Evaluation of Student Performance in an Immunization Continuing Education Certificate Program Incorporated in a Pharmacy Curriculum

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According to Tennessee Board of Pharmacy regulations, pharmacists participating in influenza immunization programs must complete the American Pharmaceutical Association (APhA) Pharmacy-Based Immunization Delivery certificate program. Our objective was to incorporate this program into The University of Tennessee College of Pharmacy curriculum so graduates would be able to administer immunizations following licensure. Pharmacy faculty trained as APhA faculty modified the course for pharmacy students. Lecture time was decreased and information previously presented in lecture was presented in cases that were evaluated by small groups of students and then discussed with faculty facilitators. Faculty supervised small groups of students practicing injection technique on each other. The self study test grade (± SD) was 95 ± 4 (78 - 100) and post test score was 94 ± 5 (73 - 100) with a score of 70 required for passing. All second and third year students successfully completed the program and 53 percent of fourth-year students elected to take and successfully completed the course. Beginning in 2000, all graduates will be recognized by the Tennessee Board of Pharmacy as immunization providers.

INTRODUCTION
Tennessee is among at least 30 other states whose pharmacy practice act has been changed to allow pharmacists to administer medications and to develop collaborative practice agreements with physicians. The rules promulgated by the Tennessee Board of Pharmacy recognized the American Pharmaceutical Association (APhA) certificate program entitled Pharmacy-Based Immunization Delivery as providing the appropriate education and training for pharmacists to conduct an influenza immunization program. While the University of Tennessee College of Pharmacy curriculum contained lectures on immunizations and a laboratory on immunization technique, this did not satisfy the board requirement for immunization competency. Therefore, to graduate students who could practice to the extent of the new practice act, it was decided to explore the possibility of integrating the APhA certificate program into the curriculum. Additionally, we wanted to implement this project by the Fall of 1998 so pharmacy students could provide immunizations during the campus influenza immunization initiative. The activities and the month prior to implementation of the course are shown in Table I.

PREPARATION OF FACULTY
The APhA licensed their program to our college and eight of our faculty completed the certificate program and were trained to be instructors. APhA provided all supporting materials for the course including self-study test, post test, answer keys, audiovisual materials, supporting resource materials, and course evaluation forms.

ADAPTATION OF TEACHING MATERIALS
To maintain the integrity of the program, all of the APhA program materials were used (including the self study manual, Centers for Disease Control book entitled “Epidemiology and Prevention of Vaccine-Preventable Diseases,” local information, and supporting documents). These course materials were purchased by the Association of Students of Pharmacy (ASP) at cost and then sold to the students. ASP also conducts annu-

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al Cardiopulmonary Resuscitation (CPR) training, another requirement for successful completion of the immunization program.

The primary consideration for the placement of the course was the campus influenza immunization initiative that is held one day during the last two weeks of October each year. To insure the availability of large number of pharmacy students as immunizers, they would need to complete the course prior to that time. Second- and third-year students are available on campus, but many of our fourth-year clerkships are away from campus. Therefore, the program was placed in the parenteral course that is offered early in the fall semester of the second professional year insuring that approximately 200 certified pharmacy students would be available to participate in the fall influenza immunization clinic. For the first year, a separate course was provided early in the fall for the third-year class and just prior to graduation for the fourth-year students.

In addition to the self-study, the APhA certificate program consists of lectures on diseases, immunizations, reimbursement, obtaining a Medicare provider number, claims submission, marketing strategies, and emergency management of complications. The technique for subcutaneous and intramuscular injections is practiced on a partner and every participant is required to administer and receive three injections. The original college curriculum contained two hours of lecture that provided an overview of routine pediatric and adult immunizations and four hours of immunization technique with practice on a dummy model in a clinical laboratory setting.

The current teaching philosophy in our college is to minimize formal lectures and use small group, case-based discussions. The content of the APhA program was reformatted to be consistent with this philosophy. The program information and slides were reviewed and the key points were organized into a lecture format that was covered in three hours and forty minutes. Two hours were allotted to specific immunization information; one hour and ten minutes to legal issues, marketing strategies, and reimbursement. Forty-five minutes were allotted to emergency management and injection technique demonstration. Two and one-half hours were allotted for seven case scenarios that covered didactic material from all aspects of immunizations, including adult and pediatric schedules, vaccine related adverse effects, vaccine relative and absolute contraindications, and emergency management of allergic reactions. In order for students to solve the cases, they were required to recall facts, consider patient specific data, and apply immunization principles. An example of a case with the solution is shown in the Appendix.

