■ Review Article_____

Factors affecting medical student attrition: A review of literature from the decade before COVID-19

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ABSTRACT

Medical student education is critical to developed and developing countries' ability to maintain and extend health services. Loss of students from teaching courses is a significant opportunity cost and real cost, particularly affecting resource-poor settings. Recent influences adversely affecting medical student completions include student attrition due to economic costs to students and their families, longer duration of study with consequent delayed earning capacity of an individual, immediate social and financial stressors and university staffing instability. Some of these, including economic costs with consequent financial stress can be addressed with external financial and other support. The present article summarises several contributing factors to medical student attrition. It highlights emerging factors in the decade before COVID-19 on a global scale and provides insight into the individual and institutional factors that affect this decision. Understanding these factors in isolation is an important stepping stone for institutions to address them, and presenting them together provides awareness of their interconnected nature for further study. This review summarises current literature in this area from the decade before COVID-19, which demonstrate higher rates of attrition in many studies in women rather than men, in migrant rather than local students, and in students with a diagnosis of mental illness and from under-represented communities.

Keywords: attrition, medical students, admissions testing, medical education

INTRODUCTION

Medicine is typically viewed globally as a desirable career choice. Consequently entry into medical courses is very competitive in most countries [1]. Despite this, students cease study of medicine every year for a multitude of reasons, with rates in Australia and internationally of 2.9% to 5.7% of students by the end of medical courses [1]. The cessation of study by a student is referred to as attrition, that is where a medical student prematurely departs from training. Such departure from training has significant economic costs, social costs, and reputational costs to the university. These costs are to the training university, who have expended resources on these students without an educational outcome resulting in clinical benefits to the community [1]. Whilst these costs vary across universities and year level at attrition, the American Institutes for Research estimated the mean cost of attrition of a single student from any bachelor's degree in the USA was $53,781 USD [2]. Additional societal opportunity costs occur with tax-funded medical education. This occurs in Australia through the commonwealth supported places scheme [3, 4].

Discontinuation of study also impacts the reputation of the university within academic communities [1]. Significant discontinuation by students can lead to resignations by university staff [1], both due to the University's standing and feelings of frustration in teaching staff due to high turnover of students. Attrition also has economic and resourcing implications for the university, and personal consequences for the students themselves. Discontinuation of medicine and other university courses has also been shown to affect a student's self-confidence and to cause personal, financial, and social stress [5].

The reasons for medical student attrition can be usefully seen as personal and institutional effectors. They have been widely studied in order to provide an evidence base for interventions to reduce attrition. Intervention strategies intended to reduce the risk of attrition can be implemented and evaluated in relation to these baseline data. Interventions that have been trialed to reduce attrition include continued use of admissions testing [6] and changes to the learning environment [7]. However, this is a dynamic topic due to the complex nature of contributory variables and the changing social context affecting students. As such, ongoing research is needed to ensure sustained efficacy of interventions. This review assessed literature relevant to medical school attrition published between January 2011 and December 2020 in English. Attrition was defined as a student prematurely leaving a medical degree for any reason, either to pursue a different degree or to halt their tertiary study altogether. The aim was to improve understanding of the current factors affecting the attrition of medical students and inform interventions at a university level to address this, thereby possibly reducing attrition.

METHODS

The search was conducted using the Cochrane Library, Scopus, and PubMed databases. These were chosen for their comprehensive nature, relevance to the topic and documented reputation in academic communities [8]. Articles were limited to those from peer-reviewed journals published in English in the 10 years before the onset of the COVID-19 pandemic (2011-2020 inclusive). The first year of this pandemic, 2020, was included as the paper was published online in late 2019. This timeframe was chosen in order to be most relevant to current university and student issues, whilst acknowledging the fact that the COVID-19 pandemic had presented unique issues worthy of further study. An initial search was conducted to identify relevant key words, which were then collated using Boolean operators. The search terms used for each database were "attrition", "dropout", "drop-out", "medical students", and "factors". These were used consistently across databases to ensure continuity and reproducibility. Once duplicates were removed, there were 81 articles screened using their titles and abstracts. There were 53/81 studies excluded at this stage due to unsuitability of the topic or lack of relevance to attrition. The remaining articles were reviewed for suitability, with 10/28 excluded on close review as having inadequate sample sizes or inappropriate study design. The specific exclusion criteria for each of these steps is shown in **Figure 1**. One other article was later included on recommendation, making a total of 19 articles included for detailed review.

