REVIEWS

A Review of Remediation Programs in Pharmacy and Other Health Professions

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The Accreditation Council for Pharmacy Education (ACPE) Accreditation Standards and Guidelines 2007 states that colleges and schools of pharmacy must have a remediation policy. Few comparative studies on remediation have been published by colleges and schools of pharmacy, making it challenging to implement effective and validated approaches. Effective remediation policies should include early detection of problems in academic performance, strategies to help students develop better approaches for academic success, and facilitation of self-directed learning. While the cost of remediation can be significant, revenues generated either cover or exceed the cost of delivering the remediation service. Additional research on remediation in pharmacy education across the United States and abroad is needed to make sound decisions in developing effective policies. This paper provides a review of current practices and recommendations for remediation in pharmacy and health care education.

Keywords: remediation, cost/benefit analysis, assessment, learning skills

INTRODUCTION

Six to fifteen percent of health professions students experience academic difficulties and these percentages are increasing.^{1,2} Poor academic performance and scholastic failure can result in student's dropping out of professional programs while still responsible for the large debts incurred. Many of these students are from under-represented groups, leading to a system where health care providers are not representative of the populations they serve, which further exacerbates existing economic and health disparities.³ Although most faculty members feel a sense of commitment to helping their students succeed, some feel that academic progression is the students' responsibility and that faculty members should not have to remediate students at the graduate or professional level.

The problem is not limited to the health professions; the prevalence of academic difficulty in higher education is staggering. The National Committee on Excellence in Education reports that although more students are enter-

ing college, more of them are not progressing.⁴ Almost 30% of college freshman need remediation in reading, writing, or arithmetic. In the community college system, approximately 50% of students receive remediation even though academic standards may have been lowered in an attempt to promote students. The Department of Education is concerned about our current educational system and this "rising tide of mediocrity."⁴ Colleges and schools of pharmacy expect their students to perform as adult self-learners, but substantial evidence suggests that adequate skills are not developed in earlier years.⁵ Consequently, some students have difficulty with the required pharmacy curricula.

Educational remediation is the act of providing a remedy to a problem or a process to correct an academic fault or deficiency. In the ACPE Accreditation Standard 2007, Standard 19 states that schools must have a remediation policy.⁶ ACPE emphasizes the need for a consistent approach, early detection, and formative assessments to provide more information regarding academic success. Many schools offer formal tutoring programs, allow students to repeat classes, or hold summer sessions to remediate course work. The purpose of this manuscript is to provide

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a broad review of the remediation literature and offer recommendations for policies and procedures to assist colleges and schools of pharmacy in the development, implementation, and assessment of the effectiveness of remediation plans. Since data in the pharmacy literature are scarce, much of the discussion is based on findings in undergraduate education and in medical and nursing programs. The information in this manuscript was based on a search of the education and health education literature databases, primarily using the EBSCOhost (EBSCO Industries, Inc, Birmingham, Alabama) search engine which contains 46 different databases. The search criteria were literature published in the last 25 years containing the keywords: *remediation, boot camp, retention, progression, attrition, academic success, supplemental instruction, high-risk students, learning skills, or progress tests*. The literature includes few comparative studies evaluating the effectiveness and outcomes of remediation programs, therefore, papers were selected based on their perceived adaptability to pharmacy education. The first section of the manuscript discusses the need for maintaining high academic standards, the progression policies that assure these high standards, and the consequences of failing to meet these standards. The second section summarizes preventive measures, including admission standards, academic assistance programs, and early detection strategies. The third section focuses on remediation approaches, including repetition of courses and the development of individualized remediation plans. The fourth section examines the associated costs and benefits of remediation and the fifth section addresses assessment of remediation efforts.

ACADEMIC PROGRESSION

Academic progression standards tend to be higher in professional programs than in undergraduate programs. Colleges and schools of pharmacy require students to meet a minimum cumulative grade point average (GPA) or course letter grade to progress. However, these numerical evaluations capture only one aspect of academic standards, and additional consideration for content validity is also needed. Academic standards should address the breadth, depth, and complexity of the material being assessed.

