

RESEARCH ARTICLES

Validation of a Formula for Assigning Continuing Education Credit to Printed Home Study Courses

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Objectives. To reevaluate and validate the use of a formula for calculating the amount of continuing education credit to be awarded for printed home study courses.

Methods. Ten home study courses were selected for inclusion in a study to validate the formula, which is based on the number of words, number of final examination questions, and estimated difficulty level of the course. The amount of estimated credit calculated using the *a priori* formula was compared to the average amount of time required to complete each article based on pharmacists' self-reporting.

Results. A strong positive relationship between the amount of time required to complete the home study courses based on the *a priori* calculation and the times reported by pharmacists completing the 10 courses was found ($p < 0.001$). The correlation accounted for 86.2% of the total variability in the average pharmacist reported completion times ($p < 0.001$).

Conclusions. The formula offers an efficient and accurate means of determining the amount of continuing education credit that should be assigned to printed home study courses.

Keywords: continuing education, lifelong learning, home study, journal reading, credit hours

INTRODUCTION

Journal articles and other forms of printed literature serve an important role in the dissemination of new scientific and therapeutic information. The use of such documents for both lifelong learning and continuing professional development are commonly used in pharmacy and other health professions. In 1986, the *Annals of Internal Medicine* ran a series of articles on "how to keep up with the medical literature" and noted that journals were the primary source of information that physicians/health professionals needed to remain current in practice.¹

Reading the professional literature is common place in the health professions. Studies of physicians and medical residents found that they spent between 3.3 and 4.4 hours per week reading medical journals or scanning abstracts.²⁻⁵ In nursing, similar results were found, with 3.5 and 4.3 hours per week reported by nurses in states with voluntary and mandatory continuing education requirements, respectively.⁶ Burke et al found that physical medicine and rehabilitation physicians in academic settings read or scanned the literature more than those in private practice.⁷ Similarly, Tenopir and colleagues found that those pediatricians with research and writing

responsibilities tended to read more than those with administrative or clinical roles.⁸ Also, nurses with graduate degrees reported reading more than colleagues without advanced degrees.⁹ Other studies have evaluated the reading habits of various health professionals.¹⁰⁻¹³ Unfortunately, no studies could be found in the literature that looked at pharmacists' reading habits.

In addition to assisting professionals in staying current, journal readings are one of the most preferred methods of continuing education. Cole et al noted that physicians can gain sufficient knowledge from reading journal articles and that journal reading as part of structured continuing education activities may be educational at all stages of the learning process.¹⁴ In a 2000 survey, physicians reported that journal articles were the most preferred and most used method for obtaining continuing education.¹⁵ In nursing, journal reading has been reported as the second most preferred method for continuing education, second only to conferences/workshops.⁶

Scott et al found that "self-study" (presumably this would consist mainly of scientific and/or therapeutic readings) was the most commonly used method of obtaining continuing education by West Virginia pharmacists; this ranking was higher than live programs offered by associations or pharmacy schools, pharmacy conventions, or structured courses.¹⁶ Preference for self-study may be less pronounced among pharmacists licensed in states that require a certain percentage of continuing

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education credit be earned by attending live programs. Maio and colleagues found that over 90% of pharmacist respondents to their nationwide study read printed materials as a means of continuing education.¹⁷ The printed materials were more commonly used than lectures/seminars, Internet-based materials, and a mediated format; this was consistent for all demographic characteristics evaluated in the study. In a study of Wisconsin pharmacists, journal articles were the second most commonly used method of obtaining credit, running a close second to live face-to-face continuing education.¹⁸

Health professionals often cite the fact that face-to-face continuing education offerings do not fit into their schedules and that this is as a barrier to attending live programs.¹⁹ The reason for the popularity of journal articles and other printed forms of continuing education is the flexibility they offer in providing “any time” or “on demand” learning. Such convenience can offset the major barriers to pharmacist lifelong learning: (1) job constraints; (2) scheduling (location/distance/time) of group learning activities; and (3) family constraints (ie, spouse, children, personal).^{20,21} For 2005-2006, home study courses (including the Internet, monographs, and journal articles) comprised 43% of the accredited continuing education programs, but represented 74% of the total CE credits awarded to pharmacists.²²

A problem facing continuing education providers is the determination of the correct amount of credit to be awarded for print-based continuing education programs. In most cases this determination needs to be made before the final galley proofs are available. So, simply timing readers on draft versions may not provide an accurate answer. Also, one would expect diverse reading speeds and levels of comprehension among pharmacists, making it difficult to obtain a representative sample. Experienced providers and/or reviewers can provide an approximation based on previous experience with similar documents.