RESULTS

Study Characteristics

The majority of studies (excluding reviews) were conducted in Europe (11/19), with fewer in the Middle East (2/19), Australia (2/19), Asia (1/19), South America (1/19), and Africa (1/19). Most articles were either cohort studies (8/19) or cross-sectional studies (8/19), with fewer literature reviews (3/19) and longitudinal studies (2/19).

Personal Variables

Mental health

Mental health problems were found to be significant factors resulting in attrition in a small number of studies (5). Adhikari et al. found Nepalese medical students had a higher prevalence of psychosomatic disorders than the general population, with higher levels of depression and anxiety in a sample of 343 students [9]. These findings were consistent with other populations of students demonstrating psychosomatic presentations. In Dubai it was shown high rates of psychiatric stress in 103 medical students [10]. This was also supported by the study in [11], which found similar results in a population of 192 Iranian medical students, with high levels of psychological distress. Both studies in [9, 11] found that gender and level of training impacted the level of psychological distress. Both demonstrated higher rates of psychological distress in females during pre-clinical training [9, 11]. The presence of mental health issues as a cause of attrition in three different populations from developing and developed countries is consistent with this being a factor influencing attrition in a minority of medical students. Yates found attrition in later years was largely due to mental health issues, with 40% of the attrition in final year students due to recurrent mental health problems [12]. However this was not a major influence in the attrition of first-year students, none of whom cited mental health issues as a reason for their departure from study [12]. Whilst at first the
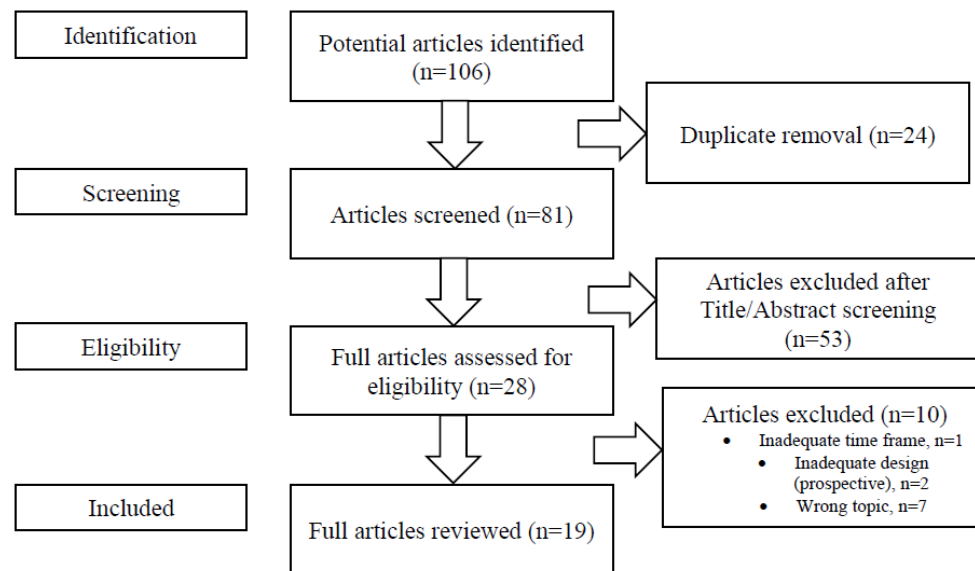
Figure 1. PRISMA flow chart for the selection of articles (Source: Author's own elaboration)

results from [9, 11, 12] seem contradictory, with the latter demonstrating higher levels of psychological distress in earlier training, this difference could be attributed to the cumulative negative effects of mental health leading to later attrition, or to the different populations studied.

