Postbaccalaureate Premedical Programs: A summary of the published evidence

Research Highlights
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Purpose: Over 200 US Postbaccalaureate Premedical programs help students enhance their academic preparation and complete premedical requirements for medical school. One third (37%) of the programs include students from groups underrepresented in the health professions and/or students from economically or educationally disadvantaged backgrounds; 18 programs have explicit diversity-based missions. Through a systemic review of published data, we sought to understand: 1. How successful Postbaccalaureate Premedical programs are at matriculating disadvantaged (DA) or underrepresented in medicine (URM) and non-DA and non-URM graduates into medical school; 2. How program graduates perform in medical school; 3. Are program graduates more likely to practice primary care or in an underserved community?

Approach/Methods: A full-text strategy was designed with a librarian using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis. We searched seven electronic databases and manually reviewed five journals with particular relevance to medical education. The search yielded 2,257 unduplicated articles. Inclusion criteria included: (1) Postbaccalaureate programs, (2) focus on medical school applicants, medical graduates, or practicing physicians, (3) control or comparison group, and (4) outcomes of interest regarding practice in primary care or underserved communities, matriculation of DA/URM students, matriculation into medical school after prior rejection, or academic performance in medical school. Of the identified articles, 14 articles met all criteria with full text available.

Results/Outcomes: Most studies were small, enrolling less than 500 participants and in many cases less than 50. The studies usually reported data from a single institution (n=12). The interventions components such as Medical College Admission Test (MCAT) preparation, summer intensives, and mentoring were inconsistently reported; intervention intensity was also difficult to ascertain. The outcome measures reported include: improved application quality (e.g. GPA, science and math mastery) (n=5), matriculation to medical school (n=9), performance in medical school (n=6), diversity in medical school (n=8), primary care specialty (n=4), and practice in underserved communities (n=4).

Discussion: Postbaccalaureate programs have potential to make significant contributions to the social mission of medical schools. Indeed data from the Association of American Medical Colleges (AAMC) suggest that 14% of U.S. matriculants to Liaison Committee on Medical Education (LCME) accredited medical schools participated in a nondegree postbaccalaureate program. Currently available research, however, provides insufficient details on each programs intervention and the contextual factors to aggregate lessons and amplify impact. Without these details, it is difficult to ascertain the mechanisms by which programs impact desired outcomes.

Significance: Postbaccalaureate Premedical programs are important pathways for diverse applicants, career changers and premedical applicants seeking to enhance their academic preparation for medical school. Shared evaluation and common metrics between programs may facilitate continuous program improvement and future outcomes research.
Perceptions on the Value of Character Strengths Among Medical Students, Residents, and Faculty

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Purpose: Only one study has evaluated which character strengths are considered important in the medical profession and which strengths are possessed by medical trainees and practitioners. This study from the United Kingdom found significant differences between students and physicians in one of 24 strengths, humor. There has not been a study that evaluated character strengths in students and physicians at a US-based health care system. Because character can be influenced by surroundings and circumstances and because character can be taught, it is important to determine desired character strengths as well as measure effects medical education has on these strengths.

Methods: We conducted a cross-sectional study on the perceived importance of character strengths in the ideal physician and those possessed by the respondents. We compared responses between four different stages of medical education; 1st year medical students, 4th year medical students, 3rd year residents, and faculty in practice at least 5 years. The study was based on previous work reported in the Virtuous Medical Practice study conducted in the United Kingdom. Two questions were modified from the Virtuous Medical Practice report. These asked participants to rank the top 3 strengths from a list of 24 from Values in Action Inventory of Strengths (VIA-IS). Participants ranked the top three strengths of the ideal physician (Ideal Strengths) and ranked the top three strengths they themselves possessed (Self Strengths).

Results/Outcomes: Of 470 responses there were 75 M1s, 59 M4s, 47 PGY-3s, and 289 Faculty. When comparing all groups, 7 strengths were statistically significant (Creativity, Honesty, Hope, Judgement, Leadership, Social Intelligence, Zest). M1s vs Faculty showed 5 significant strengths (Honesty, Hope, Judgement, Leadership, Social Intelligence). M4s vs Faculty showed 2 significant strengths (Judgement, Leadership). PGY3s vs Faculty showed 1 significant strength (Zest).

