Interdisciplinary Approach to Teaching Medication Adherence to Pharmacy and Osteopathic Medical Students

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The purpose of this project was to demonstrate to pharmacy and osteopathic medical students the value of interdisciplinary education through participation in an interdisciplinary medication adherence project. Each pharmacy student, assuming the role of a pharmacist, was paired with a medical student acting as a physician with a needle-stick exposure requiring HIV prophylaxis therapy. Medical students were randomized to participate in one of three levels of pharmacist counseling. After completion of therapy, all students met to discuss adherence barriers, complete an attitudinal survey, and obtain a tablet count. Most pharmacy and medical students agreed or strongly agreed that participation in this project will help them work better within the health care team (82% and 87%, respectively) and that they should have more participation in interdisciplinary projects (83% and 76%, respectively). At the end of the project, these students reported positive attitudes concerning working on interdisciplinary health care education initiatives.

The benefits of interdisciplinary health care have been demonstrated throughout the health care system. Patients with chronic conditions such as obesity, diabetes, hypertension, and heart disease benefit from the expertise of various health care professionals in providing optimal care. This benefit is especially pronounced in the elderly population, which uses multiple health care resources and providers. Despite the benefits associated with interdisciplinary medicine and the team approach to health care, interdisciplinary education is not often formally integrated into health professionals’ education, and there is limited literature available about interdisciplinary education initiatives. However, some academic institutions have found multidisciplinary educational experiences to be a successful method of clinical teaching and have incorporated these methods into their curriculum. Introducing medical students to other health-related disciplines early in their academic programs is one way to promote the concept of teamwork.

The purpose of this project is to demonstrate to medical and pharmacy students the value of interdisciplinary education through an interdisciplinary medication adherence project. Medication adherence was chosen as the topic because of its significance and impact throughout the United States health care system. The consequences of poor medication adherence are well documented in the literature. Poor adherence to medications decreases quality of life and escalates overall health care costs by increasing the risk and development of disease complications. Pharmacists can have a significant impact on medication adherence through various patient-counseling interventions.

Adherence to a placebo prophylaxis regimen for post-occupational HIV exposure was chosen as the clinical scenario for this project because of its increasing prevalence in the workplace among health care professionals. Radecki et al estimated that one case of occupationally acquired HIV would potentially occur for every 2200 to 3300 medical residents or students per year at their institution. Further, medication adherence is especially necessary with antiretroviral therapy, in which a 5% to 20% reduction in medication adherence can result in a 60% virologic failure.

All health professionals need to understand the value of each profession toward improving patient outcomes. The Institute of Medicine suggests that significant improvements in communication among health care providers is necessary to reduce unexpected medical events.

Methods
All third-year pharmacy students (n = 92) and all second-year osteopathic medical students (n = 115) at Midwestern University were chosen to participate in the interdisciplinary medication adherence project. Pharmacy education is generally a 4-year professional program to obtain a doctor of pharmacy degree. However, unique to Midwestern University is a 3-year doctor of pharmacy professional program. Therefore, all
Medical students were in their final year of didactic education before entering clinical clerkships. This project was designed as a collaborative effort between the course coordinators of two required didactic courses in each of the colleges’ curriculum. The medical students assumed the role of a physician with a needlestick exposure requiring HIV prophylaxis. All medical students received the same prescriptions for a placebo HIV prophylaxis regimen as described by the US Public Health Service (Table 1): zidovudine—100 mg, 2 tablets three times daily for 4 weeks; lamivudine—150 mg, 1 tablet twice daily for 4 weeks; and indinavir—800 mg, 2 tablets every 8 hours for 4 weeks. The pharmacy students played the role of the pharmacist dispensing and providing medication education on the placebo HIV prophylaxis regimen. Tic-Tac’s were used as placebo tablets and were packaged in appropriately labeled prescription vials.

Before the start of the project, all pharmacy students received scripted materials on the medications in the HIV prophylaxis regimen following the 1990 Omnibus Budget Reconciliation Act (OBRA 1990) for patient counseling. The script included the name and description of the medication, directions for use, side effects, self-monitoring information, storage requirements, refill information, and instructions for missed doses for each medication. Pharmacy students also received preprinted patient education materials from the 2000 Drug Information Handbook for the HIV prophylaxis medications to be distributed at their initial intervention with the medical students.

Each pharmacy student was paired with one medical student, totaling 92 pairings. The remaining 23 medical students were assigned to a control group. Each pair was randomized to participate in one of three pharmacy counseling interventions: group A (30 pairs), OBRA 1990 counseling and distribution of medication information sheets; group B (30 pairs), group A intervention plus a postcard mail reminder sent after 2 weeks of therapy; group C (32 pairs), group A intervention plus compliance counseling session after 2 weeks of therapy; and group D (23 students), control group. The control group did not receive any written materials or pharmacy counseling interventions with their placebo medications.