The lecture material was presented to all students in a class at the same time. The class was divided into two groups of approximately 50 for the case discussions. These groups were further broken down into groups of six to eight students who worked together to answer the cases. Three faculty facilitators were available to direct thought processes needed to solve the cases. The 50 students reassembled with the same faculty to completely discuss the cases and insure that all important ideas and concepts were completely covered in the groups. Emergency management and injection technique were taught using a group discussion, role playing, and demonstrations in groups of no more than 50 students. Five or six faculty were available to supervise and directly observe injection technique during these sessions. Students had an opportunity to practice on a dummy model prior to performing an injection on their partner. Because this course was presented early in the pharmacy curriculum, less time was spent covering reimbursement and marketing. However, students were provided with a list of the appropriate forms and contact agencies so they would have access to this information when they were ready to implement an immunization program in their pharmacy practice.

**COURSE IMPLEMENTATION**

For the first year of the program, the fourth-year students (class of 1999) were given the option to take the course in June prior to graduation. Second- and third-year students were required to take the course, and so beginning in 2000 all graduates will have this credential.

Prior to presentation of the didactic material, students were instructed to complete readings and an examination at the end of the self-study manual. The completed self-study examination was collected and evidence of CPR certification provided by students on the first day of the course. Following presentation of the course content and immunization practice, a faculty member evaluated each student’s injection technique for appropriateness. Upon completion of the course, students evaluated the course and were given an open book examination. In order to gain additional experience, students were encouraged to volunteer to screen patients and be immunizers at the annual campus influenza immunization drive. To evaluate potential differences between the three classes’ performance on the test, the pre- and post-test scores among the three
groups were compared using ANOVA with post hoc analysis using the Bonferroni method. Data are presented as mean ± standard deviation (SD).

RESULTS
All second (n = 94) and third year (n = 100) students successfully completed the requirements of the program. While not a requirement for graduation, fifty-one of 97 (53 percent) fourth-year students elected to take the course just prior to commencement. Mean grade ± SD (range) on the self-study test was 95 ± 4 (78 - 100) and on the post-test was 94 ± 5 (73 - 100) with a passing score of 70. The test scores by year of pharmacy class are compared in Table II. All students had current CPR certification at the time of the course. Because they met the criteria, all students were awarded a certificate for completion of the program. Continuing education credit was not provided since the participants were students.

Evaluations were favorable and similar between the second- and third-year classes. More than 95 percent felt the program increased their knowledge and almost 90 percent were satisfied with the program. More than 85 percent of students felt that this would be useful to their practice. In the fall of 1998, 66 of the 194 (34 percent) students who completed the program administered 1,250 doses of vaccine during the campus immunization drive. Similarly, in 1999 about one third of eligible students participated and these students immunized 1,200 individuals. No needlestick injuries occurred during the immunization technique laboratories or during either of these two campus influenza immunization programs conducted to date.

DISCUSSION
One of the primary reasons that individuals fail to be adequately immunized directly relates to health professionals who have incomplete or inadequate knowledge of vaccines and their schedules, indications, adverse effects, and contraindications(1). It is critical that health care professionals receive the appropriate education and training regarding immunizations. The APhA Pharmacy-based Immunization Delivery Certificate Program is limited in the number of pharmacists that can be certified since the number of course offerings annually is small and the course is expensive for individual pharmacists. Therefore the ability of this program to increase the number of pharmacist immunizers is modest. To most efficiently expand the role of pharmacists as immunizers, appropriate knowledge and training must be included in the college curricula so that students graduate with all the knowledge and skills needed to practice to the full extent of the law.

In colleges of pharmacy, much of the immunization information provided to students is presented in lecture format(2). Similarly, in medical school and residency programs, lecture is the most common method of teaching the subject matter and only 14 percent of schools use case studies to teach vaccine-preventable disease(3). However, the use of the pedagogical style of teaching has been challenged and the need to learn how to direct one’s self to learn has been proposed as an efficacious approach to medical education(4,5) and to promote life long learning. More innovative teaching methods include case-based format, problem based learning, and multi-station clinical scenario formats. These techniques are being used by the Centers for Diseases Control and the Association of Teachers of Preventative Medicine to enhance the presentation of immunization content in medical education(4). Consistent with this philosophy, we chose to present much of the course content in a case-based format.

All students passed the self-study test and the final examination; however, the pre-test scores improved with each advancing class. For the final examination, the fourth-year students scored better than the second- and third-year students. This may reflect the additional clinical training of the students in the third and fourth-years of the curriculum. Notably, the students in the fourth-year class chose to take the program, thus their level of interest and enthusiasm for the course may have been greater than that in the second- and third-year students where it was a requirement. All three classes averaged in the mid 90’s for both the self-study test and the final examination.