Academic failure

In a group of 639 students from Aarhus University in Denmark, it was found students' grade point averages as a measure of academic success were predictors of attrition [13]. This was particularly if the student received low grades in their first year of study [13]. Other studies in Ireland, USA, Australia, UK, Netherlands, and South Africa, with a total of 92,395 subjects corroborated the strong link between academic failure and student attrition [1, 4]. Studies from Ireland [1], Denmark [13] and literature reviews involving 91,616 individuals from multiple countries [4] demonstrated consistent findings across populations. This consistency between geographically and ethnically dissimilar study populations strengthens the validity and generalizability of these findings. Yates found that the highest contributor to increased attrition rates across all cohorts at the University of Nottingham in the UK was academic failure [12]. This was the second largest contributing factor to attrition of first year undergraduate medical students [12]. It was found the highest contributor to attrition overall at the University College Cork in Ireland occurred due to academic difficulty or failure [1].

Socio-demographic variables

The majority of studies accounted for, or investigated, the impact of sociodemographic variables on student attrition. Most articles that did so found a positive correlation

between gender and dropout [4, 14]. Women were significantly more likely to cease study than men–33.3% versus 21.1% in a population of 709 Portuguese students, the majority (67%) of whom were women [5]. However, the study in [15] found that female undergraduate medical students performed significantly better academically than their male counterparts consistently throughout their course, with the higher academic performance not preventing the reduced attrition in these women. Evidence showed variable results for the impact of age upon entry, with reviews demonstrating inconsistent and generally low level evidence for the effects of age on attrition [4]. However, in an Austrian study, age (and other variables) did affect attrition with older students admitted without passing an admissions test being more likely to cease study [14]. Results for the impact of ethnicity were also variable [4, 14]. Notably, Maher et al. found that international students from Kuwait and United Arab Emirates studying in Ireland were more likely to cease study than Irish and European students [1].

Personality

Three papers investigated personality traits that were most likely to lead to attrition using a range of questionnaires including the NEO five-factor inventory [16]. One study identified that successful students were most likely to be described as ambitious and conscientious, concluding that a student's motivation was a key factor in their decision to stay in medical school and complete medical studies [16]. Another study investigated the impact of personal motivation on attrition, also finding a positive correlation between level of motivation (assessed using a variety of questionnaires), and retention [7]. A review showed some psychological elements such as personality type were

relevant, but concluded that these were generally not agreed upon, and no single significant psychological or personality trait was useful in determining attrition likelihood [4].

Moral distress

Moral distress is defined as when students were constrained from instigating the morally correct response in an ethically challenging situation. This was examined as a cause for attrition in one study, which found the majority of medical students in their study had experienced a morally distressing event and suggested that this created a cumulative effect leading to attrition [17]. This study was conducted using a sample of 217 students from the Technical University of Munich and was specific to medical students with experience in palliative care, limiting the generalizability of the findings.

Health and family issues

Health and familial issues were often mentioned in studies, although only one study investigated the impact of this. Yates found that health and family problems were the third largest cause of drop-out in first year medical students [12].

Participation and help-seeking behaviors

The study in [5] found that students who had lower participation in class as rated by their teachers, were significantly more likely to dropout. The study in [18] found that struggling medical students who attended voluntary meetings had a higher chance of completing their first year of study.

Institutional Variables

Learning environment

The impact of the learning environment on attrition was investigated in 4 of the studies reviewed here. In 2019, it was found that teacher issues, such as specific expectations of their work and students, significantly influenced attrition [7]. They suggested that changes to the learning environment, for example introducing blended learning or flipped classrooms, would improve the rate of retention [7]. Flipped classrooms involve students watching lectures/tutorials in their own time, with classroom time used for hands-on, interactive, personalized learning. Another study found that student completion of a course was improved by implementation of software designed to create an objective-driven dynamic learning environment [19]. It was suggested changes to the learning environment, such as smaller groups to improve relationships between students and teachers, would improve students self-confidence, and

by extension reduce attrition [20]. Two reviews also assessed the impact of curriculum type on attrition [4, 7]. These two reviews reported that inclusion of problem-based learning curriculum planning, and longer course duration resulted in reduced attrition rates compared to shorter, lecture-based curricula.

