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Assessment of readiness of candidates to undertake studies of the 1st degree at the nursing department

Ocena przygotowania kandydatów do podjęcia studiów I stopnia na kierunku pielęgniarstwo

ABSTRACT

Introduction. Admission criteria should accurately assess competences that are of value when undertaking studies and that can lower the proportion of failures among those studying.

Aim. The aim of the work was an analysis of the readiness of candidates to undertake studies of the 1st degree at the Nursing department at the Medical University of Warsaw (MUW).

Material and methods. The study involved a total of 887 students of the Nursing department who undertook full-time studies of the 1st degree at the Faculty of Health Sciences MUW. Predictive analysis was performed using the method of multiple regression applying seven predictors: gender, age on entry, place of completing secondary school and the type of secondary-school final examination, and three criteria applied during the admission process for university: the result of the matriculation exam in Polish, a foreign language, and an additional subject (biology, chemistry, mathematics, geography, or civics). Depending on the tested model, the grade point average (GPA) was used as one of the four variables, achieved after the 1st, 2nd, or 3rd year of studies together with cumulative GPA.

Results. Each of the applied three selection criteria was a significantly successful predictor, both in a short- and long-term prognosis ($\beta_{stand.}$ between 0.312 and 0.417). Candidates writing the "new" matriculation achieved considerably worse results than those who took the "old" matriculation ($\beta_{stand.}$ between –0.110 and –0.153). Moreover, it was observed that men have relatively slim chances of success during studies compared to women ($\beta_{stand.}$ between –0.077 and –0.118).

Conclusions. The degree of candidates' preparation for studies of the 1st degree at the Nursing Department is sufficient. The admission criteria applied so far have shown a sufficient level of predictive validity; however, improving the admission system may lower the percentage of failures among the students of nursing.

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Key words: school admission criteria; nursing students; educational measurement; graduate education

STRESZCZENIE

Wstęp. Kryteria rekrutacyjne powinny trafnie oceniać kompetencje, które są ważne dla efektywnego podjęcia studiów, co może zmniejszać odsetek niepowodzeń wśród studiujących.

Cel. Celem pracy była analiza przygotowania kandydatów do podjęcia studiów I stopnia na kierunku Pielęgniarstwo na Warszawskim Uniwersytecie Medycznym (WUM).

Materiał i metody. 887 studentów kierunku pielęgniarstwo, którzy podjęli studia stacjonarne I stopnia na Wydziale Nauki o Zdrowiu WUM. Analizę prognostyczną wykonano metodą regresji wielorakiej z użyciem siedmiu predyktorów: płeć, wiek, miejscowość ukończenia szkoły średniej, typ egzaminu maturalnego, trzy kryteria stosowane podczas rekrutacji na studia — wynik egzaminu maturalnego z języka polskiego, języka obcego oraz przedmiotu dodatkowego (biologia, chemia, matematyka, geografia, historia lub WOS). W zależności od testowanego modelu, jako jedną z czterech zmiennych objaśnianych zastosowano średnią ocen uzyskaną po I, II lub III roku studiów oraz na zakończenie studiów.

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Wyniki. Każde z trzech stosowanych kryteriów selekcyjnych były istotnym predyktorem sukcesu, zarówno w krótko-, jak i długoterminowej prognozie ($\beta_{stand.}$ od 0,312 do 0,417). Kandydaci zdający „nową" maturę osiągali istotnie gorsze wyniki kształcenia, niż ci którzy zdawali „stary" egzamin maturalny ($\beta_{stand.}$ od –0,110 do –0,153). Ponadto, zaobserwowano, że mężczyźni mają istotnie mniejsze szanse na sukces podczas studiowania niż kobiety ($\beta_{stand.}$ od –0,077 do –0,118).
Wnioski. Stopień przygotowania kandydatów na studia I stopnia na kierunku pielęgniarstwo jest zadowalający. Stosowane dotychczas kryteria rekrutacyjne wykazują dostateczny poziomem trafności predykcyjnej, ale doskonalenie systemu przyjęć może zmniejszyć odsetek niepowodzeń wśród studiujących kierunek pielęgniarstwo.

Introduction

Conscientiousness in maintaining high standards of education and effective teaching, which are so important for public health in a profession such as nursing, should go hand in hand with constant supervision of mechanisms of selection for this direction of studies. Even the best of systems that ensure the quality of teaching will not fulfil their role if a certain group of students is not able to meet the requirements due to the lack of appropriate predispositions and features which were not assessed well during the admission process. As can be seen from the experiences of various universities, it is well worth investing energy and means into adjusting the admission policy to the dynamically changing conditions [1–3].

