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Research

# Sensitivity and specificity of course grades after exam failure used as an indicator for final course performance

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## Abstract

**Objectives:** To determine how likely academic progression committee reports were to detect poor performance of very high-risk (overall course grade  $\leq 69.4\%$ ) or high-risk (overall course grade  $\leq 75\%$ ) students (sensitivity) or to detect the absence of poor performance in low-risk (overall course grade  $> 69.4\%$ ) or very low-risk students (overall course grade  $> 75\%$ ) (specificity), and to determine which exam, when failed (exam score  $< 69.5\%$ ), was most sensitive and/or specific for a course.

**Methods:** Data were collected from Spring 2009 to Spring 2012. Tables were constructed for the exams and used to compute sensitivity and specificity. Data were broken down by specific classes that multiple students had to remediate due to course failures.

**Results:** For high-risk students, sensitivity for the reports was 78.2% for one exam failure and 44.7–75.5% for multiple exam failures. Specificity for the reports was 92.2% for one exam and 99.3–99.9% for multiple exam failures. For very high-risk students, sensitivity for the reports was 100% for one exam and multiple exam failures. Specificity for the reports was 90.8% for one exam failure and 98.1–99.9% for multiple exams. For specific courses reviewed (with the exception of two), failure of Exam 1 is the most sensitive in identifying students who are at very high-risk or high-risk for failure.

**Conclusion:** Study showed that reviewing academic progression reports at midterm of a quarter/semester can be helpful in identifying students at very high risk or high risk of failing a course, and students who fail Exam 1 in a course are most at risk of ultimately failing the course.

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## Introduction

Student attrition in post-secondary education, defined as a combination of delayed and non-completion students,<sup>1</sup> continues to be an issue of concern among institutional leaders.<sup>2</sup> Student attrition rates are one measurement being used by accreditation bodies, such as the Accreditation

Council for Pharmacy Education (ACPE),<sup>3</sup> and institutions of higher learning to indicate a program's success. One reason for this may be the fact that students who do not graduate are not able to contribute to society in their chosen field of study, thus leading to a potentially inefficient use of school and student resources.<sup>4,5</sup> Another reason may be the local, state, and federal government costs associated with students' enrollment in educational programs.<sup>1</sup> In a 2011 published report, The American Institute of Research (AIR) cited a five-year longitudinal study that ended in 2009, which estimated that students who drop out of community colleges can cost up to three billion dollars in local and state

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funds. In this same report, AIR also estimated that when federal monies given to these students are added, the total costs were estimated to be almost four billion dollars.<sup>6</sup>

Given substantial individual student and school commitment as well as accreditation standards involved in training health care professional students, it is imperative that programs find a way to minimize student attrition. Guideline 19.4 in the 2007 ACPE Standards states, “The college or school should have records of student retention and attrition for purposes of identifying and analyzing trends and making programmatic adjustments as appropriate.”<sup>3</sup> One way to minimize attrition is by admitting the appropriate students through a solid student admission process.<sup>1,2,4,5,7</sup> However, this may not catch all underperforming students as students who are admitted will have met a school’s rigorous programmatic and academic qualifications for admission. Data related to admission procedures are not always predictive of who might have academic difficulty in pharmacy school.<sup>8,9</sup> Schools also need to identify ways to recognize early on in the curriculum when a student is having problems so support services can be offered.<sup>4,5,7,10–12</sup> Professors can usually predict when certain students are failing to progress appropriately as usually it is the same group of students throughout the training process. This early recognition can potentially stop problems from occurring in clinical practice environments, as well as prevent the student from entering a cycle of failure.<sup>10</sup>

Theorists believe that the more accurately a student can monitor his/her learning the better he/she will perform as he/she can make better choices about how to regulate his/her learning. A 2012 study by Hartwig et al.<sup>12</sup> has shown a student’s ability to monitor his/her knowledge level was predictive of his/her classroom performance. This could be especially important in health care programs as academic progression standards tend to be higher in professional programs where there are minimum grade-point averages (GPA) or course letter grade requirements for progression. Students are coming into health professional programs with inadequate skills to deal with these higher standards as pharmacy programs expect students to be adult self-directed learners.<sup>4,13</sup> To be self-directed learners, students must be able to assess their learning needs, develop learning plans, and then assess their ability to achieve the desired competencies and outcomes. One of the biggest skills that students lack is the ability to self-assess.<sup>13</sup> In pharmacy education, if schools can determine ways to alert students early in a course or the curriculum, they are at risk for poor academic performance, they may be able to help them more accurately monitor their learning.

Many studies in the pharmacy literature identify student criteria in the admission process that will help schools to select students for admission that will succeed.<sup>8,14–16</sup> However, there is limited evidence on what data schools should be following in order to identify students who need academic support once they are in the program. A 2005 study by Holt<sup>2</sup> on dental hygiene programs found that

academic difficulties were one reason for student attrition. Holt recommended that faculty quickly identify those students who are struggling academically and provide them with an immediate and individualized plan to help them succeed in the program.

Failure to perform well in a program often is due to multiple factors like difficulty coping with academic workload, personal health problems, family or social issues, lack of motivation, or unrealistic expectations of the program.<sup>7</sup> A 2005 study by Cleland et al.<sup>10</sup> looked at reasons for poor performance in final-year medical students who failed their final clinical examinations. Results of this study showed that students who failed the final exams had difficulty with assessments earlier in the course and some had even been held back one academic year due to poor course performance. The authors conducted interviews with the students and found that the poor academic performers had been experiencing non-academic personal difficulties but had not asked for help for fear they would appear weak to the faculty. The authors concluded that it is important to identify students early on with academic difficulties and ensure they receive feedback on their poor performance but also support in order to address any academic or non-academic needs to help them improve.

Identification of failing students is important due to the stress that can occur for the student, the financial hardship of failing, and the increased workload that occurs for faculty in handling students who are not progressing satisfactorily in academics. Given these challenges, it is extremely important that these students be identified as early as feasibly possible, both in the program and within individual courses. This would help provide the most opportunity to affect changes that would benefit the students such as study skill advice, potential leave of absences for medical or family reasons, or even counseling on a different career path if needed.<sup>7</sup> Grade-point averages (GPAs) have been used as road markers of academic performance in many colleges of pharmacy.<sup>11</sup> In 2010, Maize et al.<sup>4</sup> conducted a review of current practices in schools/colleges of pharmacy in regards to remediation. This article found that GPA alerts and other criteria have been used within courses by many schools of pharmacy in an effort to detect poor students early; however, there are very few studies on whether these approaches are effective.

As part of the academic progression plan at Sullivan University College of Pharmacy (SUCOP), the Academic Progression and Ethics Committee (APEC) is charged with reviewing students’ progression twice each quarter (mid-term and after final course grades are submitted) to identify students early on in both a quarter (midterm review) as well as in the curriculum (final course grade review) who will need additional academic or non-academic support throughout the three-year accelerated curriculum. Reports for APEC are created by the Office of Academic Affairs and Assessment (OAA). These reports list students who have scored  $\leq 75\%$  on an exam in their courses and what the students’

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