Economic Costs and Benefits Associated With a Community Pharmacy Rotation

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This paper reports the results of a work sampling study to look at the costs and benefits to pharmacist preceptors of community pharmacy rotations. The objective of this study was to determine the percent of the student's time spent on various activities during a rotation using work sampling, including time spent being taught and supervised by the preceptor. The cost of the preceptor's time spent teaching and supervising the student and the benefit of time saved by the student's work activities were calculated. Data were collected from five students/sites over a three-week rotation. The economic analysis measured 'preceptor input' or costs, and 'student output' or benefits. Students were found to spend almost twice as much time in work output activity as time spent by the preceptor in input activities. The results of the economic analysis of costs and benefits to the preceptor were sensitive to the wage value assigned to student output. When work output by the student was assigned a value of 50 percent of a pharmacist's salary, there was a balance of costs to benefits.

BACKGROUND
This study was undertaken to determine more definitively the costs and benefits to the community pharmacist when acting as a preceptor in college of pharmacy based experiential programs. In most colleges of pharmacy this training takes place after all didactic course work is completed and is meant to allow the student opportunities to apply the principles learned in the classroom in an actual health care delivery setting. Students occupy space, use facilities and supplies, and require the time of the preceptors and staff to teach them; these can be viewed as costs or resources consumed. Students also provide benefits by their activities, such as filling prescriptions and counseling patients, which
may offset these costs. Acting as a preceptor for pharmacy students also has the indirect benefit of maintaining and upgrading the preceptor’s skills and knowledge base.

RELEVANT STUDIES
A few studies have attempted to establish the cost of educating pharmacy and other health professions students in clinical settings. They have differed in their scope, methods, and results. These studies have included different variables which may affect resource consumption, and they have measured costs and benefits in various ways. These studies have all focused on inpatient settings. No studies thus far have looked at community pharmacy extern programs.

Beck and McMillen(1) conducted an activity analysis of PharmD clerkships to evaluate the student/instructor contact time (labeled cost) and student contributions to patient care (labeled benefits). No dollar values were assigned. This study brought into focus the question of measuring non-exclusive activities. Non-exclusive activities are those activities whereby both costs and benefits occur simultaneously. For example, when preceptors discuss patient care plans with a student, this activity is neither exclusively teaching nor exclusively patient care because both occur simultaneously. This is defined as “joint product costing” and has perplexed investigators as how best to assign costs and benefits. Several investigators have proposed ways of establishing cost allocations of joint product activities(2), but the best solution is still unclear.

Looking at the outcome of drug costs, Briceland, et al.(3) found that educating PharmD students in a hospital setting provided an overall benefit in cost savings to the pharmacy drug budget. They found that about one-half of the patient care interventions by PharmD students resulted in drug cost savings, while one-quarter of the interventions increased drug costs. Of these latter interventions, they speculated (but did not measure) that the decrease in patient complications and length of stay would offset the higher drug costs. This study did not look at costs to the hospital in terms of staff or preceptor’s time.

In another study which only looked at benefits to the hospital, Mueller and Abel(4) assessed the impact of college of pharmacy based educational services. They studied the influence of clinical services and student education provided by faculty and staff on the hospital’s drug costs and patient charges. They concluded that these services result in decreased drug costs and patient charges as well as improved quality of care. They made no attempt to document the costs involved.

Davis and Rudd(5) found that the time spent by clinical pharmacy faculty preceptors with PharmD students one-on-one exceeded faculty time saved by the students by an average of 20 hours per rotation. This study used a diary kept by the preceptor to track time spent and saved by being a preceptor for a PharmD student. This time measurement was not verified by student input and there were no attempts to measure the impact of students on patient care or drug costs. Hammersberg(6) also used a survey/self-report of time spent and saved by preceptors of six allied health programs such as physical therapy, medical lab technology, and respiratory therapy. The results indicated that the student contribution to decreased workload did not offset the cost of their clinical education. Mundel(7) noted that self-reporting when used alone is risky as an accurate time measurement of workload.

Two studies looked at other factors which may influence costs of clinical education. Kling and Bulgrin(8) found that the total cost of clinical education for lab technicians was influenced by the prior experience of the students, with those students who had lab work experience needing less time from instructors. The variables of length of rotation and sequence of rotation (again relating to prior experience) played a role in the cost/benefit study of occupational therapist students done by Shalik(9). This study concluded that a minimum of six weeks on site was needed to recover the costs incurred during the beginning of the rotation.