Progression Policies

Progression policies among colleges and schools of pharmacy share many similarities and are intended to preserve the high academic standards dictated by the profession. Progression policies dictate when a student cannot proceed in the curriculum and must either remediate, repeat a section of the curriculum, or be removed from the program. In this paper, didactic progression in-

cludes progression policies for students who fail courses that do not involve experiential learning and are taken during the first few years of the program. Advanced practice progression is dictated by policies that usually affect the final year's experiential learning.

Didactic Progression

In some schools, students receiving a "D" or "F" are placed on academic probation. The students are usually allowed a specified timeframe to correct the deficiency. If this does not occur, the students proceed to academic suspension or are dismissed from the program. Alternatively, some schools offer reduced course loads and other individualized remediation plans to address specific academic deficiencies of students. These programs are described in additional detail in the subsequent section on remediation approaches.

Advanced Practice Progression

The advanced practice progression model at St. Louis College of Pharmacy is typical of many schools. Any student who receives a grade of "Not Pass" for a rotation must meet to develop a plan for remediation before the next experiential assignment. A student receiving 3 "Not Passes" in APPEs is subject to dismissal from the college.

Drake University College of Pharmacy uses a competency model for progression. Students are not given a grade for each APPE, but instead are scored on each competency. The entire APPE year utilizes a continuous assessment process in which students receive individualized feedback from practitioners at the end of each APPE. The goal of the year is to achieve and maintain a 4 on a 5-point Likert scale in each competency prior to graduation. If at the end of the 8 APPE sequence, students are not yet achieving a level of competence required to graduate, an individualized remediation plan is developed to meet the required standard.

PREVENTIVE MEASURES

In addition to identifying students who are not progressing, colleges and schools of pharmacy can devise preventive measures to minimize the need for remediation. Common preventive strategies are summarized below and in Figure 1.

Admission Standards

One strategy for minimizing the need for remediation is to admit only the most highly qualified students to a pharmacy program. Characteristics that are accurate predictors of a student's success in the PharmD program include cognitive and non-cognitive traits.

Figure 1. Preventative measures to minimize the need for remediation.

Cognitive Traits

Prepharmacy GPA (especially math and science), prior attainment of a 4-year degree, and Pharmacy College Admission Test (PCAT) scores can predict academic success in at least the first year of pharmacy school.⁷⁻¹⁰ Although the ability of the PCAT to predict academic success is highly variable, most studies demonstrated that the PCAT composite score and the PCAT subscores (biology, chemistry, verbal, reading comprehension) strongly predict (p -value ranging from 0.35 to 0.51) academic success in the first 3 years of pharmacy school.¹¹ The California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Dispositions Inventory also predict academic success during the first 3 years of pharmacy school, with the CCTST further predicting success on advanced practice experiences.^{12,13} PCAT composite and subscores have also been associated with success on the NAPLEX examination.^{7,11}

The current data support the use of traditional assessment tools and markers (PCAT, prepharmacy GPA) as part of the admissions process to predict academic success in didactic coursework. However, it does not guarantee success on clinical APPEs, which emphasize problem-

based learning.⁸ The current focus of pharmacy to provide patient care suggests that the admissions process should consider additional nontraditional markers to help identify students who can succeed as pharmacists.

Noncognitive Traits

In addition to traditional admissions criteria, the assessment of nonacademic qualities, such as motivation, professionalism, and responsibility, is important.¹⁴ Successful performance in the clinic is predicted by strong communication skills, self- and social awareness, self-control, and moral reasoning.^{12, 15} In 2007, 80% of colleges and schools of pharmacy interviewed applicants, with only 13% using structured interviews with predefined questions as a component of their interviews.¹⁶ Since the ACPE Accreditation Standards 2007 (Guideline 17.3) now require student interviews, a combination of traditional test admission tools (GPA, PCAT scores, prepharmacy math and science scores, reading comprehension scores) and nontraditional assessments (structured interviews and essay writing) provide an opportunity for colleges and schools of pharmacy to select the most qualified candidates, thereby minimizing the need for remediation.