In worldwide literature we can find works that attempt to assess various techniques of selecting candidates to nursing departments [1–11]. While analysing the above issue, we draw attention to two clearly outlined research areas: (a) complex evaluation research of methods used in selecting candidates, which are, by their nature, of composite character and bear a large degree of uncertainty in the accuracy of inference, and (b) predictive research that concerns evaluation of selective factors which are aimed at features that may decide about the achievement of professional success by a candidate.

A well-planned strategy and admission policy allows mastering of the rules accepted previously and adjusting the mechanisms of selection to the changing conditions, such as the number of candidates and their level of general knowledge and skills at the start, as well as personnel needs in a given profession. The question once asked by Wilson still remains fresh and valid: "How can the process we had always used be improved?" [12]. If we want to conduct a coherent admission policy that is based on evidence, we need to be able to validate the tools used in the process of candidate selection.

Aim

The aim of the study was an analysis of candidates' preparation for studies of the 1st degree at the Nursing Department at the Medical University of Warsaw (MUW).

Table 1. Characteristic of a tested group of students of the 1st degree at the Nursing department at the Medical University of Warsaw

Tabela 1. Charakterystyka badanej grupy studentów studiów I stopnia na kierunku Pielęgniarstwo na Warszawskim Uniwersytecie Medycznym

Mean age ± SD		20.0 ± 2.87
Number of students beginning their studies		887
Number of graduates		657
Number of attrition	1st year	204
	2nd year	17
	3rd year	9
Gender	Women	806
	Men	81
Place of school completion	Warsaw	197
	Other	690
Matriculation exam	New type	717
	Old type	170

SD — standard deviation

Material and methods

A total of 887 students from the Nursing Department who undertook studies of the 1st degree at the Faculty of Health Sciences at MUW qualified for the study, after the changes in matriculation exams introduced in 2005. The age average of students was 20.0 ± 2.87 years; over 90% of the studied group were women; 3/4 of the students graduated from a high school outside Warsaw; and 81% took the "old" type of matriculation. The percentage of failure among the students was 26%. Detailed characteristics of the studied group are presented in Table 1.

Prognostic analysis was carried out with the use of the multiple regression method. The proposed regression model involved the use of four dependent variables (predictors) belonging to the group of socio-demographic factors: gender, age on entry, place of completing secondary school, and the type of

Table 2. Evaluation of parameters of the linear function of regression for four of the tested predictive models

Tabela 2. Ocena parametrów liniowej funkcji regresji dla czterech testowanych modeli predykcyjnych

	Regression model of the outcome variable			
	1st year GPA	2nd year GPA	3rd year GPA	Cumulative GPA
F statistic	32.457	19.027	22.061	36.936
P-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Standard error of estimation	0.347	0.323	0.350	0.287
Adjusted R^2	0.244	0.159	0.183	0.277

GPA — grade point average

secondary-school final examination. In addition, the model applied three criterion variables used during admission for studies: the school finals score in Polish language, a foreign language, and an additional subject (biology, chemistry, mathematics, geography, history, or social education). Depending on the tested model, the grade point average (GPA) obtained after the 1st, 2nd, or 3rd year of study as well as the cumulative GPA for the whole course of study was applied as one of the four dependent variables. The model of regression was adjusted to the empirical data using the estimation method of Ordinary Least Squares (OLS). In testing the assumptions for the multiple regression method, a redundancy assessment and an analysis of residuals (autocorrelation degree, normal distribution of residuals, and homoscedasticity) were employed. The direction and force of the relevant variables were interpreted by establishing a standardised β regression coefficient. In order to evaluate the degree of variance explanation for each regression model, values of adjusted R^2 were established.

Calculations were performed in a statistical set of STATISTICA 12.5 (StatSoft©, Inc.) according to the MUW licence. For all analyses, the relevance level assumed *a priori* was $\alpha = 0.05$.

Results

As part of testing preliminary assumptions for the linear analysis of regression with estimation using the OLS method, the distribution of variables was evaluated. The results of the Shapiro-Wilk test presented relevant discrepancies with normal distribution. However, for individual quality variables, no presence of outlying data in the Grubbs test was noted. Moreover, the diagnosis of any potential influence of outlying data on the dispersion of variables using Mahalanobis and Cook's distance showed no relevant violation of conditions concerning the presence of such data in the data set. No relevant collinearity was noted for any of the variables introduced into the tested models

of regression (tolerance > 0.1). Also, the analysis of residuals showed no violation of conditions assumed for the estimation using the OLS method.