One concern with administering immunizations is the potential for needlestick injury. De Vries et al. conducted an anonymous survey of students and practitioners for the number of needlestick injuries that had occurred during the past one or two years(6). Out of 150 medical students surveyed, (the response rate was 92 percent), 22 percent reported at least one needlestick injury over a two-year period. Only 22 percent of these needlestick injuries were reported to the hospital(6). In a seven-year longitudinal study, almost 12 percent of medical students had an exposure to body fluids and of the 119 exposures 61 percent were needlestick(7). Reporting of exposure to a needlestick hotline service increased from 45 percent at the beginning of the service to 65 percent seven years later and further demonstrates the problem with under reporting of needlestick injury(6). We had no needlesticks reported during either training or the campus influenza immunization program where 245 students administered approximately 3,000 injections. During the technique training and just prior to the campus immunization program, the importance of appropriate needle handling and disposal was reviewed and was likely significant.

Table II. Self-study test and post-test scores of second and third year students who took the APhA Pharmacy-Based Immunization Delivery continuing education course in 1998 and 1999

<table>
<thead>
<tr>
<th></th>
<th>Second year</th>
<th>Third year</th>
<th>Fourth year</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>94</td>
<td>100</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Self study test</td>
<td>93.6±4.6</td>
<td>95.4±3.6</td>
<td>96.1±3.5C</td>
<td>0.0003</td>
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<tr>
<td>Range</td>
<td>78-100</td>
<td>85-100</td>
<td>81.25-100</td>
<td></td>
</tr>
<tr>
<td>Post test</td>
<td>93±5</td>
<td>92.9±4.8</td>
<td>95.8±3.3C</td>
<td>0.0008</td>
</tr>
<tr>
<td>Range</td>
<td>73-100</td>
<td>80-100</td>
<td>85-100</td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA
* Different from second year, P < 0.05 (Bonferroni method).
* Different from second and third year, P < 0.05 (Bonferroni method).
in our ability to avoid needlestick injury.

We were able to successfully train our students in the appropriate methods of injection technique and have them successfully provide vaccinations to others. By graduating students who have this competency, the number of pharmacist immunization providers in our state will be significantly increased, and as a result, the number of adults adequately immunized in our state and the surrounding area will be increased.

References

APPENDIX

Case example and solution (in italics)

Herman is a 75 year old male who presents to your pharmacy for the first time with a prescription for insulin. He is requesting an extra bottle of insulin because he is going on a 2 week camping trip in Tennessee to watch the leaves change. Other than diabetes, CS has no other problems.

1. What is the first question you want to ask Herman about immunizations?

Which immunizations have you had?

2. What specific screening questions need to be asked for your patient profile?

a. Have you ever had a severe reaction or allergy to previous vaccines?

b. Do you have allergies to drugs (neomycin, streptomycin, polymixin) or food (concern for eggs with influenza and yellow fever, gelatin)?

c. Do you have an acute illness? If pt has a high fever and is moderately ill then immunizations should be deferred.

d. Do you or those living with you have any form of immunosuppression? Those taking immunosuppressants (steroids, antineoplastics) or who have immunodeficiency (cancer patients, AIDS, asplenia) require special consideration.

e. Have you received antibodies (immune globulins) or blood products? Must be considered with MMR and varicella. The length of time after administration of these products that the MMR immunization can be given depends on the immunoglobulin dose. Recommendations are that after IVIG, 5 months should pass before varicella vaccine is given (RedBook).

f. Could you be pregnant or planning a pregnancy? Obviously this is a male patient. Don’t need to be concerned about pregnancy or breastfeeding in the household.

g. What other chronic diseases do you have? If patient has other diseases, immunizations would be even more important.

h. If patient is a child, do you have any neurologic diseases? Issue with pediatric immunizations.

3. What immunization(s) are recommended for this patient?

Td within the last 10 years, not just tetanus toxoid

Pneumovax

Influenza, (The vaccine should be given late September through October, about 6 weeks prior to anticipated influenza season. Immunity duration is about 6 months.)

4. Herman informs you that he already had the “pneumonia vaccine” 6 years ago. Does he need another, and if so, when?

Yes, he is over age 65, it has been longer than 5 years since he received the first dose of pneumococcal vaccine, and he is has a chronic disease (diabetes). The vaccine can be given any time and with other vaccines, just administer with a separate syringe and at a separate injection site.

5. Does Herman need Lyme Vaccine?

Lyme disease is not a significant problem in Tennessee, but it depends on where he is living or hiking. This vaccine is recommended for persons who live in residential areas infested by vector ticks. Vaccine is also recommended for recreational activities and persons who have outdoor occupations in these areas. Still need to use precautions against ticks.

6. If Herman decides to camp in an area of high risk and decides to get the vaccine, what is the dosing schedule and how efficacious is it?

The schedule includes three injections given at 0, 1, and 12 months. Efficacy after 2 doses is 49 percent and after 3 doses is 76 percent.