Academic Assistance Programs

Academic assistance is often required at transition points from high school to undergraduate training and from undergraduate to graduate or professional training.¹⁷ Many students finish high school and enter undergraduate studies with inadequate reading, writing, and arithmetic skills.¹⁸ In addition, some students entering professional programs have an inadequate science foundation and lack appropriate behavioral aptitudes (eg, drive, motivation, inquisitiveness, curiosity). Therefore, academic assistance programs are designed to help students avoid academic difficulty and the need for remediation. During the 2006-2007 academic year, 90.4% of public and 61.4% of private institutions of higher education provided some type of academic assistance.¹⁹ These programs attempted to develop confident and motivated learners who can concentrate, manage their time, set goals, synthesize information from multiple sources, problem solve, develop strategies for studying and test taking, and perform self-assessment of their learning.²⁰⁻²⁴ Assistance programs vary along 2 dimensions, emphasizing either (1) correcting deficits to make more effective learners or (2) teaching content-specific skills and strategies.^{25,26}

Supplemental Instruction

Supplemental instruction is one of the most prevalent academic assistance programs in higher education, with programs in approximately 139 colleges and universities in the United States and 27 schools around the world. Supplemental instruction is a proactive support system developed to increase the academic success of students at the point of trouble instead of waiting until the end of the semester when it is too late. It is basically proactive remediation. The International Center for Supplemental Instruction at University of Missouri at Kansas City (UMKC) has collected data from 37 institutions, 1003 courses, and 119,009 students from fall 2003 through fall 2006. Overall, supplemental instruction students had: (1) a higher mean average GPA, (2) fewer D's, F's, and withdrawal grades overall in all courses, (3) higher grades in core classes, and (4) fewer D's, F's, and withdrawal grades in their major.²⁷

The supplemental instruction program at the University of North Carolina at Charlotte (UNCC), which was piloted in 1985, is typical of many university programs. UNCC hires students who have received A's in high-risk courses (one with a 30% failure or withdrawal rate).²⁸ UNCC targets high-risk courses, rather than high-risk students, because a stigma can be attached to students being assigned to supplemental instruction.²⁹ This small-group collaborative-learning environment builds self-confidence through praise for the process of discovery

as well as for producing correct answers. The supplemental instruction sessions do not re-teach course material, but emphasize thinking, reasoning, analyzing, organizing, problem-solving, and practical application of ideas using the language of the subject matter. The program has increased retention, and students who attend supplemental instruction have statistically higher grades compared to those who do not attend.²⁸

Learning to Learn in Pharmacy School Orientation

In a proactive effort to avoid difficulties arising from suboptimal learning and study habits, some professional schools have instituted programs to develop learning skills. At Auburn University, students undergo a week-long orientation that introduces them to the demands of the program and its approaches to learning. Students work in teams in a variety of activities that focus on assessment and self-assessment, study skills, a systematic methodology to address patient care problems, professionalism, use of learning resources, and self-governance. The efficacy of the process has not been evaluated, although it is modeled after the Pacific Crest Learning to Learn Camp, which is effective in aiding the retention of students at moderate but not high risk.³⁰

Deliberate Practice

Deliberate practice, another academic assistance technique, is characterized by training structured and adapted to the learner's level. Students practice repetition and feedback, exploring alternatives, problem solving, reflecting, planning, accessing resources, studying for understanding, learning from mistakes, and taking an achievement or competitive stance to their studies.³¹ Deliberate practice requires great effort, but skill and success increase, and the knowledge becomes transferable to other contexts.³² Training in deliberate practice is a central component of the problem-based curriculum at McMaster University.³³ The most significant indicator of the development of high levels of performance is deliberate practice.^{34,35} This hypothesis has been verified at Maastricht Medical School, where students who engage in deliberate practice are more successful than other medical students.³¹

Year-End Assessments, MileMarker, or Progression Examinations

The early detection of potential problems is essential for introducing timely interventions that may circumvent future remediation efforts. In addition to course grades, progress examinations are being increasingly employed as an assessment tool to measure knowledge and skills and can affect a student's progression in a program.