Every one of the tested models of regression, regardless of the assumed outcome variable, presented statistical relevance (P < 0.0001). The highest degree of variable adjustment to the model was observed in the case of outcome variable — cumulative GPA (adjusted $R^2 = 0.277$). While comparing the degree of explanation of the observed variable, the changeability of GPA for consecutive years of studies, it was noted that in the case of the 1st year GPA the degree of the explained variance of this variable by the predictors was significantly higher than for the other years of studies (adjusted R^2 for consecutive years, respectively: 0.244, 0.159, and 0.183). Detailed report on the values of statistics for the four tested models of regression are presented in Table 2.

The results of the analysis of regression show that neither the age of the student, nor the location of the high school had a relevant impact on the results obtained throughout the course of studies at the Nursing Department. However, there are significant intra-gender differences concerning GPA calculated both after each year of studies and as cumulative GPA. It was observed that men manage their studies much worse than women ($\beta_{stand.}$ between –0.077 and –0.118). Among the socio-demographic variables, another important success predictor for a student was the type of matriculation exam. It was noted that students who obtained their maturity certificate after the year 2005 (the "new" type of exam) had a significantly lower chance of success during their studies, as opposed to the students with the "old" type of exam ($\beta_{stand.}$ between –0.110 and –0.153).

As for the predictive assessment of the recruitment criteria applied during the admission process for the nursing studies, it was shown that every selective factor was a relevant predictor of success during the course of studies. This dependency was observed both in short- and long-term prognoses. Moreover, among

Table 3. Summary of the standardised regression coefficients ($\beta_{stand.}$) for four of the tested models of multiple linear regression

Tabela 3. Zestawienie standaryzowanych współczynników regresji ($\beta_{stand.}$) dla czterech testowanych modeli liniowej regresji wielorakiej

Predictors	Regression model of the outcome variable			
	1st year GPA	2nd year GPA	3rd year GPA	Cumulative GPA
Age	0.065*	0.033*	0.058*	0.059*
Gender# 0 — Woman 1 — Man	–0.105	–0.097	–0.077	–0.118
Place of school completion# 0 — Warsaw 1 — other	0.017*	-0.005*	-0.032*	0.005*
Matriculation exam# 0 — old type 1 — new type	–0.153	–0.110	–0.124	–0.149
Polish language	0.096	0.091	0.105	0.113
Foreign language	0.119	0.117	0.164	0.153
Additional subject	0.403	0.317	0.312	0.417

*Statistically insignificant (P-value > 0.05); #Binary variable (dichotomous variable); GPA — grade point average

the applied selective criteria, the result obtained by a candidate in an additional subject proved the strongest predictor ($\beta_{stand.}$ between 0.312 and 0.417). For the criterion such as a foreign language, the predictive value was average ($\beta_{stand.}$ between 0.117 and 0.164), whereas the worst result was observed for the score in Polish language ($\beta_{stand.}$ between 0.091 and 0.113). The summary of results concerning the evaluation of predictors in the analysis of regression is presented in Table 3.

Discussion

Choosing an appropriate set of selection criteria for a given direction of studies allows the University's admission policy to be performed in a manner corresponding to its assumptions. Adjusting these criteria is directly connected with validity, which is to be understood as a degree of compliance with which a tool of educational measurement assesses what is has been designed to quantify. Thus, it is the usefulness of a given criterion in the light of a certain set of features and properties of an examination [13]. There is no exact method of measuring the validity; there is only some intermediate evaluation. In this work, the analysis of accuracy was based on studying predictive validity using the multiple regression method.

