.73 (4.49-51.9) in female students. Consequently, the following equations can be used for predicting CPIE score for each gender:

male students:

$$\text{CPIE score} = 68.06 + (0.513 \times \text{CBSE score})$$

female students:

$$\text{CPIE score} = 23.73 + (0.696 \times \text{CBSE score})$$

Some limitations in the use of these types of equations should be noted since they were not intended to be used to predict CPIE score for only one student. These types of equations will produce

valid results if they are used for a large number of subjects.

The students who have begun basic medical education in different years were compared. Correlation coefficient and predictive validity were 0.694 and 0.481 for those entered in 1988; 0.685 and 0.469 for those entered in 1992; 0.352 and 0.124 for those entered in 1996. These results showed that correlation coefficient and predictive validity progressively decreased during the period between 1988 and 1996 as can be seen more clearly in Table 3.

Discussion

The results of this study demonstrated that there is no significant difference in CBSE mean score and CPIE mean score between the two genders. These results confirmed previous findings that there is no significant difference in these scores between male and female medical students (3).

Correlation coefficient between CBSE and CPIE was 0.598; while regression analysis of the predictive validity of the CBSE mean score indicated that CBSE mean score had 0.358 predictability for CPIE mean score.

Correlation coefficient between these two scores has been 0.65 and predictive validity of CBSE score for predicting CPIE score has been 0.42 in a study that had been performed in Guilan Medical University (3).

Glew showed that the CBSE score had 0.85 predictability for the USMLE score (4).

In current study, correlation coefficient between CBSE mean score and CPIE mean score was higher females than males.

The students, who have entered in 1988, 1992 and 1996, were studied separately and correlation coefficient and predictive validity progressively decreased during the period.

In conclusion, predictive validity results reflected the usefulness of CBSE mean score for predicting CPIE mean score. The authors would appreciate feedback from other medical schools concerning the local relevancy of the correlations and predictive validity studied in this survey.

References

1. Bella JI. The application of basic science concepts to clinical problem solving. *Med Educ* 1999;24(2):137-47.
2. Oye Bola DD. Preclinical medical students for medical specialist and the basic medical science. *Afr J Med Sci* 1998;27(3-4):209-12.
3. Behmoud F. Predictive validity of the comprehensive basic examination mean score for the assessment of medical students performance. *J Med Educ* 2002;1(30):137-9.
4. Glew RH. Relationship between students performance on the NBME comprehensive basic science examination and USMLE step 1. *Acad Med* 1997;72(12):1097-102.