Progression examinations can be utilized in a variety of ways in an assessment program. Some examples are: benchmarking results of year-end examinations in comparison to other schools in the nation, determining progress, and (most relevant to the present manuscript) identifying students who would benefit from remediation.^{36,37} In a year-end assessment examination, the questions are either tied to a school's outcomes or directly to a course. This can help identify weaknesses or a loss of knowledge over time by students. The identified students can become candidates for remediation to help strengthen and recall their knowledge and equip them with missing skills. Out of 64 colleges and schools of pharmacy surveyed in 2006, 34 used some type of year-end assessment.³⁸ This number will undoubtedly increase due to the call for "periodic, psychometrically sound, comprehensive, knowledge-based and performance-based formative and summative assessments" in Standard 15 (Guideline 15.1) of the ACPE Standards 2007.⁶ Currently, the colleges and schools of pharmacy in Texas either administer a Year-End examination or are moving in that direction. (For more information on year-end examinations, consult one of the articles written by faculties from the Texas Tech University or University of Houston.^{36,39})

Other Early Detection Strategies

Other early detection strategies implemented by colleges and schools of pharmacy include GPA alerts and criterion blocks within a course. Although no comparative studies exist with regard to the effectiveness of these strategies, they represent logical approaches to early detection of students who are at risk for remediation. Several colleges and schools of pharmacy have GPA alert points that are different from the minimal GPA necessary to progress. For example, a school may require a minimum GPA of 2.2 to progress, but students receiving a GPA under 2.5 are sent to academic advising and counseling to address issues and circumvent major problems before they occur. The progression policy at the Pacific University of Oregon School of Pharmacy incorporates a modified block curriculum with a pass/no pass criterion for each block. A student scoring less than 90% on any biweekly examination on Fridays must return the following Monday for reexamination. One consequence of this policy is that students who are in trouble are identified quickly.

REMEDIATION APPROACHES

Remediation has not been widely studied in colleges and schools of pharmacy; therefore, existing information is derived largely from remediation efforts in medical, nursing, and liberal arts schools. For medical and nursing schools, most remediation occurs after students have com-

pleted their didactic courses. Remediation approaches described in this paper are summarized in Figure 2.

Course Repetition

Many colleges and schools of pharmacy use course repetition as their remediation plan. Students are required to repeat a course in which they received a D or F the next time the course is offered. Some schools offer only one chance to bring the grade up to an acceptable grade of C. If a student does not earn the appropriate grade, progression in the program can be stopped. Although this is common practice, it is most effective for students who do poorly in 1 or 2 courses due to extenuating circumstances. There are no data to suggest that this method is effective in remediating students with learning issues.

Individualized Remediation Plans

The alternatives to course repetition entail the development of a multifaceted remediation plan tailored to the individual needs of the student. The following sections provide examples of remediation approaches that can be applied from early stage pharmacy students to practicing pharmacists.

Student Directed Remediation. Remedial education has the greatest impact on the learner when it is individualized, highly interactive, and delivered in a meaningful context.⁴⁰ During an in-depth interview, instructors can determine prior knowledge, motivation, and interest in the subject matter to develop a remediation plan.²⁰ Some of the approaches that have been used include: having students review their taped standardized patient examinations and identifying areas that need improvement⁴¹ and interviewing students about possible test-taking anxieties.⁴² In the Peer Assessment Program in Ontario, physicians guide other physicians through chart review to identify areas for improvement and formulate a remediation plan.⁴³

Summer Restudy Programs. Many colleges and schools of pharmacy utilize summer restudy programs as a remediation alternative to course repetition. A major advantage of this option is that successful completion allows the student to rejoin the class in full standing at the start of the next academic year. The structure of the summer restudy program varies between schools and ranges from self-study of course materials followed by retaking of examinations, to more structured programs with assigned readings, assignments, practice problems, and discussions with the course instructor. Due to the smaller numbers of students engaged in summer remediation, the approach tends to be more individualized and amenable toward addressing non-cognitive issues that affect performance (eg, time management, test anxiety)

Figure 2. Using remediation instead of course repetition: approaches and assessment.

and learning issues (eg, deficiency in a particular scientific area).