Several of the conducted analyses of multiple regression include socio-demographic variables into the model as important predictors: gender, age on entry, type of completed high school, or parents' education. The tested predictive models showed no significance

in the place of completing high school. Candidates considered as "locals" (Warsaw) and "non-locals" (outside Warsaw) did not differ in terms of their achievements during their studies. What is inconsistent, however, are the observations concerning the influence of age on entry on the results of education. As can be seen from the results of several predictive studies concerning teaching nurses, variable "age" is positively correlated with the results achieved during the studies [14–16]. By and large, in the case of older students, considerably better results are noted as opposed to students who began their studies under the age of 26, regardless of their additional qualifications on entry [14]. In studies on the reasons for not completing studies, young age is pointed out as a negative predictor [15]. As reported by Pryjmachuk et al. [15], age on entry is of relatively low impact on the timely completion of studies. However, in self-studies, none of the tested models of regression confirmed the relevant influence of age on students' achievements, regardless of the tested model of regression. However, another variable may be connected indirectly with age, for which predictive relevance was discovered. It was found that students who obtained the "new" matriculation certificate achieved comparatively low results during studies compared to those who received their matriculation certificate after the year 2005 (the "old" matriculation). Indirectly, this result suggests that age may be a relevant predictor of success while studying at the Nursing Department. Probably the discrepancies between the relevance of

both predictors (age and type of matriculation exam) result from a low sample size of older students in the study population.

As concluded by Ferguson et al. on the basis of a systematic literature review, it is recommended that "gender" be considered as one of the more important factors (independent variables) in predictive studies concerning medical education [17]. The analysed models of regression show a significant role of gender as a predictor of success. The results point to the fact that women achieved statistically better results of education in every one of the tested models. This observation is generally confirmed in the results of studies published to date [18–20]. The majority of researchers present that women are better at studying than men. Moreover, regarding medical education, it was observed that women, as opposed to men, have a higher likelihood of completing their studies with a distinction [18]. The results of self-studies are thus supported by the findings of other researchers in the area of the influence of such variables as gender on achieved success during the course of studies. In-depth analysis concerning intra-gender differences in the achieved learning outcomes suggests that women may be conditioned by a greater diligence, more thorough work during exercises, and higher attendance, compared to men. According to the above thesis, it is women who achieve greater progress during their studies at university than men with a similar academic background [19].

If we wish to carry out a proper selection of candidates, we follow the rule that says we should chose those who meet a certain minimum criterion of the required knowledge and skill, and present certain predispositions needed in a given profession. Using tools of educational measurement that are inadequate in evaluating these features contributes to a greater percentage of failures. As can be seen from the analysis of predictors from the group of selection criteria, each of them was a relevant factor conditioning achievement of success in the direction of nursing. A relatively good validity of selection criteria used at MUW means that in the majority of cases the results achieved by candidates reflect their actual properties and features. What is of concern, however, is that despite the good results in the area of predictive validity, in a tested group of students a relatively high attrition rate was noted (0.26). Data obtained from such countries as Australia [21], Canada [22], the UK [23], and the USA [24] prove the seriousness of this issue. As reported by Waters [25], the attrition rate among the students in Scotland varies in the range 28-30%. Losing nearly a third of students who were positively verified during the admission process is connected with a financial loss for the government of around £17,000 per year per student (bursary + unit cost of teaching) i.e. around £99 million per year [25]. That is why it is of so much importance to obtain high precision in evaluating competences of candidates for whom the result of the exam test falls near the point of pass/fail, because the group of such candidates bears the highest risk of attrition during their studies.

It should be remembered that the point of the entry exam is not to verify the learning outcomes from high school (that is the role of the matriculation exam), but an assessment allowing the University to conclude whether the candidate is competent enough on entry to undertake the studies. The specificity of a given evaluation tool is its ability to select candidates who should not be accepted (negative selection). From the point of view of selecting the best candidates, criteria characterised by greater specificity are better as it allows avoidance of a situation in which, among the students who begin their studies, are those with inadequate level of competences on entry. An admission system will not play its role if a certain group of examinees is unable to meet the requirements due to the lack of appropriate features and predispositions that have not been assessed well during the educational diagnosis and verified during the admission to academic institutions.

Limitations

This study is limited by that the data were obtained only from a single university. As a consequence, it is difficult to predict if the determined criteria would be as valid in similar degree programs in other institutions. Ideally, each institution would identify its own predictors of academic success based on their specific student population and the available measures.

Conclusions

Generally, the degree of preparation of candidates for studies of the 1st degree of Nursing is satisfactory. The admission criteria used until now show an appropriate level of predictive validity. However, it is still necessary to elaborate a good admission policy that could correspond to the growing problem of demographic drop, and the new needs connected with the increase in additional competences that are part of the nursing profession. Among the key problems that still need solving the following should be listed: attract and recruit the appropriate candidates; select effectively not just for retention, but also for the achievement of the required skills and attitudes; provide both support and a challenge in practice and education to appropriately retain and reduce wastage; and achieve the correct numbers of well-qualified nurses.

Acknowledgments

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