Correlation of National Medical Admission Test Scores, General Weighted Average Grade in Pre-Medicine Courses, General Weighted Average Grade in Medicine and the Physician Licensure Examination Scores among Medical Graduates of the University of the Philippines Manila College of Medicine

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ABSTRACT

Objectives. This study was conducted to examine the validity of the National Medical Admissions Test (NMAT) score, Pre-Medicine general weighted average grade (Pre-Med GWAG) in predicting the academic performance in medical school, as measured by the medical school general weighted average grade (Med GWAG) and Physician Licensure Examination (PLE). It also aimed to study which among the NMAT, pre-medicine GWAG and MedGWAG best correlates with PLE.

Methods. Records of graduates of the UPCM from 2004 to 2009 were retrieved and data regarding the following entry characteristics were collected: National Medical Admissions Test (NMAT) scores, pre-Medicine general weighted average grade (Pre-Med GWAG), medical school general weighted average grade (MedGWAG). Average and individual subject scores in the PLE were retrieved for this study. Statistical analysis using the Pearson correlation analysis was performed using STATA.

Results. The NMAT, MedGWAG and PLE scores of the direct and lateral entrants were not significantly different from each other. There was weak correlation between NMAT and Pre-Med GWAG and weak to moderate correlation between NMAT and Med GWAG. Except for the 2009 graduates where no correlation between NMAT and PLE scores was observed, weak to moderate correlation between NMAT and PLE scores was noted for 2004-2008 graduates. There was moderate to strong correlation between Pre-Med GWAG and Med GWAG and weak correlation between Pre-Med GWAG and PLE scores. There was strong correlation between Med GWAG and PLE scores.

Conclusions. Pre- Med GWAG had higher correlations to Med GWAG than NMAT scores. In terms of PLE scores, the Medicine GWAG showed the highest correlation followed by Pre-Med GWAG, then NMAT scores.

Key Words: medical admissions test, comprehensive examinations, physician's licensure examination

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Introduction

Student selection in a medical school which accepts a large number of applicants in relation to the available slots seems to be easy, accept the best applicants. In reality, any mode of assessment for student selection is implicitly predicting future behavior of an applicant, that is, the selected applicants will be "good students" and "good doctors".

The University of the Philippines Manila College of Medicine (UPCM) has 2 modes of entry to its 7 year Integrated Arts and Medicine Program (Intarmed). First is by direct entry to its Learning Unit 1, where 40 students are accepted from the top 50 male and top 50 female scorers in the University of the Philippines College Admission Test (UPCAT). The second is by lateral entry of 120 graduates of a baccalaureate program to its Learning Unit 3.

The National Medical Admission Test (NMAT) is a medical admissions test given twice a year by the Center for Educational Measurement and is taken by students or graduates who intend to apply to a medical school. Schools are given the prerogative to set particular NMAT scores that will be needed to satisfy eligibility for admission to their institution.[1] Only applicants with NMAT scores of 90 percentile or higher are considered for lateral entry admission to the UPCM. The requirement of NMAT scores of 90 percentile or higher, however, does not apply to direct entrants. While they are required to take the examination, performance in the said exam does not affect chances for acceptance to LU 3. Enrollment (or promotion) to Learning Unit 3 (first year medicine proper) is assured provided students satisfactorily completes all required courses for Learning Units 1 and 2.

A major criterion employed by the UPCM in the selection of lateral entrants is past academic performance, mainly their general weighted average grade (Pre-Med GWAG) in their undergraduate program. An interview is also used to evaluate an applicant's attitude, motivation, study habits, leadership, high work standards and communication skills, among others. The comparable data to the baccalaureate or pre-Med GWAG of the lateral entrants

is the GWAG of the direct entrants in the first 2 years of the 7 year program.

Medical graduates are required to take and pass the Physician Licensure Examinations (PLE) given by the Board of Medicine of the Professional Regulation Commission (PRC) after a one-year internship training to be able to practice medicine as a profession in the Philippines.[2] The performance of the graduates of a medical school (passing rate) is often used as a yardstick of the quality of education provided by the school.