Admission tests and selective procedures

Six studies evaluated the impact of admission tests and selective procedures on attrition rates in universities. Kraft et al. found that students admitted using selective procedures were more likely to pass their examinations on the first attempt and took less time to do so [6]. They also showed the introduction of admissions testing reduced the percentage of students who ceased study prematurely [6]. This finding was also supported by other studies [14, 21], supporting the generalizability of this finding across cultures. Two studies investigated the impact of admissions testing on gender, finding that whilst open admissions favored admitting women to the program, admissions testing tended to favor admitting men [6, 14]. It was also found that the introduction of selective procedures reduced the effect of sociodemographic variables on attrition rates [14]. However, the study in [12] identified that interviews conducted with students prior to their entry as part of a selective process were not able to identify those students who would go on to cease study due to mental health issues. The undergraduate medicine and health sciences admission test, used in Australia until 2019, had an uncertain value in admissions testing [15]. These studies indicated interviews may still provide a selection method for communication skills that support medical students in their studies and provide a protective factor reducing attrition [15]. The study in Australia [23] also suggested a portfolio assessment as a predictor of success within clinical placement. This may provide a use for medical schools by inclusion within admissions testing.

Tuition fees

One German study investigated the direct impact of tuition fees on attrition and found that there was no significant relationship between cost of the program and likelihood of students ceasing study prematurely [23]. Three other studies commented on the impact of financial stress as a variable affecting attrition, although this was not linked directly to tuition fees [1, 11, 20].

Academic policy

One study found inclusion of an academic dismissal policy, where students with low grades were discontinued after the

second year of study, did not lead to early dropout [18]. Further studies of this variable have not been published, and effects of discontinuation in different cultures remain largely unknown.

DISCUSSION

This review identified 19 recently published articles that were relevant to examining the causes for attrition of medical students. The major problems resulting in medical student attrition are related to personal and institutional variables.

Personal variables such as mental health, particularly depression and anxiety, were identified in most studies as being relevant to attrition. However, few papers studied the direct impact of mental health on attrition. There were 3/19 analyses that were cohort studies using quantitative methods, and another 11/19 analyses used retrospective data. All of these papers were largely unable to identify the underlying reasons for this stress or did so only on a superficial level with no qualitative input from the sampled populations. Interestingly, these results were consistent over the time frame of the current review. Due to the changing nature of the educational context caused by global events and technological advancements, it is important to understand the most relevant variables to attrition. These could potentially improve

(1) our ability to predict variables that may change as societal influences vary and

(2) the cultural shifts influencing these variables.

This suggests further studies with qualitative data collected would assist this understanding.

Academic failure was also widely studied as a contributing variable and was shown to be important for attrition. There was a divergence in findings of the impact of personality on academic failure between the beginning and end of the decade. This could indicate the influence of cultural and temporal differences on the effect of this variable on a student's decision to cease their study. This further emphasizes the need for a stronger framework and continual research and reviews of this topic.

Other potential personal factors, including moral distress, personal health issues, family issues, participation, help-seeking behaviors, and sociodemographic variables, were identified as significant in a range of studies. There is clearly a complex relationship between these variables, and no study completed in the time frame of this review examined the inter-relatedness of these different personal variables.

The studies also largely failed to provide deeper reasoning for these. Such insights could have been achieved through in-depth interviews with the populations sampled. Whilst these interviews are markedly more costly and time-consuming than surveys, and less generalizable due to the practical need for smaller sample sizes, it would provide much greater insight into how these variables influence attrition individually and through interactions between them.