As indicated by these studies, the costs and benefits of experiential programs are affected by many variables, and they can be measured in various ways. Drug costs and time spent by preceptor/teachers are most commonly measured in these types of evaluations of pharmacy programs.

PROJECT OBJECTIVES
The first objective of this project was to determine the types of activities and the percent of the student’s time spent on each during a three week rotation in a community pharmacy.

The second objective was to determine the costs (i.e., resources consumed) of a rotation from the preceptor’s viewpoint. In this analysis, cost was limited to preceptor time spent teaching and supervising pharmacy students. Time was converted into a dollar value based on current average pharmacist salary in the study area.

The third objective of this project was to quantify economic benefits to the preceptor, in terms of time saved, by the student’s work activities. This was also converted into a dollar amount.

METHODS

Work Measurement
Several work measurement techniques are available, including time-motion analysis, self-reporting, and work sampling; yet, no single work measurement technique is without shortcomings(6,10). Self-reporting is a common technique as seen earlier in the review of other studies. It has been used to establish measurable workloads(11). Roberts(10) states that personal bias and data collection inaccuracy plague the technique of self-reporting. Time-motion studies, in which activities are timed from beginning to end, are cumbersome when many different activities take place in a short period of time (10). These two methods may not be appropriate for the activities performed during an experiential rotation.

Work sampling, which is based on the laws of probability, is an indirect method of work measurement not requiring the actual timing of individual activities. A work sampling study utilizes randomly spaced or fixed sampling observations to obtain a ratio of given activity to total number of observations. This can approximate the time spent on that activity. According to Roberts(10), the advantages of work sampling are: it can be used to measure any kind of work, it is easy, economical, does not interrupt work flow, and it is particularly useful in the analysis of non-repetitive or irregularly occurring activities like those performed in a community pharmacy.

Some problems that need to be considered in work sampling relate to the observer and are as follows: (i) effect of observer presence on study subjects; (ii) bias in data collection; and (iii) difficulty in assessing cognitive func-
tions. These can be minimized by training observers in work measurement techniques, establishing reliability ahead of actual data collection, and using other observable signs of cognitive or thinking activities such as the use of a reference book or calculator. This last action can be verified at a later point in time when it would not interrupt the subject’s activities. This study used work sampling for collecting data.

Sites/Preceptors

Five community retail sites participating in the college’s experiential program were selected to participate in the study. Permission to observe activities was obtained from the preceptor pharmacist and the student who would be there during the study period. An effort was made to select sites similar to each other. The following criteria were used: the preceptor must have participated in the experiential program for more than three years; the preceptor must have received consistently positive student evaluations for the prior three years; and each site must have had a prescription volume of approximately 100 prescriptions per day.

Of the five sites selected, three were owned and operated by the preceptor, and two were chain pharmacies. The median number of prescriptions filled during a six-day work week was 600 (range of 500 to 675). Two of the preceptors had received the college’s award for preceptor of the year, and four of the preceptors had participated in a special project to train preceptors.

Students

The students had been assigned to the study sites, as part of their experiential requirements for the college’s BS degree, several months prior to the start of the study. Three of the students were female, and two were male. The prior community pharmacy experience for three students was 500 hours of internship. One student had 1000 hours of internship, and one student had no previous experience. None of the five students had hospital internship experience.

Data Collection

During the community pharmacy rotation, the student spends a minimum of eight hours per day at the pharmacy. Each student/site was randomly assigned a different day of the week. A student was monitored on the same day of the week. A student was monitored on the same day of the week. A student was monitored on the same day of the week. A student was monitored on the same day of the week. A student was monitored on the same day of the week.

Observations were made only during the actual time that the student was at the site. The one exception was when a student was delivering prescriptions, observations were continued in that category until the student returned. No observations were taken during lunch when the student was not present. An observation was noted every three minutes throughout the day. The same trained observer collected all the data at all of the sites. The observer was seated out of the active work area but within hearing and view of most activities. This was done to make the observer as unobtrusive as possible.

The activity of the student was observed and recorded. Preceptors were observed indirectly by noting if and how the student was interacting with them. When an activity was unable to be clearly defined (such as the student stepping out of the line of site of the observer or it was impossible to tell if a phone call was professionally related or a personal call), the observer made a note and verified the actual activity soon after when the interruption would not influence the normal student/preceptor interaction.