All groups met at an initial session where the prescription for the HIV prophylaxis regimen was presented and the three prepackaged placebo medications were dispensed. Also at this session, the initial pharmacy intervention (OBRA 1990 patient counseling and distribution of medication information sheets) took place for those medical students assigned to one of the three intervention groups (A, B, and C). In addition, pharmacy students assigned to group B were given a prescribed medication adherence postcard mail reminder to be placed in their partner’s campus mailbox at 2 weeks. The postcard included statistics relating adherence to treatment failure for HIV therapy, as well as suggestions on ways to improve medication adherence. For those assigned to group C, both the pharmacy and medical students met for a medication adherence assessment session at 2 weeks. During this session, the pharmacy students completed a medication adherence assessment form. This form was used to review and record adherence to each drug regimen by a tablet count, to identify barriers to adherence, and to record possible solutions to the identified barriers. Complete medication adherence to the drug regimen was defined as the number of tablets remaining in each bottle being equal to the expected amount in each bottle at the time of the assessment.

After 4 weeks of therapy, all groups met for a medication adherence assessment session and to complete an attitudinal survey. All groups used the medication adherence assessment form described previously. Students worked together to identify barriers to medication adherence and possible solutions to these barriers. A final tablet count was also obtained. After completion of the study, all participants were involved in a postsession discussion to review issues learned from the project.

**Attitudinal Survey**

At the final session, the students completed an attitudinal survey to gather information concerning their attitudes toward the medication adherence project. Results of this survey were used to assess the perceived value of this interdisciplinary approach to education. The survey consisted of a four-point Likert-type scale (strongly agree, agree, disagree, strongly disagree).
Results

Medication Adherence

All assigned students from pharmacy and medicine participated in the study; however, not all participants submitted the necessary paperwork for each segment of the study. A total of 107 (group A = 27, group B = 27, group C = 30, and group D = 23) medication adherence assessment forms were completed by the students during the final session for a 93% response rate. All students assigned to group C participated in the mid-project medication adherence assessment session and completed a medication adherence assessment form. At the midpoint of the project, only three (9%) medical students in group C were compliant with the drug regimen, while by the end of the project 28% were compliant with the drug regimen.

At the completion of the project, overall medication adherence to the entire drug regimen was 35%. Group B had the highest rate of adherence at 43%, while group A had the lowest rate (27%) of adherence (Figure). No statistical difference in medication adherence was demonstrated between groups.

During both the midpoint and final medication adherence assessment sessions, several barriers to medication adherence were identified. These include remembering to take medications, loss or spillage of medications, and difficulty in following a complex drug regimen. Students also identified some possible solutions to these barriers. These include simplifying the drug regimen, using a medication pillbox, using

Statistical Analysis

Raw medication adherence was calculated via a tablet count. These data were then used to calculate descriptive statistics. Analysis of variance was performed to determine the effect of the level of intervention on medication adherence. The statistical software SAS release 6.12 was used for all data analysis. A significance level of $\alpha = 0.05$ was predefined for all statistical tests.

Attitudinal Survey

A $\chi^2$ test for independence was done to determine the relationship between survey variables. A separate analysis was done to determine the effect of group assignment on student responses to survey items.
friends and family to remind the patient to take the medication, using separate medication bottles for the workplace and at home, using calendar reminders, placing the medication bottles in a highly visible place, and obtaining more follow-up and counseling from the pharmacist.