Institutional variables identified as contributing to attrition included learning environment, admission tests, selection procedures, tuition fees, and academic policy [6, 7, 18, 23]. Most studies investigated the relationship of attrition with admission tests, selection procedures or demographic variables. However, relationships between these variables were not studied. It is important to identify these multi-dimensional relationships between variables in order to create a framework to understand why medical students cease study prematurely. Changing policy and culture are likely to influence one or multiple variables, which may have a ripple or cumulative effect through its relationships with other factors and eventually lead to a students' decision to cease study of medicine. A stronger understanding of the relationship between university policy and culture would benefit interventions such as improving support systems conducive to maximum engagement [7]. It was found that interviews conducted with students prior to their entry were unable to identify students who were likely to cease study [12]. Current selection procedures aimed at reducing attrition are not currently as effective as possible. A stronger foundational framework for understanding reasons students experience the variables identified by the studies reviewed in this paper would contribute to improving the efficacy of such procedures.

Attrition of medical students is of great importance in the wellbeing of both students, universities, and the general population. The 19 studies reviewed in this paper all identified potential variables for attrition of medical students from their courses. These included personal variables, such as the mental health of students, and institutional variables, such as the learning environment. Many of these variables were consistent across the countries included in these studies. However, few of these studies examined the relationships between these variables, and many were limited to simply reporting quantitative data. This potentially limits the efficacy of solutions targeting one single variable as opposed to a range of inter-related variables. For an appropriate framework to be developed to reduce rates of attrition, the reasons that certain variables

have an impact, and their inter-relatedness, must be well understood. This will also allow the framework to be flexible as the context in which such research takes place continues to shift. Further, such a study would improve the predictive value across different contexts. Further research should focus more on the potential relationships between variables using a qualitative design, to create a strong theory with a well understood network of inter-connected variables. This will allow for a strong predictive value for attrition of medical students in order to create efficient solutions to this issue. It is of great importance to improve this framework, to ensure that the experiences of current and future medical students and teachers within the education system can contribute to the successful completion of their study. This will reduce economic costs to the universities and society where applicable, reduce the negative psychological and financial stress of attrition on students and their families, and will strengthen the health workforce.

Many of the studies reviewed were limited in their applicability by their design. Cohort studies often used limiting methods such as surveys that did not allow for qualitative responses. This meant that they could not provide possible mechanisms for the impact of these variables on attrition. Many studies also used retrospective data, which also limited detailed understanding of the underlying causes of attrition. Whilst these studies were successful in identifying the contributing variables to attrition of medical students, and making these results generalizable, few were able to examine the underlying causes of these variables in a qualitative way. The present review was limited to online databases in a defined timeframe using studies in English. The databases used are well regarded academically, and the time frame was chosen to be of most relevance to English speaking universities. The search terms were aimed at finding the most relevant studies, based upon prior assessment of their utility. The search terms were kept as general as possible, and Boolean operators were used to ensure that the search terms would target as much of the relevant literature as possible.

Overall this review demonstrated the importance of assessing qualitative and quantitative variables in optimizing study retention rates. Attention to individual and institutional issues could potentially reduce the personal, community and educational costs of attrition.

CONCLUSIONS

The present study found that certain individual characteristics were more likely to lead to medical student attrition including gender, migrant status, diagnosed mental illness and background. Institutional variables including learning environment, fees, and policies all also contributed to attrition. However, admission tests and selective procedures were a protective factor to mitigate the effect of other institutional variables. Some factors appeared to have varying effects over the course of the degree, for example as the gender disparity in psychological distress was higher in pre-clinical years. The present study was limited by the limited qualitative information available to allow for deeper understanding and a lack of standardised definitions for any variable or study program discussed. In synthesising the literature, the individual variables investigated by individual studies can be conceptualised as an interconnected web. Future studies would benefit from investigating the relationships between these variables, as well as the differential contribution of these factors across the course of the study program. The presence and contributions of additional protective factors should also be investigated, incorporating an understanding of this host of variables as targets for interventions.

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