Instrument

A data collection instrument was devised for recording observations. A pretest of the initial instrument was undertaken prior to the study at one of the selected sites to determine ease of use. This pretest was also used to assess whether the presence of the observer would have an impact on student/preceptor activity. To better enable the observer to make a quick decision concerning the nature of student activity, the instrument was expanded to list the most common student activities. The final data collection instrument contained 14 categories. Listed below are the categories and examples of activities placed in those categories. The first two were performed with the preceptor, while the remainder were performed independently of the preceptor.

1. One-on-One Instruction. Inclusion in this category meant that the preceptor and student were interacting and could not be engaged in any other concurrent activity. For example: preceptor demonstrating an activity such as the computer system or how to fill the unit dose cassettes; preceptor discussing pharmacy related topics with student; preceptor teaching patient counseling techniques; preceptor discussing answers to questions in the student manual.

2. Supervised Activity. Inclusion in this category meant that the preceptor’s attention was focused partially but not totally on the student and that concurrent activity could take place. In other words, the preceptor was monitoring the student’s activity but had their attention focused on more than one thing. However, the student was not working completely independently. Thus, these were non-exclusive activities. Examples include: preceptor entering prescription data into computer while observing the student count out the medication; preceptor on the phone but monitoring the student as the student filled a prescription: checking a student-filled prescription before dispensing.

3. Prescription Distribution. The student performed distributive prescription functions independent of preceptor monitoring. Examples include: entering prescription data into the computer; checking computer profile for interactions; counting and labeling the prescription.

4. Patient Contact. Examples: prescription and over-the-counter medication counseling; answering patient questions; receiving the prescription from the patient; taking a patient medication history.

5. Professional Phone Consults. Examples: receiving a prescription from a physician: calling for a refill authorization; answering patient inquiries.

6. Drug Information Retrieval. Defined as: using resource material to answer physician, patient, or preceptor drug therapy related questions.

7. Checking in orders/stocking shelves.

8. Filling unit dose cassettes.

9. Sales transactions.

10. Deliveries
11. Pharmacy related paperwork (insurance forms).

12. Required Manual Paperwork. The manual is used as a checklist of required activities and includes a set number of drug use evaluations that must be completed along with documentation of completed competencies.

13. Special Project. This project is a required activity for the rotation and is intended to be a learning experience for the student and also to benefit the site. Examples of projects have included designing patient information handouts for over-the-counter medication; putting together a health fair; surveying patients to find out what type of advertising they prefer; and nursing home inservices.

14. Nonproductive. Activities were placed in nonproductive time when there was no benefit or cost related to the rotation. Examples include: discussing non-pharmacy related issues such as the weather and sport scores; personal phone calls; restroom breaks; waiting.

The instrument is shown in Figure 1. At the end of each day of observations, both student and preceptor were asked if that day had been a typical day for that site in terms of work load and interruptions, and if the preceptor spent the typical amount of time with the student. Any unusual out of the ordinary occurrences were noted.

Data Analysis

For purposes of analysis, some of the 14 categories of activities were grouped together. Four of the non-supervised activity categories (prescription distribution, patient contact, professional phone consults, and drug information retrieval) were combined into a group labeled pharmacist-equivalent output because these are activities commonly performed by a pharmacist and require professional skills. Similarly, five other non-supervised categories (checking in orders, filling unit-dose, sales, deliveries, and pharmacy paperwork) were combined into a classification labeled as technician-equivalent output: these activities do not require professional skills. The remaining five categories (one-on-one instruction, supervised activity, student manual paperwork, special project, and non-productive) were not merged.

In the economic analysis, four categories of activity were used. The categories of one-on-one instruction and supervised activity together are referred to as preceptor input. These are the resources consumed or the costs of a rotation. Similarly, pharmacist-equivalent output and technician-equivalent output are the economic benefits to the pharmacy. These collectively are referred to as student output.

For the economic analysis, a monetary value had to be assigned to each of these four categories. One-on-one teaching consumed the pharmacist’s entire attention, and was assigned a value of $22 per hour, which was the average salary for community pharmacists in the study area.

The category of supervision did not consume all of the pharmacist’s attention in that other activities were performed concurrently with supervision. In other words for the supervising category, the pharmacist preceptor was engaged in two activities: teaching and something else. Since the precise proportion of attention devoted to student teaching during supervision was unknown, a baseline estimate of 50 percent was used. A sensitivity analysis was done, using the values of 25 percent and 75 percent of supervision spent on teaching.

