A Model to Predict Student Failure in the First Year of the Undergraduate Medical Curriculum

Gerard J.A. Baars[a,*], Theo Stijnen[b], Ted A.W. Splinter[c,1]

[a]*Risbo, Erasmus University Rotterdam, The Netherlands*
[b]*Department of Medical Statistics and Bioinformatics, Leiden University Medical Center, The Netherlands*
[c]*Erasmus MC, The Netherlands*

Abstract

Purpose: To develop a model for the early and reliable prediction of students who fail to pass the first year of the undergraduate medical curriculum within two years after the start.

Method: 1819 medical students of five consecutive cohorts were included. By logistic regression analyses, predictions for failure in the first-year curriculum were made at 0, 4, 6, 8, 10 and 12 months. Predictive variables included pre-admission variables such as age, gender, pre-university education GPA, the way students were selected, and post-admission variables such as number of credits obtained, degree of participation in exams, and exam success rate. Variables were only included if they contributed significantly to the model both for the five cohorts together and for each cohort separately. Students who had voluntarily withdrawn before a predictive moment were not included in the analyses.

Results: Students who had passed all exams at 4 or 6 or 8 months (so-called "optimals") had a chance of 99% of passing the first-year curriculum. Within the group of non-optimals, at 6 months, failure to pass the first-year curriculum could be predicted with a specificity of 66.7% and a sensitivity of 84.5% by using the variable 'passing 0 exams between 4 and 6 months'. Specificity increased from the start till 6 months and remained constant afterwards.

Discussion: The earliest moment with the highest specificity to predict student failure in the first-year curriculum seems to be at 6 months. However, additional factors are needed to improve this prediction or to bring forward the predictive moment.

*Correspondence to: Erasmus University Rotterdam, Risbo, Burgemeester Oudlaan 50 (room T11-20), 3062 Rotterdam, PA, The Netherlands. Fax: +31 10 408 1141.
    E-mail address: baars@risbo.eur.nl (G.J.A. Baars).
    [1]This author is deceased.

1. Introduction

Worldwide, universities are under pressure to reduce the number of students who fail to complete their study.[1–3] The major motives are a waste of money and talent. Student failure is the resultant of a 'mismatch' between student-related factors on one side and curriculum-related and/or social environment related factors on the other. Examples of student-related

factors are the inability to adapt oneself to the academic environment, allocating insufficient time to studying, lack of discipline, and lack of motivation.[4–9] Examples of curriculum related factors are unsatisfactory teaching methods and styles, difficulty of exams, and absence of remedial support.[9–11] And examples of social environment related factors are membership of a students' social club, having a job, and students' lack of involvement with their peers and faculty staff inside and outside the university.[12–14]

Considerable differences in the percentage of students who fail to complete their study within an acceptable period of time are observed between various fields of study. For example, the percentage of failing students in the behavioural and technology sciences is approximately 50–60%.[15] In this regard, medical students are a positive exception.[16,17] In Erasmus medical school, retrospective data has shown that an average of 'only' about 13 percent fails to complete their study within 10 years of study (unpublished observation).

It is well-known that the majority of students who are not successful fails to perform well during the first year in university.[10,18,19,20]. This is also true for Erasmus medical school, in which approximately 80% of all failing students do not complete the first-year curriculum (unpublished observation). Before 2014, students of Erasmus medical school were obliged to pass this curriculum part within two years after the start of their study. Students who failed were forced to withdraw, unless they had suffered from temporary, but serious personal circumstances such as decease of close relatives or illness.

The challenge of Erasmus medical school is to identify as soon as possible after the start and as reliable as possible students who will fail to pass the first-year curriculum within two years of study. Such an early and reliable identification would have the potential advantage of intervention by a short remedial support programme for a well-defined subgroup of

motivated students in order to help them to overcome their initial problems or referral to another study for the subgroup that is not willing to remediate.

Concerning the prediction of those who will fail, it was demonstrated before that there seems to be a relationship between student achievement in the first months in university and subsequent achievement.[20–23] However, looking at abovementioned studies, two major problems arise. First, they do not indicate exactly which specific students will fail. And secondly, they do not give any insight into the best moment to predict whether students will fail or not.

Therefore, the goal of the current study was to develop a model for the early and reliable prediction of those who fail to pass the first-year medical curriculum within two years after the start. To that end, data on pre- and post-admission variables was collected from 1819 students of five consecutive cohorts. By logistic regression analyses, predictions for failing to pass the first-year curriculum were made at 0, 4, 6, 8, 10 and 12 months.

2. Method

2.1. First-year curriculum of Erasmus medical school

This study was conducted at Erasmus medical school. Its curriculum, which was entirely integrated and theme-oriented, was implemented in 2001 and consisted of four pre-clinical years and two clinical years. The pre-clinical years were aimed at providing students a theoretical basis and clinical knowledge in order to prepare them for the clinical years. In the clinical years, the focus was on the acquisition of problem-solving and practical clinical skills.

The composition of the first-year curriculum is shown in Table 1.

The first year of the pre-clinical phase comprised four themes, i.e. "An introductory course", "Disorders

Table 1
Composition of the first-year curriculum.

Time	N exams	Obtainable credits (during period)	Number of credits (cumulative)	Theme(s)
Between 0 and 4 months	3	19.0 credits	19.0 credits	Introductory course Disorders in the milieu interieur (part 1&2)
Between 4 and 6 months	2	13.0 credits	32.0 credits	Disorders in the milieu interieur (part 3&4)
Between 6 and 8 months	2	11.5 credits	43.5 credits	Abnormal cell growth (part 1&2)
Between 8 and 10 months	3	16.5 credits	60.0 credits	Abnormal cell growth (part 3&4) Integration exam
Between 10 and 12 months	10 re-exams	60.0 credits	60.0 credits	All 4 (sub)themes