

CHAPTER 7

Should medical school selection be replaced by lottery?

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Submitted

Abstract

Concerns related to fairness of medical school admissions through selection have led some scholars to consider selection as an expensive lottery and suggest that lottery may be fairer. This paper considers the issue of selection versus lottery from two angles: 1) student motivation, engagement, learning and performance outcomes, and 2) diversity of the medical student population. What this paper adds is a holistic perspective on this issue grounded in the findings from research. Research indicates that selection yields only small gains compared to a lottery procedure, while the student diversity may be compromised. Medical schools can reduce the costs of selection by organizing national selection procedures. Also measures to improve student diversity, like arranging opportunities for underrepresented students to obtain healthcare experience, are required.

Medical school admissions are generally based on selection. However, concerns related to fairness have led some scholars to consider selection as an expensive lottery^{1,2} and suggest that lottery may be fairer^{3,4}. Dutch medical schools have admitted eligible students through lottery for years, before a gradual change to selection was imposed by the government⁵. This paper considers the issue of selection versus lottery from two angles: 1) student motivation, engagement, learning and performance outcomes, and 2) diversity of the medical student population. Some of these issues have been addressed in recent publications^{6,7}. What this commentary adds is a holistic perspective on this issue grounded in the findings from research.

Student outcomes

A great variety of performance outcomes is considered in research investigating the differences between selected and lottery-admitted students and the evidence is inconclusive. While better professional behaviour and clerkship performance among selected students have been reported^{8,9}, no differences were found for Year-1 course completion and Year-3 OSCEs¹⁰⁻¹² and findings regarding other performance outcomes are mixed⁹⁻¹⁶ (see Table 1).

Student motivation and engagement have also been compared between selected and lottery-admitted students. Differences between the groups mainly pertained to strength of motivation, in which selected students had the highest scores^{13;14;17;18} except in one study, where differences did not reach significance¹⁹. More importantly, the quality of motivation and student engagement did not seem to differ between selected and lottery-admitted students^{13;18}. Only one study found better quality of motivation among selected students in comparison with lottery-admitted students²⁰ (Table 2). Differences between the two admission groups are small and do not always reach significance. Moreover, the practical relevance of a 0.1 higher GPA on a scale from 1 to 10, for example, is questionable. It seems that selection yields only marginal benefits while most applicants are probably able to complete their studies and most of them are able to become capable doctors, if properly trained⁷.

Researchers have applied the Taylor-Russell model to evaluate the practical usefulness of selection and have drawn similar conclusions²¹. The Taylor-Russell model can be used to determine the success ratio of selection. The success ratio is calculated based on the base rate, selection ratio and the predictive validity of the selection procedure. Here,

base rate means the expected success rate without applying selection, and selection ratio means the percentage of students that will be selected. A small effect of selection can be expected when either the base rate or the selection ratio is high. For the Dutch context, calculations showed that with a base rate of around 0.80 and a selection ratio of around 0.60, the success rate of increases with 1.8% when selection is applied. This increase from 81.3% to 83.1% corresponds with a gain of around 6 successful students at each medical school (with a total number of 2785 places in eight different medical schools). Taken together, the gains in selection seem to be small compared to lottery, especially because students and some have advocated the use of a lottery system after certain academic standards have been met^{4,7}.

Table 1 Overview of research on admission groups and performance

Authors	Outcome measures	Findings
Hulsman et al. (2007) ¹⁴	Year-1 GPA Year-1 examinations	<i>GPA</i> : no differences <i>Pass all exams</i> : no differences
Urlings-Strop et al. (2009) ¹⁶	Dropout 60 course credits per year Year-1 GPA	<i>Dropout</i> : selected < lottery-admitted <i>Course credits</i> : no differences, except in the second year for 1 out of 4 cohorts (selected > lottery-admitted; this did not remain after stratification for year of entrance and lottery category) <i>GPA</i> : no differences, except in the first year for 1 out of 4 cohorts (selected > lottery-admitted)
Urlings-Strop et al. (2011) ⁸	Clerkship dropout Clerkship GPA	<i>Dropout</i> : selected < lottery-admitted <i>GPA</i> : selected > lottery-admitted
Urlings-Strop et al. (2013) ¹⁵	Dropout Clerkship GPA	<i>Dropout</i> : no differences between participants and non-participants; selected > rejected lottery-admitted <i>GPA</i> : no differences between participants and non-participants; selected > rejected lottery-admitted
Schripsema et al. (2014) ⁹	Year-1 GPA Course credits Good professionalism score Dropout	<i>GPA</i> : top pu-GPA > selected > lottery-admitted <i>Credits in Year-1</i> : selected and rejected lottery-admitted > lottery-admitted <i>Credits in Year-2</i> : selected and rejected lottery-admitted > lottery-admitted <i>Credits in Year-3</i> : no differences <i>Professionalism</i> : selected > rejected lottery-admitted and lottery-admitted <i>Dropout</i> : no differences