To determine a monetary value for the pharmacist-equivalent output of the students, a baseline value of 50 percent of pharmacist salary was used. A sensitivity analysis was also done using a high value of 100 percent of pharmacist salary to a low value of 30 percent pharmacist salary (comparable to the average technician wage in the area). The baseline value for technician-equivalent output was the average technician wage in the area of $6 per hour. A sensitivity analysis used the starting technician wage ($5 per hour) and the high wage ($7 per hour).

The distribution of time across activities was described and analyzed in various ways: summaries for the entire data collection period, by each week of the rotation, and by site or rotation (i.e., the data were summarized for each of the five students). The observations for each day were converted to percentages of time spent on a given activity by dividing the number of observations in an activity by the total number of observations that day (and multiplying by 100). Data for each rotation and for the entire data collection period were derived from these daily proportions.

RESULTS

There were 14 days of data collection. On the second Friday scheduled for data collection, both student and observer were unable to get to the site due to severe weather condi-
tions. In the opinion of students and preceptors, the days of data collection were typical of the rotation. Both preceptor and student consistently agreed that the observer’s presence had not made a difference. One student’s comment was typical for the group. “I was nervous at first to know that you were watching, but after awhile we got busy and I forgot that you were there.” For 11 of the 14 days of data collection, both preceptor and student perceived the day to be normal in terms preceptor-student interaction. On one day, a computer problem caused both student and preceptor to perceive less than normal interaction; however, this did not coincide with a reduction in the actual amount of one-on-one teaching for that day. For the remaining two days, the student and preceptor differed as to whether their interaction was more or less than normal.

During the data collection period, a total of 1,952 observations were made. All observations fit into one of the 14 categories. The number per day ranged from 122 to 152, with a median of 139.5. Length of lunch breaks and a few missed data points each day accounted for this variance. Percentages of time were calculated for each day, and the daily figures were averaged to calculate the distribution of time during each rotation and the entire data collection period.

The percentage of time spent on each of the detailed categories of activities during the entire data collection period is shown in Figure 2. Each bar shows the percentage of time that was spent in that category of activity. More specifically, approximately 12.5 percent of the time was devoted to one-on-one teaching, and another eight percent was spent on supervision. The activity of processing prescriptions accounted for over 25 percent of the time, and nearly 20 percent of the time was nonproductive. The required rotation manual consumed about 10 percent of the time, and the remaining categories each had less than five percent of the rotation time.

Since student skills and activities may change over the course of a rotation, the distribution of time across activities was assessed during each of the three weeks. Table T shows the median and range of time spent by the five students on each activity for each week. There were no linear trends, except with supervision where the median decreased each week. There was a slight decline in one-on-one instruction during week two, with an increase seen during week three.
the preceptor’s attention was devoted to education during simultaneously. The baseline estimate was that 50 percent of the total time for each rotation or site as well as the median value are shown in Table II.

Finally, the distribution of time was calculated for each rotation or site for the four economic variables (one-on-one instruction, supervision, pharmacist-equivalent output, and technician output) as well as the proportion of non-productive time. For the selected categories of activities, the distribution of time was calculated for each rotation or site as well as the median value are shown in Table II.

Among the rotations, the median percent time spent in one-on-one instruction was 13 percent. This was fairly consistent across rotations, with a range of 11 percent to 15.5 percent. The median time spent by preceptors in supervising students was about half that of one-on-one instruction. The median for supervision was almost eight percent of the total time, but the range of three percent to 18 percent indicated a wide difference in supervision across rotations.

With respect to output, the median pharmacist-equivalent output accounted for 30 percent of the time during the rotation. The range was quite wide with values of 26 percent to 51 percent. The percent of time spent doing technician-equivalent activities had a wide range of values (2 percent to 25 percent). This activity had a median value of 7.5 percent.

Results—Economic Analysis

In this study, the costs—or resources consumed—during a rotation were limited to the preceptor’s time. Costs included the preceptor’s time in one-on-one teaching and supervision. On-one-one teaching was assumed to consume the preceptor’s entire attention, and was correspondingly values at the prevailing pharmacist wage rate of $22 per hour. As mentioned earlier, supervision involved joint product costing because more than one service was produced simultaneously. The baseline estimate was that 50 percent of the preceptor’s attention was devoted to education during supervision. The value of each cost element as well as the total cost in each site or rotation is shown in Table III. As seen there, one-on-one teaching costs ranged from $281 to $409, while supervision costs ranged from $37 to $234. Total costs for the three-week rotation across the five sites ranged from $408 to $515.