The Accreditation Council on Pharmacy Education (ACPE) offers limited guidance for assigning credit for printed home study courses.²³ For assigning any credit to home study continuing education programs, ACPE requires that providers use a realistic method that is “educationally sound and defensible” to determine the amount of time required to complete a home study program. The Council indicates acceptable procedures for determining the amount of time include: (1) estimating/calculating the time required for materials to be presented in a live format; (2) pilot testing the program on a group of representative pharmacists; or (3) using an advisory panel “consisting of individuals qualified by experience and training in the development and administration of continuing pharmacy education.” A notable absence is

the ACPE’s use of any acceptable procedures, such as formulas, for determining credit prior to publishing a home study course. While reference is made here to *home study courses*, other terms which may be used synonymously and which are not mutually exclusive include *enduring materials* and/or *mediated programs*. Only one formula could be identified, for any profession, that provides a method for calculating credit for printed home study courses. Only one method for calculating credit for printed home study courses was found in the literature. Published in 1991 by Mergener, this formula provides an *a priori* method for assigning credit, based on estimated minutes required to complete the home study materials (reading and completing a final examination).²⁴ The *a priori* method (ie, “before the fact”) allows the continuing education provider to determine the amount of credit before the home study course is presented in the final published format. The formula is based on the number of words in the text, the number of examination questions, and a subjective estimation of the difficulty level of the content of the material (based on a 5-point Likert scale):

$$\text{Time (in minutes)} = -22.3 + (0.0209)(\text{number of words}) + (2.78)(\text{number of questions}) + (15.5)(\text{difficulty level})$$

The resultant number of minutes is further multiplied by a more conservative correction factor of 0.91 to determine the amount of credit to assign a given article. For all continuing education programs, ACPE allows 1 hour of continuing education (0.1 continuing education units) to be awarded for “50-60 minutes of participation or its equivalent.”²³

Extension Services in Pharmacy (ESP) at the University of Wisconsin has used this *a priori* formula as the “gold standard” for estimating credit for printed home study courses since the formula’s publication in 1991. In 2005, ESP petitioned the ACPE for renewal of its status as an accredited provider. In January 2006, ESP was awarded a 6-year extension of their accreditation with an interim report required in 2007. In the evaluation of the ESP program, the ACPE expressed concern regarding the *a priori* formula for printed home study courses and noted the “use of this formula is acceptable as long as data from participants validated the results.”²⁵

The purpose of this study was to provide validation of the *a priori* formula used by the University of Wisconsin, and presumably other ACPE-accredited providers, for determining credit for printed home study continuing education courses.

METHOD

To validate the current process for determining credit *a priori* for printed home study courses receiving continuing education credit, 10 University of Wisconsin

home study courses were included in the study. Each of the 10 courses required pharmacists to self-report the amount of time needed to complete the specific course. All final examination/evaluation forms received for credit for home study courses through the University of Wisconsin are maintained on file for a minimum of 5 years. A student was assigned to record the times reported by pharmacists for all the evaluation/final examination forms for each of these 10 courses.

At the same time the student was asked to recount the number of words in each article using the process described by Mergener.²⁴ Each faculty member responsible for coordinating the individual articles (4 different faculty) were asked to search their records and determine the level of difficulty originally assigned to each article. For 9 out of the 10 articles, the faculty members had used the *a priori* formula to determine credit. The tenth printed home study course (identifier 06-023) had been converted from a live offering, and since it contained the same material it was assigned the same amount of credit as the live program.

With the word count from the student, the number of final examination questions and the difficulty level used by the faculty member responsible for the program, the amount of credit appropriate for each course was recalculated using the *a priori* formula. The amount of estimated credit using the formula was then compared to the average amount of time required to complete each article through the pharmacists' self-reporting. The relationship between these 2 measures was assessed using Pearson correlation and linear regression available on Minitab, Version 14 (Minitab Inc, State College, Penn; 2004). Due to the small sample size (N = 10 courses) and the possibility that either time calculation might not be normally distributed, an additional nonparametric correlation was calculated (Spearman rho

correlation).²⁶ The calculation of the ρ -statistic was performed by hand because it is not available in Minitab.