Authors	Outcome measures	Findings
Lucieer et al. (2015) ¹¹	Dropout Year-1 GPA Course credits at 52 weeks Year-3 OSCE Bachelor completion in three years	<i>Dropout</i> : cognitive selected < lottery-admitted <i>GPA</i> : no differences <i>Course credits</i> : cognitive-selected > lottery-admitted <i>Passing OSCE</i> : no differences <i>Completion</i> : no differences
Stegers-Jager et al. (2015) ¹²	Year-1 course completion within one year Pre-clinical course completion within 4 years Clerkship performance	<i>Year-1</i> : selected > non-selected (top pu-GPA and lottery-admitted; after including early medical school performance, this did not remain) <i>Pre-clinical course completion</i> : no differences <i>Clerkships</i> : no differences
De Visser et al. (2016) ¹⁰	Year-1 Course credits (obtaining ≥42 out of 60; obtaining all 60 credits) Year-1 Dropout Year-1 GPA Year-1 nursing attachment Bachelor completion in three years Year-2 and 3 GPA (theoretical exams) Year-3 grade (clinical course)	≥42 <i>course credits</i> : selected > lottery-admitted; no differences between selected and rejected lottery-admitted 60 <i>credits</i> : top pu-GPA > selected > lottery-admitted and rejected lottery-admitted (adjusted for GPA, only selected > lottery-admitted remained) <i>Dropout</i> : selected < lottery-admitted <i>GPA</i> : top pu-GPA > selected > lottery-admitted and rejected lottery-admitted (adjusted for pu-GPA, only selected > lottery-admitted and rejected lottery-admitted remained) <i>Nursing attachment</i> : no differences between groups <i>Completion</i> : selected > lottery-admitted (adjusted for pu-GPA, no differences remained) <i>GPA</i> : top pu-GPA > selected > lottery-admitted and rejected lottery-admitted (adjusted for pu-GPA, only selected > rejected lottery-admitted remained) <i>Clinical course</i> : top pu-GPA > selected > lottery-admitted (adjusted for pu-GPA, only selected > lottery-admitted remained)
Wouters et al. (submitted) ¹³	Year-1 GPA Year-1 Course credits Year-4 Clerkship performance	<i>GPA</i> : top pu-GPA > selected <i>Course credits</i> : no differences <i>Clerkships</i> : top pu-GPA > selected

Diversity of the medical student population

Another issue that needs to be taken into consideration in the discussion is the effect of selection on the diversity of the student population. A diverse student population results in a student population which is well-prepared to meet the needs of a diverse society²². If the medical professionals workforce shows a good representation of the diversity in the patient population, the best possible healthcare for every individual can be provided²³.

Therefore, medical schools have the responsibility to generate a student population that is a reflection of the society it will serve in the future^{24,25}. There are concerns, however, that student diversity may be compromised due to selection⁶. In particular, students from ethnic minority backgrounds^{26,27}, students without a medical family background²⁸⁻³⁰, lower socioeconomic status students^{27,29,31}, and students who are first in family to go to university^{29,32,33} are underrepresented in medical education. A first explanation pertains to biased selection procedures³⁴⁻³⁶. Furthermore, self-selection among those students has been suggested as a possible cause for their underrepresentation³⁷. Self-selection occurs when students decide to refrain from applying to medical study. For example, research indicated that having a medical doctor as a parent makes it easier to gain information about the medical profession, as well as acquiring internships in healthcare, which is often part of the selection criteria³⁸. When students without parents in the medical profession perceive their chances of success in selection to be lower than the students with parents in the medical profession, this can negatively affect their motivation, and subsequently cause them to refrain from applying. This brings us to the question, “Should medical school selection be replaced by lottery?” It has become evident that several factors need to be considered. While selection, which is generally costly, is aimed at increasing the quality of the student population, research indicates that selection yields only small gains compared to a lottery procedure. Furthermore, the diversity of the student population may be compromised, which calls for measures to counteract this effect. However, current widening participation measures lack evidence for effectiveness. It appears that a relatively inexpensive and fair (in terms of equity) procedure that yielded a well-performing, motivated student population was exchanged for a more expensive procedure which seems to disadvantage students that are underrepresented in medical education.

Practical implications and recommendations

Firstly, medical schools should try to reduce the costs of selection procedures as much as possible. Some of the selection steps can be conducted at the national level for all medical schools, following the examples of the use of national aptitude tests in the UK, the US, Canada and Australia. Furthermore, the use of expensive selection tools for which low validity and reliability has been reported should be reconsidered^{34,41}. For example, scoring of letters of references is expensive, while there is consensus that the use of references in medical school selection is neither valid nor reliable⁴¹. Academic records on the other hand, have a high predictive validity and are readily available for all applicants⁴¹.

Table 2 Overview of research on admissions groups and motivation and engagement

Authors	Findings
Nieuwhof et al. (2004) ¹⁹	No differences with regards to the strength of motivation of selected and lottery-admitted students
Hulsman et al. (2007) ¹⁴	Higher strength of motivation among selected students in comparison to lottery-admitted students
Kusurkar et al. (2010) ¹⁷	Higher strength of motivation among selected students in comparison to lottery-admitted students
Kusurkar et al. (2013) ²⁰	Higher autonomous motivation among selected students in comparison to lottery-admitted students
Wouters et al. (2016) ¹⁸	Higher strength of motivation among selected students in comparison to lottery-admitted and top pu-GPA students No differences with regard to the quality of motivation Higher strength of motivation, autonomous motivation and controlled motivation among recently selected students in comparison with non-selected students and students who were selected longer ago
Wouters et al. (submitted) ¹³	Higher strength of motivation among selected students in comparison with top pu-GPA students. No differences with regards to quality of motivation No differences with regards to engagement

Secondly, if medical school admissions remain based on selection, definite measures should be taken to improve the student diversity. Next to preventing bias in selection procedures³⁴, such measures should be aimed at the recruitment of a diverse applicant pool. Recruitment efforts can include guidance for students at high schools to make a well-informed study choice. High school counsellors can help students identify the factors that influence their study choice and guide them towards a choice based on the right motivation. Medical schools can contribute by improving their information days and aiming their recruitment strategies at high schools with a high proportion of students that are underrepresented in medical education. For example, medical students from ethnic minority backgrounds can be involved in giving information to high schools students about the medical study and profession as a form of inspiration

or role modelling. Moreover, to reduce inequality in selection, medical schools should create opportunities for all students, especially from underrepresented groups, to get experience in healthcare.

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