This study was undertaken to determine if NMAT scores correlate to general weighted average grade in the preparatory Medicine course (Pre-Med GWAG), medical school general weighted average grade (Med GWAG) and the PLE scores. This study also aimed to determine if the Med GWAG correlates to Pre-Med GWAG and PLE scores.

Methods

Records of graduates of the UPCM from 2004 to 2009 were retrieved and data regarding the following entry characteristics were collected: National Medical Admissions Test (NMAT) scores, pre-Medicine general weighted average grade (Pre-Med GWAG), medical school general weighted average grade (MedGWAG). Average and individual subject scores in the PLE were also retrieved for this study. Included for analyses were data obtained from students who graduated on time and took the PLE immediately after graduation. Statistical analysis using the Pearson correlation analysis was performed using STATA.

Results

Tables 1 and 2 list the number of students admitted, the number of students who graduated on time and who immediately took the PLE. The NMAT scores of the graduates from 2004 to 2009 are summarized in Table 3. The mean NMAT scores ranged from 94-96.67. The average score for the 6 classes was 95.53. Mean NMAT scores of the direct entrant group (95.69) and the lateral entrant group (95.61) did not differ significantly from each other (p=0.8380).

Table 1. Number of students by type of admission

Class (Year of graduation)	Direct entry		Lateral entry		Total
	Number	Percent	Number	Percent	
2004	28	17.72	130	82.28	158
2005	39	25.49	114	74.51	153
2006	37	23.13	123	76.88	160
2007	34	21.12	127	78.88	161
2008	37	24.18	116	75.82	153
2009	42	25.77	121	74.23	163

Table 4 shows the Pre-Med GWAG of the direct and lateral entrants. No comparison between the two groups was made because the basis of the Pre-Med GWAG was different; grades in LU 1 and LU 2 for the direct entrants and the grades for the baccalaureate course (4 years) for the lateral entrants.

Table 2. Number of students who graduated on time and took PLE immediately after graduation

Year Graduated	Direct	Lateral	Total
2004	21	109	130
2005	34	104	138
2006	29	96	125
2007	26	111	137
2008	28	110	138
2009	38	114	152
Total	176	644	820

Table 3. NMAT scores

Year Graduated	Direct entrant		Lateral entrant	
	n	NMAT Mean	n	NMAT Mean
2004	21	95.90	109	94.03
2005	34	96.47	104	95.99
2006	29	96.21	96	96.67
2007	26	94.19	111	95.12
2008	28	95.71	110	96.64
2009	38	95.95	114	96.40
Total	176	95.79	644	95.79

p=0.8380

Table 4. Pre-Med GWAG

Year Graduated	Direct entrant		Lateral entrant	
	n	Pre-Med GWAG (LU1-2)	n	Pre-Med GWAG
2004	21	1.63	109	1.72
2005	34	1.64	104	1.70
2006	29	1.62	96	1.65
2007	26	1.86	111	1.74
2008	28	1.70	110	1.66
2009	38	1.70	114	1.64
Total	176	1.69	644	1.69

Table 5 shows the average Med GWAG were 2.10 and 2.09 for the direct and lateral entrants, respectively**.** There is no statistical difference in the Med GWAG between the 2 groups (p= 0.1732).

Table 5. Medical school general weighted average grade (Med GWAG)

Year Graduated	Direct entrant		Lateral entrant	
	n	Med GWAG	n	Med GWAG
2004	21	2.17	109	2.13
2005	34	2.17	104	2.12
2006	29	2.12	96	2.10
2007	26	2.09	111	2.11
2008	28	2.10	110	2.09
2009	38	2.00	114	2.01
Total	176	2.10	644	2.09

Table 6 shows the average PLE scores of the graduates. There was no statistical difference between the mean PLE score of the direct entrants (80.67) and the lateral entrants (80.24)   p=0.1732.

Table 6. Professional Regulation Commission Board of Medicine Physicians Licensure Examination (PLE) mean scores

Year Graduated	Direct entrant		Lateral entrant	
	n	PRC PLE	n	PRC PLE
2004	21	78.88	109	78.58
2005	34	79.40	104	79.06
2006	29	79.59	96	79.26
2007	26	81.08	111	80.70
2008	28	81.70	110	81.52
2009	38	82.59	114	82.07
Total	176	80.67	644	80.24

The grading system of the university is that the highest grade is 1.0 and the lowest passing grade is 3.0, conditional failure is 4.0 and failure is 5.0. The correlation coefficient between the NMAT and the Pre-Med GWAG is negative because the lower the GWAG, the higher the grade. There was a significant weak linear correlation between NMAT score and Pre-Med GWAG in classes 2006-2009. The correlation in class 2004 and 2005 was not significant.

