Analysis of Student Grades in a Medical Pharmacology Course at the National Autonomous University of Mexico

MARÍA DOLORES RAMÍREZ-GONZÁLEZ 1*, HECTOR JAVIER DELGADILLO-GUTIÉRREZ 4, EUSEBIO CONTRERAS-CHAIRES 1, JOSE LUIS FIGUEROA-HERNANDEZ 1, ALICIA CEA-BONILLA 2, YOLANDA SALDAÑA-BALMORI 2 & IGNACIO MENDEZ 3

Departments of 1Pharmacology & 2Biochemistry, School of Medicine; 3Institute for Research on Applied Mathematics and Systems, National Autonomous University of Mexico; 4Department of Biological Systems, Metropolitan Autonomous University – Xochimilco
*e-mail: mdrg@servidor.unam.mx

At the Medical School of the National Autonomous University of Mexico (FM-UNAM), students admitted are requested to have an average grade over “8” (scale 0-10) in their three years of pre-university studies [1]. Student grades are of the utter importance because selection of groups and, later on, of hospitals for clinical clerkships is based on their averages in the previous school year.

Pharmacology is a second-year subject and the eight hours of weekly instruction are provided in groups of 15 to 30 students, who work with two to four professors throughout the year (37 to 38 weeks). Course content is divided in three sections. At the end of each section, students take partial exams and their scores are averaged with partial assessments given by the professor based on classroom and homework tasks. When students do not get a final average grade over “9” they must take one or two final exams. The final grade of the course at the end of the year must be over “6” to be credited; otherwise they will have only one more opportunity to re-register in the course. Further attempts for accreditation involve extraordinary exams that can be taken only once a year.

In the last nine years the assessment criteria and the design of the course have been modified. Since 1996, students are required to take three instead of four partial exams, whereas the contribution of professor’s assessment in partial evaluations remained at 40% of the total grade.

In the school years of 1992-1996 the institutional policy required the use of a letter grading system of NA, S, B and MB which had a numerical equivalency of 5, 6, 8 and 10, respectively. Students were marked using a scale of 0 to 10 and marks were converted to grades using the ranks: 5.9 or less for NA; 6.0 to 7.3 for S; 7.4 to 8.7 for B; and 8.8 to 10.0 for MB. In 1997, the letter grading system was substituted by a scale of round numbers (5, 6, 7, 8, 9 and 10) with 6 as the lowest limit for accreditation. Any mark lower than 6 is converted to 5. During the years analyzed in this work, the system for marking partial exams was also changed to introduce, in 1994, negative marking (i.e. the total number of incorrect answers is subtracted from the total number of correct answers). Later on, in 1997, simple multiple choice questions were changed for more complex designs attempting to explore the ability of students to identify and resolve problems, as described by Davis and Allen and Brown et al. [2,3].

Parallel to all these modifications in assessment criteria, in 1996 the traditional approach of studying drugs by therapeutic indication was substituted by the study of drugs’ mechanism of action, as described by Rodriguez et al. [4]. Additionally, laboratory experimentation in vitro was totally replaced by the use of computer-aided activities.

Considering that it is not clear to what extent all the changes made in these last nine years had a significant effect on student learning, in this initial work we analyzed medical student grades in the pharmacology course at FM-UNAM during the school years of 1992 through 2000.

METHODS: At FM-UNAM school year begins in August and ends the following year in June. The population studied included 7118 students who registered in the school years 1992 to 2000. The grade selected for the analysis is the one obtained by the students at the end of the school year and is the figure that appears in their academic records before extraordinary exams. At FM-UNAM this grade is taken as an assessment of the learning achieved in pharmacology by the student through the school year.

Statistical analysis was performed using SPSS V.10 software (Chicago, US). A database was constructed using as indicators year of registration, student identification number and the final grade of the course (FGC) attained by each student. Assessment of normality for FGC distribution was done with the Kolmogorov-Smirnoff test, and median values and interquartile estimates were calculated as proposed by McLachlan and Whiten [5]. One-way ANOVA and post hoc tests for homogeneous subsets were also calculated. Significant differences were considered with a p value of 0.01 at least.

RESULTS: Figure 1 depicts the FGC observed in each school year. When comparing the earliest and the latest records (1992 versus 2000) there is a significant decrease of FGC in the school year of 2000 (p<0.001). Comparison of all student FGC records before and after 1996 indicated significantly higher grades (p<0.001) with the new format of the course: 8.19 ± 1.38 versus 7.87 ± 1.69 (± SEM estimated for n equal to 3874 and 3244, respectively). Dur-
During the years analyzed the median values were “8” (with an interquartile range of 1) except for the school years of 1997, 1998, and 1999 when this value increased to “9” (interquartile range of 2). Correspondingly, the average FGC increased when compared to the previous school year: 8.07 (1996) versus 8.30 (1997), 8.35 (1998) and 8.31 (1999) \( (p<0.01 \text{ at least}) \).