RESULTS

With the exception of 1 course, the amount of credit originally assigned (at the time the course was released for distribution) for each course was less than the time estimated using the *a priori* formula, assuming 50-60 minutes equaled 1 contact hour of credit (Table 1). This can be attributed to the conservative approach used by the University of Wisconsin in assigning credit. The one exception was a home study course (06-023) that had been converted from a 2-hour live program, and since it represented the same materials had been assigned 2 hours of home study credit.

To determine whether the self-reported times of pharmacists met the prescribed amount of credit, 95% confidence intervals were created for each course based on the average reported amount of time required by the pharmacists to complete each course. As seen in Table 2, with the exception of 06-023, the amount of credit awarded fell within or below the 95% confidence intervals. The interval bands for 3 courses (05-042, 04-142 and 06-038) exceeded the amount of credit awarded for each course.

To validate the use of the *a priori* formula, comparisons were made between the average time reported by pharmacists to complete the course work and the estimated amount of time based on the formula (Table 3). Comparing the 2 times (formula estimate and actual reported average time), a significant positive correlation was found ($r = 0.928; p < 0.001$). A scatter plot illustrating this relationship is presented in Figure 1. The nonparametric Spearman rho statistic showed a similar strong positive relationship ($\rho = 0.855, p < 0.001$). Finally, linear regression was applied to determine whether a linear re-

Table 1. Credit Awarded Based on the *a priori* Formula to Home Study Continuing Education Programs

Course Number	Word Count	Number of Questions	Difficulty Level*	Estimated Time Using Formula, Minutes	Time for Credit, [†] Minutes
04-045	4107	15	4	81.0	75
05-050	6931	15	3	72.3	50
05-042	5098	10	4	70.4	50
06-040	5824	10	5	85.7	75
04-142	3363	10	3.5	60.1	50
06-023	5760	10	5	85.5	100‡
03-083	3840	10	3	54.0	50
05-096	3513	10	4	67.4	50
06-038	7573	10	4	75.0	50
04-110	4510	10	3.5	62.3	50

*Difficult level was a subjective decision made by the course coordinator based on a 5-point scale with 5 representing the most difficult or unfamiliar material

[†]Credit issued as hours or CEUs (hours/10), but listed in minutes for this table and based on lower limit of 50-60 minutes equaling 1 hour of credit

[‡]Home study course was based on conversion of a live 2-hour program and not evaluated using the *a priori* formula

Table 2. Comparison of Credit with Respect to 95% Confidence Intervals for Self-Reported Times

Course Number	Lower Boundary	Time for Credit*	Upper Boundary
04-045	85.1	75	91.7
05-050	59.4	50	62.9
05-042	68.7	50	75.7
06-040	86.6	75	97
04-142	62.2	50	68.1
06-023 [†]	84.9	100	109.3
03-083	48.5	50	51.9
05-096	63	50	71.4
06-038	67.1	50	80.8
04-110	59.5	50	68.4

*Credit issued as hours or CEUs (hours/10), but listed in minutes for this table and based on lower limit of 50-60 minutes equaling 1 hour of credit

[†]Only course to have credit awarded to not fall below the confidence interval, using 50 minutes as representative of 1-hour (as prescribed for live programs)

relationship existed between the estimated time and reported time to complete each course. Linear regression produced a significant result ($F = 49.8; p < 0.001$) with the regression line accounting for 86.2% of the total variability in the self-reported times. The data points and regression line with 95% confidence bands are illustrated in Figure 1.

DISCUSSION

The *a priori* formula, originally published in 1991, appears to be a valid method for estimating the amount of credit to assigned to printed continuing education materials. Based on the courses studied, there was a strong positive correlation between the estimated times and those reported by the pharmacists completing the courses. When tested against reported pharmacist completion times, it showed a strong positive correlation. Using linear regression, the comparison can produce a regression line

Table 3. Comparison of Estimated Time and Self-reporting Times

Course Number	No.	Estimated Time Using Formula	Average Self-reported Times for Pharmacists
04-045	18	81.0	88.4
05-050	77	72.3	61.2
05-042	262	70.4	72.2
06-040	100	85.7	91.8
04-142	202	60.1	65.1
06-023	45	85.5	97.1
03-083	598	54.0	50.2
05-096	142	67.4	67.2
06-038	56	75.0	73.9
04-110	115	62.3	63.9