There was moderate correlation between NMAT and Pre-Med GWAG among direct and lateral entrants in 2006, direct entrants in 2005 and lateral entrants in 2004 (Table 7).

Table 7. Correlation between NMAT Score and Pre-Med GWAG

Year Graduated	Direct entrant			Lateral entrant		
	n	correlation coefficient	p value	n	correlation coefficient	p value
2004	21	-0.3940	0.0772	109	**-0.4288**	< 0.0001
2005	34	**-0.5804**	0.0003	104	**-0.3137**	0.0012
2006	29	**-0.6356**	0.0002	96	**-0.4191**	< 0.0001
2007	26	-0.3686	0.0639	111	**-0.3767**	< 0.0001
2008	28	-0.3314	0.0849	110	-0.1673	0.0806
2009	38	-0.1651	0.3220	114	-0.2883	0.0019

Table 8 presents the correlation between NMAT scores and Medicine GWAG. Significance was noted for the 2006 and 2009 graduates of the direct entrant group and 2004, 2005, 2006 and 2009 for the lateral entrant group.

Table 8. Correlation of NMAT Score and Medicine GWAG

Year Graduated	Direct entrant			Lateral entrant		
	N	Correlation coefficient	p Value	N	Correlation coefficient	p Value
2004	21	-0.1916	0.4053	109	**-0.4288**	< 0.0001
2005	34	-0.3933	0.0812	104	**-0.3737**	0.0012
2006	29	**-0.5490**	0.0020	96	**-0.4191**	< 0.0001
2007	26	-0.1918	0.3480	111	-0.1918	0.3480
2008	28	-0.2815	0.1467	110	-0.2815	0.1467
2009	38	**-0.4885**	0.0019	114	**-0.4885**	0.0019

Correlation of the Pre-Med and Medicine GWAGs revealed a significant positive correlation in all classes for both direct and lateral entrants (Table 9). Note that this correlation was stronger for the direct entrants with correlation coefficients ranging from 0.7438 (2005) to 0.8365 (2008).

Table 9. Correlation between Pre-Med GWAG and Medicine GWAG

Year Graduated	Direct entrant			Lateral entrant		
	N	Correlation coefficient	p Value	N	Correlation coefficient	p Value
2004	21	**0.7512**	0.0001	109	**0.6406**	< 0.0001
2005	34	**0.7438**	0.0000	104	**0.4846**	< 0.0001
2006	29	**0.7974**	0.0000	96	**0.5219**	< 0.0001
2007	26	**0.7262**	0.0000	111	**0.3867**	< 0.0001
2008	28	**0.8364**	0.0000	110	**0.4362**	< 0.0001
2009	38	-0.0349	0.8353	114	**0.5212**	< 0.0001

The NMAT and PLE scores had moderately strong correlation among lateral entrants of 2004 and 2006 and direct entrants of 2005. There was a strong correlation among direct entrants of 2006. (Table 10)

Table 10. Correlation of NMAT and PLE Scores

Year Graduated	Direct entrant			Lateral entrant		
	N	Correlation coefficient	p Value	N	Correlation coefficient	p Value
2004	21	0.0167	0.9428	109	**0.4501**	< 0.0001
2005	34	**0.5151**	0.0018	104	**0.3628**	0.0002
2006	29	**0.6494**	0.0001	96	**0.4618**	< 0.0001
2007	26	0.0778	0.7055	111	**0.3467**	0.0002
2008	28	0.1826	0.3525	110	0.1154	0.2300
2009	38	0.1845	0.2675	114	0.1963	0.0363

Table 11 shows very strong correlation between Pre-Med GWAG and PLE scores among direct entrants in 2005, and strong correlation in 2004, 2006 and 2008. Among lateral entrants, moderately strong correlation between Pre-Med GWAG and PLE scores in 2004, 2006 and 2009 was noted.