Reduced Load Program. One of the remedial approaches adopted at Indiana University School of Medicine in 1973 is a reduced load program. Students qualifying for this program are allowed 2 years to complete their first year. The program is designed to provide an alternative to dismissing students facing academic difficulty after they start their required course work. The program objectives are to provide academically weak students an opportunity to develop competence, self-esteem, and study habits, while continuing their program of study. Students are placed in the reduced load program based on the reason for the course failure, the student's past academic performance and the record of progress of other medical students who graduated from the same undergraduate institution. Once students are enrolled in the program, they are directed to specific faculty members and/or peer tutors to address deficiencies in targeted subject areas. Their schedules are maximized to strengthen their science foundation and enhance their study and time management skills.⁴⁴ A few colleges and schools of pharmacy utilize reduced load programs that allow students to complete 2 academic years over a 3-year period. Com-

bined with counseling, this may be more effective than course repetition, but thus far no research studies have evaluated its effectiveness.

APPE Remediation

Many colleges and schools of pharmacy have implemented checklists to ensure that students are clinically and professionally competent in APPEs. The process is similar to medical schools that use standardized patient care scenarios to enable faculty members to document the clinical competencies of their students.^{1, 41} Among 62 medical schools, competency examinations of students using standardized patients were used for: diagnosis of deficiencies, development of individualized remediation plans, and retesting of students (24 schools). Remediation plans vary and include individual performance reviews, practice with standardized patients, clinical observation and feedback, tutoring, and/or additional didactic work which require ongoing investment of faculty time and skills.⁴¹

Prelicensure Remediation

Since the National Council Licensure Examination-Registered Nurse (NCLEX-RN) passing rate is a criterion

that is used for accrediting nursing schools, many programs use the Health Education Systems, Inc. (HESI) Exit Examination to identify students in need of remediation prior to taking the NCLEX.^{42,45} At the College of Nursing at the University of Arkansas for Medical Sciences, all students receiving a failing grade on the HESI Exit Examination scored above 99% on the retake after remediation. During remediation, the student nurses take a practice examination and then discuss the difficult questions. This is followed by a lecture on the material, a case, and the development of a care plan. Lastly, students participate in a test-taking strategy session which assists them in approaching tests in a more organized, logical, and thoughtful manner.⁴²

Clinical Practice Remediation

Medical schools report difficulty in identifying students with academic deficiencies in the clinic because many medical students do rotations with clinicians who are not trained as teachers and lack the time to address issues due to patient or research demands.⁴⁶ Some of these students graduate and do not undergo remediation until they are licensed providers making costly mistakes. Approximately 30%-40% of physicians participating in remedial professional development programs improve their performance, as determined through peer review.⁴⁷ Remedial professional development programs are individualized in content, objective, number, type and duration, and "tailored to the specific needs and limitations of each physician" with regard to their knowledge base, clinical judgment, and/or specific skills.⁴⁷

In a successful intervention program, physicians who were rated poorly in their clinical skills were required to meet with a peer assessment committee. At the end of the meeting, the physicians were given a report of the findings and educational materials and provided with follow-up sessions for 9-12 months. Later evaluations of these physicians show sustained improvement for more than 6 years.⁴³