With respect to the benefits received by the pharmacy, two categories were measured: pharmacist-equivalent output and technician-equivalent output. These were activities performed by the student without direct supervision. Using the baseline estimates of value (50 percent of pharmacist wage for pharmacist-equivalent output and average technician wage for technician-equivalent output), the benefits for each site are shown in Table III. The value of pharmacist-equivalent output ranged from $340 to $679, and the range of technician-equivalent output was $16 to $179. Total benefits across the five sites ranged from $394 to $695.

Also shown in Table III is the benefit-to-cost ratio for each of the five sites. These ranged from 0.88 to 1.58. Two sites had ratios less than 1.0, indicating that costs exceeded benefits, while the remaining three sites had benefits in excess of costs.

To test the sensitivity of the results to the assumptions made in the baseline case, the analysis was redone using the median time for each of the four economic variables and using various monetary values. These results are shown in Table IV. In the baseline case, using the median times and baseline values, the total costs and benefits amounted to $446 and $452, respectively; with a benefit-to-cost ratio of 1.01. In the sensitivity analysis, supervision was varied from 25 percent of preceptor attention devoted to teaching to 75 percent devoted to teaching (that is, the 75 percent represents a higher cost because less of the preceptor’s attention can be spent on the other activity). Total costs became $395 and $497, with corresponding benefit-to-cost ratios of 1.14 and 0.91. (Benefits remained at the baseline level.)

On the benefit side, the value of pharmacist-equivalent output was varied from 30 percent of pharmacist wage (also roughly equal to the technician wage) to 100 percent of pharmacist wage. With these figures, the value of pharmacist-equivalent output was $238 and $796, respectively. Using the baseline estimates of technician-equivalent output ($54) and total costs ($446), the corresponding benefit-to-cost ratios became 0.65 and 1.90. Thus, the results were quite sensitive to the value assigned to pharmacist-equivalent output. Varying the value of technician-equivalent output

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Table III. Dollar value of activity by site

A similar pattern was seen with pharmacist equivalent output which doubled during week two and declined in week three. The manual was worked on more during the first and third weeks than during the second. The categories of technician output and non-productive were relatively constant across the three weeks. Of interest were the large ranges, indicating that activities each week varied across the five pharmacies.

Finally, the distribution of time was calculated for each rotation or site for the four economic variables (one-on-one instruction, supervision, pharmacist-equivalent output, and technician output) as well as the proportion of non-productive time. For the selected categories of activities, the distribution of time for each rotation or site as well as the median value are shown in Table II.

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*All calculations used median time for three weeks.

*Equivalent to average technician wage.
from starting to high technician wage did not substantially affect the results.

DISCUSSION

With respect to the economic impact of the rotations, the benefits and costs were roughly equal at all sites; that is, no site experienced a tremendous financial burden or gain by serving in the experiential program. The median percent of time that preceptors spent in teaching and supervising during a three week rotation was 21 percent or 25 hours. In return, the median percent of time spent by students in pharmacist-equivalent and technician-equivalent activities for the rotation was 38 percent or 45 hours. This output was done without direct supervision by the preceptor. The value of this contribution to the pharmacy was quite sensitive to the wage rate assigned to pharmacist-equivalent output. The question is whether the student is closer in value to a registered pharmacist or a technician. Further, the economic analysis did not attempt to include the benefit of student output during the time recorded as supervision. That is, while being supervised, the student was actually benefiting the site by producing an output (e.g., filling a prescription, counseling a patient). If this had been included in the analysis, there would have been an overall increase in benefits to the site.

Each site or rotation had its own distinct pattern of activity. Several variables and the interaction between them may have influenced the use of time. While the sample size was too small to quantitatively assess the effects of these variables, some observations are noteworthy.

One factor that affected activity patterns across rotations was related to the requirements of the rotation: namely, completion of the student manual. Many of the competencies in the manual mandated one-on-one interaction between preceptor and student. Some students preferred to complete their required manual early in the rotation and relatively high amounts of one-on-one instruction took place at the same time. Also, for those students who waited until the last few days of the rotation to complete assignments, one-on-one instruction by the preceptor increased during the last week.