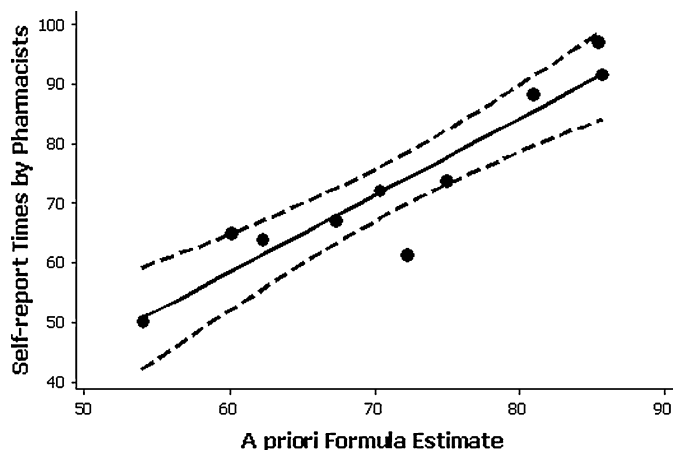


Figure 1. Linear Regression with 95% Confidence Bands for Reported Times

accounting for more than 85% of the variability in the average reported times for completion. Only 1 course (05-050) fell outside the 95% confidence bands.

The weakest aspect of the *a priori* formula is the subjective assignment of level of difficulty. As noted by the ACPE, there are “questions over the validity of the formula arising from problems in accurately assessing the difficulty of the material.”²⁵ The original work by Mergener used a 5-point Likert scale for estimating “difficulty and unfamiliarity,” with 5 representing the most difficult or unfamiliar material.²⁴ The paper did not specify that only whole numbers be used to estimate difficulty (whole numbers were used in the original research to establish the formula).²⁴ ESP allows departmental faculty to use intervals of 0.5 in addition to whole numbers for greater flexibility in assigning a level of difficulty. If anyone coordinating a printed home study course has trouble estimating the level of difficulty or potential reader unfamiliarity with the subject matter, they could impanel a group of continuing education experts to determine the level, thus complying with ACPE’s third suggested method for establishing credit.²³

One could challenge the use of self-reporting by pharmacists as a means of validation. If 1-hour of credit is being awarded, why would a pharmacist not simply list 60 minutes for the completion time? A response might be that one should assume the professional integrity of the respondent to be accurate in their responses. The 1 course for which the *a priori* formula was not used supports this assumption. Course 06-023 was a direct conversion of a live program to a printed home study course with the same contents. The live program was 2 hours in length and an acceptable ACPE procedure to determine home study credit is “[a]ssessing the amount of time the activity would require if it were delivered in a more formal and structured live program format.”²³ Thus, a parallel 2 hours

of credit was assigned to the home study version of the same course. If pharmacists blindly listed time to match the amount of credit issued, they should have averaged approximately 120 minutes (2 hours of credit). Only 31.1% of the respondents indicated that it required 2 hours, whereas 62.2% reported the course required less than 2 hours to complete. Pharmacists who completed 06-023 reported the course took a mean time of 97.1 minutes to complete (standard deviation of 40.5 and a range of times from 30 to 240 minutes). If the *a priori* formula would have been used to calculate the amount of time, the estimate would have been 85.5 minutes and only 90 minutes of credit would have been awarded (0.15 CEUs). In hindsight, assuming a 2-hour live program would convert to a 2-hour home study course was erroneous and the use of the *a priori* formula would have provided a more accurate estimate; for examples, 85.5 minutes would have been converted to 1.5 hours of continuing education credit.

CONCLUSION

Professional reading is one of the most preferred methods of lifelong learning and continuing professional development. Often pharmacists use journal articles or other printed material as a means of fulfilling mandatory continuing education requirements. Determining the amount of credit to be assigned for print-based continuing education programs presents a challenge to accredited providers, particularly in the environment in which time is used as a mean to measure learning accomplishments. Based on the result of this study, the 1991 *a priori* formula continues to be an effective and convenient method for continuing education providers to estimate credit for printed home study courses before the document is printed in its final format. Until another method is developed and validated, the Accreditation Council on Pharmacy Education should continue to recognize this formula as one of several suitable means for assigning credit.

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