Table 11. Correlation between Pre-Med GWAG and PLE scores

Year Graduated	Direct entrant			Lateral entrant		
	N	Correlation coefficient	p Value	N	Correlation coefficient	p Value
2004	21	**-0.6737**	0.0008	109	**-0.4911**	< 0.0001
2005	34	**-0.8333**	0.0000	104	-0.2878	0.0030
2006	29	**-0.7414**	0.0000	96	**-0.4655**	< 0.0001
2007	26	-0.3301	0.0995	111	**-0.3232**	0.0005
2008	28	**-0.7593**	0.0000	110	-0.2542	0.0074
2009	38	-0.3809	0.0182	114	**-0.4712**	< 0.0001

There is significant strong to very strong correlation between the Medicine GWAG and the PLE scores in all classes except for direct entrants in 2007 where the correlation is moderately strong. (Table 12)

Table 12. Correlation of Med GWAG and PLE scores

Year Graduated	Direct entrant			Lateral entrant		
	N	Correlation coefficient	p Value	N	Correlation coefficient	p Value
2004	21	-0.7229	0.0002	109	-0.7472	< 0.0001
2005	34	-0.7747	0.0000	104	-0.7797	< 0.0001
2006	29	-0.8182	0.0000	96	-0.8569	< 0.0001
2007	26	-0.4737	0.0145	111	-0.7523	< 0.0001
2008	28	-0.8222	0.0000	110	-0.7757	< 0.0001
2009	38	-0.7229	0.0000	114	-0.8174	< 0.0001

Discussion

Previous studies had been conducted to determine if admissions criteria utilized by the UPCM had any correlation to performance in medical school. A study by Catbagan on lateral entrant graduates of UPCM in 1986-1994, reported that Pre-Med GWAG and NMAT scores correlated well with the average grades in the basic science subjects in medical school.[3] Gonzales and Salonga also conducted a study to validate admissions criteria of UPCM where delay in graduation was utilized as the outcome measure.[4] This study reported that among the lateral entrants who graduated in 1994-1995, delay in graduation correlated with NMAT scores < 85 percentile.

The current study also aims to determine if two of the criteria for admission to UP College of Medicine, namely the NMAT score and Pre-Med GWAG could be predictive of performance in medical school. The Pre-Med GWAG represents a student's academic performance for 4 years of study for the lateral entrants and 2 years for the direct entrants while the NMAT is a reflective of academic performance for a single examination. The current study showed that the NMAT score and the pre-Med GWAG had weak correlation to each other. In terms of the ability for these 2 criteria to predict good academic performance in Medicine, the Pre-Med GWAG had moderate to strong correlation to the Medicine GWAG while the NMAT score had weak to moderate correlation. The findings would therefore imply that Pre-Med GWAG was better able to predict student performance in medicine. Note that the present study excluded graduates who were delayed in graduation.

In terms of correlation with PLE scores, the Medicine GWAG had the highest correlation followed by Pre-Med GWAG, then NMAT scores. This implies that among the three variables, the Medicine GWAG would be the best predictor of success in the Physicians Licensure Examinations. One would expect the Medicine GWAG to have stronger correlation to the PLE scores in comparison to Pre-Med GWAG and NMAT scores in as much as the subject or content of the licensures examinations would cover comparable areas of knowledge as that covered in medical school. Aside from this, considering that the UPCM imposes a high requirement on NMAT scores among its admitted students (≥90 percentile) it would be expected that the NMAT scores of its graduates would be homogenous, thus resulting in low correlations. Note that the weak correlation of NMAT scores to PLE scores observed in the present study differed from findings reported by Donnon et al in their study correlating the MCAT (Medical College Admission Test) which is widely used in the US and Canada as a screening tool, to performance in medical school and licensing examinations. In their study, Donnan et.al found the MCAT to have a relatively consistent and good predictive validity for performance in both medical school and licensing examinations.[5]

While there are other factors taken into consideration in determining admission of students to the UPCM, the present study focused only on NMAT scores and pre Med GWAG as possible predictors of future performance. Other factors that could possibly affect and perhaps even predict future performance of applicants in medical school include students' attitude, motivation, study habits, leadership, high work standards and communication skills. These are taken into consideration thru structured interview and may be subject of future investigations.

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