For Self Strengths, all groups showed 3 significant strengths (Judgement, Kindness, Leadership). M1s vs M4s showed 1 significant strength (Kindness). M1s vs Faculty showed 2 significant strengths (Kindness, Leadership).

Responses were ranked to determine if differences existed between the groups in how they ranked their answers. For the Ideal Strengths and Self Strengths 3 significant strengths were found (Honesty, Judgement, Leadership), with Self Strength showing an additional significant strength (Fairness).

Regarding Ideal Strengths, M1s vs Faculty showed 3 significant strengths (Honesty, Judgement, Leadership). M4s vs Faculty showed 2 strengths (Honesty, Judgement). PGY3s vs Faculty showed 3 strengths (Judgement, Leadership, Zest).

For the Self Strengths, M1s vs M4s and M1s vs PGY3s each showed 1 strength (Leadership) while M1s vs Faculty showed 7 significant strengths (Bravery, Fairness, Gratitude, Judgement, Kindness, Leadership, Love). M4s vs PGY3s showed 1 strength (Judgement). M4s vs Faculty showed 2 strengths (Fairness, Judgement).

Discussion: Results show significant differences in how each group values character strengths. The largest difference in both Ideal and Self Strengths is between M1s and Faculty with 17 significant differences in contrast to 6 for M4s vs Faculty and 4 for PGY3 vs Faculty. This may be associated with admissions policy differences or possible effects of the education system itself as the number of significant strengths declines with each group as education proceeds. Additionally, the strengths that were most significant included Leadership (12), Judgement (11), and Honesty (6), Kindness (4) with the remaining 8 strengths having 3 or less occurrences in each category. This may reflect that the admissions process has changed regarding these strengths or that the current education system has
the greatest effect on changing how students and faculty value these four strengths in particular.
Multi-variate analysis to identify factors affecting multiple mini-interview performance

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Purpose: There has been a recent increase on the focus of professionalism and communication skills as part of the evaluation for medical school admissions. Coincident with this shift in emphasis, many medical schools have moved to multiple mini-interviews (MMI) to better assess non-cognitive skills. The objective of this study is to determine the factors affecting MMI scores.

Methods: In the decision to invite students to interview, 13 independently scored file review variables (including: undergraduate GPA; MCAT scores; clinical exposure; letters of recommendation (LORs); service record; research experience; and leadership activities) and 15 personal characteristics (such as gender) were considered.

We utilized a 7-station circuit, single-rater-station MMI setup to interview 587 applicants. Station interactions were scored by raters from five backgrounds: clinical faculty, basic science faculty, medical students, administrative staff, and community members. Station prompts included topics such as journey-to-medicine, teamwork orientation, and cultural competence. Responses were recorded using a 1-5 integer scale, low-score-best-response scoring system.

Multiple linear regression was used to fit models between MMI composite scores attained by candidates and potential admissions variable predictors of performance. In each case, variables were selected that reduce the Bayesian Information Criterion (BIC). The GLIMMIX procedure from the SAS statistical software (version 9.4) was used for fitting models.

Results: When treating the 13 components of the file review score separately, only Leadership and LORs were kept in the final model, while gender was the only student characteristic kept in the model; all other file review components and candidate characteristics were not associated with MMI score, nor did they improve the model fit. Better performance on the MMI was significantly associated with higher scoring LORs (slope = -0.04, SE = 0.02, p-value = 0.015). Leadership did not have a significant relationship with MMI score (slope = -0.03, SE = 0.01, p-value = 0.053). Gender had a significant association with MMI score (p-value = 0.003), with female students having higher performance MMI scores (difference = -0.12, SE = 0.04) than male students.

In a separate analysis, the sum of file review experiential components was used as a metric, and only this total, best MCAT score, and gender were kept in the final model; none of the other applicant characteristics were associated with MMI score, nor did they improve the model fit. The experiential point score total was not significantly associated with MMI score (slope = 0.00, SE = 0.01, p-value = 0.144). Best MCAT score was significantly and positively associated with MMI score (slope = 0.01, SE = 0.005, p-value = 0.016), implying an inverse relationship between best MCAT score and higher ranking MMI performance.