COSTS AND BENEFITS OF REMEDIATION

Colleges and schools of pharmacy are faced with financial issues when dealing with remediation of students. One solution is to charge students for remedial coursework, which would help offset costs such as faculty and staff time as well as resources needed to administer remedial courses. In the absence of cost-effectiveness data in health care education, we can only examine the undergraduate literature, which suggests that the benefit of remedial coursework exceeds the cost of delivering remedial services.⁴⁸ Approaches such as remedial tutoring by peers, directed or independent study for remediation, or the use of technology could reduce the cost of

delivering remedial instruction even further. Considering that the biggest cost associated with remedial courses is incurred from faculty time, some suggest a direct payment to faculty members as a way to incentivize them and garner their support for this process. While this is a valuable tool to encourage faculty members to take an active role in remediation, policies and procedures need to be in place to ensure an appropriate and fair process.

The immediate beneficiaries of remedial coursework are the students. This process provides added learning opportunities for students to enhance their success rate in the curriculum. A closer look at remediation suggests that benefits of this process go beyond the students alone. The educating institution reaps both immediate and long-term benefits. These benefits come from tuition revenue, contribution of the student to the campus culture and a broader alumni base who contribute back to the college in many different ways. As tuition plays an ever-growing role in the operating budget of academic institutions, many colleges cannot afford to lose 5% or more of their student body due to academic difficulties. A remediation process not only provides students maximal learning opportunities, it helps minimize significant tuition revenue fluctuations. A long-term benefit of a successful remediation process is a larger and more loyal alumni base that is more committed and willing to give back to the institution with money, time, or gifts in-kind. Finally, society benefits from a larger pool of productive pharmacists in the workforce when successful remediation programs contribute to graduating larger numbers of qualified practitioners.

The higher education system incurs significant costs to remediate unprepared students; however, it often only represents about 1%-2% of the total higher education budget. Additionally, revenue generated from remedial programs often covers the cost of providing these services.⁴⁸ A 1998 report of the Institute for Higher Education Policy estimated that remediation absorbs about \$1 billion of the \$115 billion budget of the public higher education system.⁴⁹ The ratio of remediation expenditure to the total budget varies considerably among states as well as segments of higher education. For example in Arkansas, a state with standards that mandate remediation for low performance on standardized tests, the cost of remediation in colleges and universities was 3% of the total budget for 1995-1996.

The 1998 Higher Education Policy report also contends that remedial education is more cost-effective and far less expensive for society than such alternatives as unemployment, low-wage jobs, welfare participation, and incarceration.⁴⁹ In another study of economic burden, costs incurred by Michigan businesses are estimated at an

average of \$601 million per year, taking into account lost productivity as well as costs incurred by the criminal and social justice systems when students leave high schools without adequate reading, writing, and arithmetic skills.⁵⁰

In a 2001 report, Saxon and Boylan reviewed contemporary literature on the cost of remedial education.⁴⁸ While the investigators warn against sweeping strategic decisions about delivery, modification, or elimination of remedial education based on this data, they recognize a couple of common findings among all studies. First, remediation costs are always in the range of 1%-2% of the overall cost of education. Second, revenues generated by remedial course work either fully cover or exceed the cost of delivering the service. Finally, the alarming finding of this study was that there is no ongoing research tracking growth and/or cost of remedial education.⁴⁸

Despite evidence suggesting that the cost of remedial education is easily absorbed by the revenue generated from its delivery, there is always an interest in reducing costs. One potential approach to ameliorate the cost of remediation is the use of technology. While there are no recent studies that investigated the use of technology, a 1981 Naval Academy study reviewed its computer-based, academic remedial training program. Both immediate and prolonged instructional benefits were identical, but in the cost analysis, the classroom approach was more cost effective than the computer-based program. However, the investigators realized that over the long run, the computer-based program might prove to be more cost-effective. More importantly, advancement and cost reduction in technology since 1981, especially transition from mainframe to personal computers, may make computer-aided remediation more cost-effective in this era.⁵¹

ASSESSMENT AND EVALUATION OF REMEDIATION EFFORTS

Remediation efforts must be evaluated to determine whether goals are being met, and assessed to make effective decisions to optimize and improve programs. This is important because there are no validated, turnkey models for remediation. The best assessment and evaluation plans should include an array of data that are drawn from both formative and summative assessments, which incorporate standardized as well as locally developed methods.⁵² There are 2 main areas in which the effectiveness of a remediation plan for colleges and schools of pharmacy can be evaluated: (1) preventative strategies to minimize the need for remediation, and (2) remediation approaches to correct deficiencies.