Earlier studies with occupational therapy and lab technician students suggested that prior work experience may affect activities—and thereby costs and benefits—of a rotation (8,9). However, in this study, the one student (S-2) without prior pharmacy-related experience had the second highest level of pharmacist-equivalent output. (This student also had the highest level of supervision recorded during the observation period.) The lack of experience may have been offset by another student variable—motivation. Outside of this study, many preceptors have observed students with no prior experience, but motivated to do well, perform at exceptionally proficient levels. Conversely, also seen are those students who have many hours of prior experience but are unmotivated and provide a low level of participation or output.

Another variable which could have influenced the way time is used during a rotation is the student-preceptor relationship. During data collection the observer detected a personality conflict between one student (S-5) and preceptor. This rotation had the lowest percent of time spent in supervised activity. Similarly, non-productive time accounted for 9–36 percent of the total observed time across rotations. While some of this time was spent on student breaks, the majority of this time was observed to be spent with the preceptor in casual non-pharmacy conversations, such as discussions of sports. This may be an indicator of personality styles or poor time management.

Site variables may influence the activities during a rotation. For instance, the rotation (S-4) with the highest proportion of technician-equivalent output was the only site among the five study sites that utilized a unit-dose system. Much of one day was spent by the student working with this system resulting in a disproportionate amount of technician-equivalent activity for that site. Also, the two rotations with the highest values for pharmacist-equivalent output were sites which had a slightly higher volume of prescription activity in comparison to the other three sites. Interestingly, these same two rotations had the lowest amount of non-productive time.

LIMITATIONS

There are several limitations to this study. First, the time available to collect data made a small sample size necessary. Second, indirect benefits were not measured. Some indirect benefits to the preceptor include the prestige of a college of pharmacy faculty title, increased mental stimulation, and the opportunity to learn from the students.

Generalizations to other programs are difficult to make. The days of any of these rotations were not unduly repetitive with percent of time spent on any given activity varying from day to day. Also, each school differs in their requirements for experiential programs. Length of rotation may have played a role in that a three week period of time may be insufficient for a student to feel comfortable enough to perform independently.

There are several limitations to this study that may affect the economic analysis. It was impossible to determine if or how much time the preceptor spent planning for the rotation outside of the actual rotation time. Likewise, students indicated verbally that time was spent outside of the rotation working on their required special project and manual. The special project is required by the college to have a benefit for the site as well as being a learning experience for the student. The manual has several sections that benefit patient care. For instance, the student is expected to thoroughly review and make recommendations to improve the drug therapy of 15 of the pharmacy’s patients. The time spent outside of the rotation and the corresponding benefit to the site from either of these activities were not measured.

Another potential benefit to the site that was not measured was the output by the student during one-on-one teaching and supervision. Although the preceptor was spending time with the student, the student was generally providing a benefit such as filling a prescription. Only non-supervised output by the student was measured and used in the economic analysis. This may have caused an underestimate of pharmacist-equivalent and technician-equivalent student output.

Increased time spent in the activity category of pharmacist-equivalent output does not necessarily equate with increased productivity. Unknown was the actual number of prescriptions filled by the student per day. While the percent of time spent per day by the student in the pharmacist-equivalent output category may have been high, there was no way of knowing if this was related to volume or quality of output or if it was a result of slowness on the part of the
student. However, even if the student is slow, there is a benefit to the preceptor. The preceptor’s time saved can be used for other activities such as allowing for increased patient counseling time or designing and implementing pharmaceutical care plans.

CONCLUSIONS
Several conclusions can be drawn from this study. First, community pharmacy rotations differ in their flow of activities. In this small sample, no patterns of activities or trends over a three week rotation were discernible. Students spent almost twice as much time in productive activities that benefited the pharmacy than preceptors spent in teaching and supervision. Further, the students spent more time in pharmacist-equivalent activities than in technician-equivalent activities. Second, work sampling is a viable—but costly—method of measuring time and activities during a rotation. The data collection procedure worked, but it was quite labor intensive. Fifteen person-days of effort (not counting pre-testing) were needed to acquire a 20 percent sampling of five rotations. Third, for the pharmacy, the costs and benefits of participating in a college experiential program are nearly equal. The benefit-to-cost ratios across pharmacies ranged from 0.88 to 1.58. While this conclusion is sensitive to some variables, the approach used in this study was quite conservative in the assessment of benefits.

Further research is recommended. This is a very important issue in pharmacy education and it deserves more attention. Larger sample sizes and investigating longer rotations are recommended. In addition, further study should attempt to quantify those benefits and costs not measured in this study, such as student work output during supervision and preparation by both student and preceptor outside of scheduled hours.


References