Discussion: The purpose of incorporating the MMI into the admissions process is to standardize directed assessment of non-cognitive candidate competencies that relate to pre-professional readiness. It is not surprising that these difficult-to-ascertain qualities are only minimally associated with aspects revealed on
the application. This disconnect is particularly telling with respect to academic preparedness as measured by best MCAT score, since we find that better MCAT scores are inversely related to MMI performance. The much more qualitative metric of LOR scoring, however imperfect, was, in contrast, a better predictor of the non-cognitive competencies that the MMI seeks to assess.

**Significance:** Our analysis bolsters our confidence in the MMI assessment process as a whole, since it is clear that it measures a different set of core competencies that are outside of academic preparedness and experiential immersion. These findings speak to the complexity of candidate evaluation while underscoring the importance of holistic review procedures that try to incorporate multiple angles of assessment to match the right candidate with the right institution.
Validity evidence for using the Situational Motivation Scale to assess pre-clerkship medical student motivation

Research Highlights
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Purpose: Motivation is of particular concern in education. When learners are motivated they try harder to understand, process information at a deeper level, and are more apt to apply what they’ve learned to novel situations [1]. Although scales assessing motivation toward education exist, no studies have sought validity evidence for their use in a pre-clerkship medical school context. The Situational Motivation Scale (SIMS) is a 16-item instrument informed by self-determination theory and supported by validity evidence for its use within psychology field and laboratory settings [2]. Our objective was to gather psychometric validity evidence for the use of SIMS to assess the constructs of intrinsic motivation (IM), external regulation (ER), identified regulation (IR), and amotivation (AM) in pre-clerkship situational and short-term student contexts.

Methods: Situation and short-term versions of SIMS were administered to n = 156 students (82 M1s and 74 M2s on two separate occasions) at the Frank H. Netter MD School of Medicine. We gathered five sources of construct validity evidence typically sought to support the link between an instrument’s scores and its intended construct [3]: ‘Content’, review of grammatical changes by content experts; ‘Response Process’, derived from six focus groups of n = 7 learners; ‘Internal Structure’, represented by Cronbach’s, factor analysis, and internal correlation analyses; ‘Relationship to Other Variables’, correlational analyses to three other pertinent instruments (Multidimensional Crowworker Motivation Scale, Academic Motivation Scale, and Maslach Burnout Inventory-Student Survey); and ‘Consequences’, as reviewed by learner and faculty stakeholders.

Results: Item wording was slightly fine-tuned following the initial focus group; experienced medical educators familiar with self-determination theory were consulted to ensure content validity. Response process evidence indicated good learner comprehension of the 16 items and that survey administration was not burdensome. Internal consistency revealed acceptable Cronbach’s values: situational and short-term IM (0.98 & 0.98), IR (0.98 & 0.82), ER (0.95 & 0.99) and AM (0.93 & 0.91). SIMS exhibited further construct validity as evidenced by internal and external correlational analyses; correlations coefficients among the four subscales reflected theorized simplex-like patterns for both contexts. Factor analysis found appropriate factor loading. Lastly, no appreciable direct consequences or potential harms were identified that could impact future pre-clerkship learners who opt to complete or not complete the SIMS instrument.

Discussion: Learner motivation in medical school is influenced by opportunities and challenges derived from students interaction with the curriculum. The will to go forward and transition productively from engagement during face-to-face learning events (e.g., lectures) to subsequent durative, self-directed learning (e.g., studying) calls for motivation in both situational (here-and-now) and short-term (brief, transitory period) contexts. Listed on a continuum, self-determination theory recognizes the constructs of intrinsic motivation, extrinsic motivation, and amotivation [4]. Intrinsically motivated students learn because they enjoy it or get a sense of accomplishment from learning. Students seek self-directed competence if their levels of intrinsic motivation are strong enough to engage them in effective learning strategies [5]. Extrinsically motivated students are moved by grades or other rewards [5]. Amotivated students are disengaged and consciously choose to reject many learning opportunities; a situation similar to learned helplessness where the individual experiences feelings of incompetence and uncontrollability [5]. This study found that there is strong validity evidence for the use of SIMS to measure these constructs in pre-clerkship medical students. Limitations of this study include that data has only been collected from medical students at one U.S. institution and that SIMS is a self-reported measure of motivation.

Significance: Motivational pedagogy is an emerging teaching framework that endeavors to minimize disengagement and instead promote intrinsic learner motivation. SIMS represents a useful tool for evaluating pre-clerkship curricular design and its impact on students towards this end.