With regard to evaluating preventative strategies, several factors can be examined. First, what preventative strategies are being used by the school to minimize the

need for remediation? Second, among those strategies employed, are the most relevant features being examined? For example, when assessing and evaluating admission standards, are both cognitive and noncognitive traits that are important and predictive of the success of pharmacy students and practitioners being considered? Third, what is the evidence that these measures are effective? For example, are standardized test scores or GPA requirements good predictors of success in different stages or aspects of the program? The use of different sources of assessment data can generate converging lines of evidence to provide a more complete picture of whether the preventative strategy is achieving its goal. However, the quality of the assessment tool is perhaps more important than the quantity of data when obtaining an accurate view of the landscape. The importance of conducting evaluative assessments is underscored by the possibility that at a particular school, a single factor or type of preventative strategy may be a powerful predictor of success or risk, negating the need to implement varied preventative programs, and instead focusing only on the one(s) that are most relevant.

Remediation approaches are also amenable to assessment along several dimensions. First, how are the needs and issues to be addressed as part of the remediation identified? For example, a structured interview may be used to achieve this goal. Second, what types of remediation approaches are being used by the school? The default policy appears to be course repetition. The alternate involves the development of individualized remediation plans, which can take several forms including summer restudy programs or reduced-load programs. Therefore, a third question is whether appropriate interventions are being introduced to address the needs and deficiencies of the students? For example, a summer self-study of course material may be appropriate for an academically strong student who performed poorly because of a medical crisis, but may not be an optimal approach for a student with time management or performance issues due to test anxiety. Ultimately, the effectiveness of the intervention needs to be evaluated to determine the success of the remediation effort. The type of student issue being addressed also influences the nature of the assessment. For example, a student with test anxiety or clinical skills issues needs monitoring over a sufficient time period to document improvement. A student who fails a single class may be considered successfully remediated after passing the course on a second attempt. However, follow-up monitoring to determine whether students can apply the problematic concepts later in the curriculum, including in clinical situations, can be instituted for a more comprehensive assessment plan.

Limitations

A major limitation of this review is that relatively few studies on remediation have been performed in colleges and schools of pharmacy. Therefore, much of the data was extrapolated from other educational settings, with a focus on findings that have the potential to be applied to pharmacy education. Additionally, select examples from colleges and schools of pharmacy are included since comprehensive survey results are not available. In selecting examples, information was gathered from a representative cross section of schools and colleges of pharmacy in all areas of the country (Northeast, East Coast, South, Midwest, West Coast, and Northwest); public and private; long established and new; as well as research and teaching intensive. Overall, it is difficult to dictate a generalized remediation policy or describe a turnkey approach. Student success is affected by many factors including preprofessional preparation, class size, class diversity, language issues, motivation, teaching skills, learning skills, and diagnosis of learning problems. All of these factors should be taken into consideration when designing remedial instruction. Remediation is not "one size fits all." The most successful remediation programs are ones that are tailored to the individual student.

CONCLUSIONS AND FUTURE DIRECTIONS

An optimal system of remediation begins with prevention. Rigorous admissions standards, academic assistance programs, and aggressive early detection policies can help to minimize the need for remediation. Effective remediation policies should strive to identify students early (first 1-2 years) in their pharmacy school career, use proactive strategies to help students develop better approaches to academic success, and combine academic counseling and mentoring to facilitate self-directed learning. Finally, colleges and schools of pharmacy need to promote research to evaluate current methods of remediation to determine the impact they have on graduation rates, board passage rates, job success, and cost/benefit to the school.

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