The comparison for the frequencies of FGC for the periods 1992-1996 and 1997-2000 is shown in Fig. 1 (pie histograms). Our data indicate a significant decrease of the grade “5” (9% versus 3%; \( p<0.01 \)) and an increase of the frequency of the higher grades “9” and “10”.

Figure 2 reveals a significant decrease \( (p<0.001) \) in the proportion of the lowest grade (“5”) in the school years of 1995, 1997, 1998, 1999 and 2000. It is worth mentioning that “5” is the failing grade and was not modified by the changes in the grading system of 1997.

DISCUSSION: Data presented in this paper suggest the presence of grade inflation, defined as a steady trend towards higher grades and a decreased percent of the lowest grade (Figures 1 and 2). Grade inflation is a phenomenon well identified in education, but very little information is available in the medical literature. This can be explained by the concerns of institution discrediting [6]. Student assessment is a complex task usually achieved by the use of written exams and allowance for the teachers to make
The final grade of the pharmacology course given at FM-UNAM, as described above, is the compounded result of several factors. It includes both objective and subjective assessments (written exams and professor’s evaluation). It seems from the literature there is always uncertainty whether these assessments are a direct measure of the actual or useful knowledge acquired by students in basic science courses [8]. However, as it stands at FM-UNAM, as well as any other school, course grading for each student is an unavoidable task with straightforward implications on the student’s life and academic development. Further performance of students in clinical clerkships may be related or not to the grade average attained in basic science courses [9] and medical students may even consider basic science courses as not very useful [10]. But student grades are usually the only indicator easily available to judge student “learning”. This controversial issue spreads over any educational institution but it is particularly relevant in medical schools because grades define the availability and eligibility for further clinical clerkships [11].

Professors must be aware of their role and responsibility when grading students. When a change in institutional policies for evaluation or program design occurs, it is advisable that faculty in charge of lecturing be informed not open judgments to evaluate student’s abilities. At FM-UNAM, as in many other institutions, it is a common practice to aggregate the results of these two independent assessments [5] and this procedure may contribute to grade inflation. However, it may also be indicative of the reluctance of faculty to give lower grades either because it could negatively affect their own promotion and tenure or because there is confusion on the faculty’s role as teachers and evaluators [7]. This latter situation can be readily corrected by providing adequate faculty development and training to critically evaluate students. One specific action could be to make student performance standards more explicit to teachers, contributing to faculty development and professionalism. It may also indicate a steady transition away from traditional methods of evaluation where students are expected not only to be knowledgeable but also to develop attitudes and abilities related to pharmacology that cannot be evaluated with the instruments and aggregation of assessments currently used. In either circumstance, careful attention must be given to assure competent performance of students and effective learning. Students who perform inconsistently in partial evaluations should receive particular scrutiny during assessment as proposed by McLachlan and Whiten [5], instead of waiting to see the final grade at the end of the school year.

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only on the characteristics of the change itself but also on the reasons, the theoretical framework, that support the modifications. Medical faculty should be at least familiar with the educational theories relevant to the curriculum they are lecturing [12]. A simpler procedure could be to provide information continuously to faculty in order to promote awareness on the grade patterns and their development so that each professor will weight his/her own contribution in a summative and retrospective view. Practices such as the use of student scores as the only indicator of faculty performance, as proposed by Rodriguez et al. [13] should be strongly discouraged because they may actively promote grade inflation.

With the data presented herein we cannot distinguish whether the increase of FGC (Fig. 1) may reflect a more capable student cohort or a failure to identify poor achievers, as noted by Speer et al. [6]. On the other side, it must be mentioned that, in 1998 and 1999, academic activities were strongly disturbed by student revolts, and their pervasive effect cannot be excluded. The increase in the average FGC in 1997 could be due to the change in the grading system, but there is no evident explanation for the increase observed in 1995 (p<0.005). The data presented in this paper also show a nadir of grades in the school years of 1993, 1994 and 2000 (Fig. 1; p<0.01 at least when compared to the average FGC observed in the previous year), suggesting a possible impact of the changes made to the design of partial exams. This is an issue currently under research.

In conclusion, assignment of grades in the basic pharmacology course in the second year of medical education appears to rely strongly on written exams. Therefore we propose that comprehensive evaluation of students should include: the use of explicit criteria for professors’ assessment and, the use of instruments different from exams of multiple-choice questions to assess meaningful student achievements. The data presented here also indicate that when innovations to the program, design or evaluation, are introduced to entire student generations without control, this is likely to cause alterations in the distribution of grades. This distortion makes it even more complex to analyze the impact on students learning as it appears by the decrease in the grades of the school year 2000, or the minor increase detected when comparing grades before and after the extensive modifications to the course made in 1996 (Fig. 1). Therefore we propose that intensive programs of evaluation and an “evaluation” of the evaluations must be performed to assure competency and quality in the education of medical students in basic pharmacology as a fundamental science for drug prescription.

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