Table 2
Medical and Pharmacy Student Attitudinal Survey Results

<table>
<thead>
<tr>
<th>Statements*</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Because of this project I have more empathy for my patients.</td>
<td>36 Med 19 Pharm</td>
<td>55 Med 62 Pharm</td>
<td>7 Med 18 Pharm</td>
<td>1 Med 0 Pharm</td>
</tr>
<tr>
<td>2. Because of this project I have a better understanding of medication adherence.</td>
<td>33 Med 19 Pharm</td>
<td>55 Med 69 Pharm</td>
<td>10 Med 11 Pharm</td>
<td>2 Med 0 Pharm</td>
</tr>
<tr>
<td>3. I am satisfied with the interaction I had with my assigned counterpart.</td>
<td>42 Med 30 Pharm</td>
<td>41 Med 55 Pharm</td>
<td>4 Med 13 Pharm</td>
<td>4 Med 3 Pharm</td>
</tr>
<tr>
<td>4a. My assigned pharmacy student provided me with sufficient information.</td>
<td>50 Med NA Pharm</td>
<td>25 Med NA Pharm</td>
<td>4 Med NA Pharm</td>
<td>10 Med NA Pharm</td>
</tr>
<tr>
<td>4b. My assigned medical student was interested in the information I provided.</td>
<td>NA Med 20 Pharm</td>
<td>NA Med 62 Pharm</td>
<td>NA Med 8 Pharm</td>
<td>NA Med 10 Pharm</td>
</tr>
<tr>
<td>5. In practice, physicians have sufficient time to provide patient counseling.</td>
<td>1 Med 3 Pharm</td>
<td>41 Med 27 Pharm</td>
<td>36 Med 56 Pharm</td>
<td>14 Med 11 Pharm</td>
</tr>
<tr>
<td>6. In practice, pharmacists have sufficient time to provide patient counseling.</td>
<td>11 Med 17 Pharm</td>
<td>60 Med 44 Pharm</td>
<td>24 Med 34 Pharm</td>
<td>6 Med 6 Pharm</td>
</tr>
<tr>
<td>7. Participating in this project will help me to work better with the health care team.</td>
<td>19 Med 14 Pharm</td>
<td>68 Med 68 Pharm</td>
<td>11 Med 12 Pharm</td>
<td>1 Med 3 Pharm</td>
</tr>
<tr>
<td>8. My opinion of the pharmacist’s role on the health care team has changed as a result of this project.</td>
<td>13 Med 11 Pharm</td>
<td>39 Med 41 Pharm</td>
<td>35 Med 39 Pharm</td>
<td>5 Med 1 Pharm</td>
</tr>
<tr>
<td>9. Students should participate in more interdisciplinary projects.</td>
<td>18 Med 22 Pharm</td>
<td>58 Med 61 Pharm</td>
<td>14 Med 16 Pharm</td>
<td>6 Med 1 Pharm</td>
</tr>
<tr>
<td>10. This was a beneficial project.</td>
<td>19 Med 15 Pharm</td>
<td>62 Med 53 Pharm</td>
<td>15 Med 24 Pharm</td>
<td>3 Med 5 Pharm</td>
</tr>
</tbody>
</table>

*Statement 4a appeared on the medical student survey; 4b appeared on the pharmacy student survey.
†Data may not add up to 100%, as all respondents did not provide complete data. NA indicates not assessed.

Attitudinal Survey
Attitudinal survey results are shown in Table 2. Ninety-one percent of medical students and 96% of pharmacy students completed the attitudinal survey. Of those who completed the attitudinal survey, more medical students than pharmacy stu-
tudents reported having increased empathy for their patients after participating in the project ($P = .04$). No other shared survey item reached statistically significant difference. Most pharmacy and medical students agreed or strongly agreed that the project provided a better understanding of medication adherence (88% vs 88%, respectively), will help them work better with the health care team (82% vs 87%, respectively), and that students should participate in more interdisciplinary projects (83% vs 76%, respectively). Medical students in the control group were less satisfied with the interaction and information they received about their medications ($P < .001$ and $P < .001$). There were no other statistically significant differences identified among the groups.

**Postsession Discussion**

Although awareness of occupational HIV exposure was not formally evaluated in this study, the risk of this rare but significant occurrence, especially among medical students, was addressed at the postsession discussion. Students were able to appreciate the possibility of having to take such a complex regimen if such an unfortunate situation occurred.

Students were given an opportunity to comment on how to improve the project for the future. Several medical students noted that their fellow classmates did not take the project seriously. Suggestions for improvement include a better understanding of the project goals as well as an additional standardization of patient counseling provided. Several medical students commented that a 4-week duration of therapy was excessive for this project. Pharmacy student comments were similar. They also commented that there was an unequal amount of work distributed among the three intervention groups for pharmacy students.

**Discussion**

As health care continues to progress toward interdisciplinary medicine, health care education needs to incorporate more opportunities for interdisciplinary learning into didactic course curricula. This project showed student attitudes were overall positive in working with their health care professional counterpart, suggesting acceptance of more interdisciplinary education initiatives. Most pharmacy and medical students agreed or strongly agreed that participation in this project will help them work better within the health care team and that they should have more participation in interdisciplinary projects in their professional programs.

Although no statistical difference was identified in adherence to medications among the different levels of pharmacy interventions, those medical students who had increased pharmacy involvement were more satisfied with the interdisciplinary interaction. This is demonstrated by the statistically significant difference in attitudes among medical students who received pharmacy counseling versus those who did not.

Medical students indicated they had more empathy for patients after participating in this project than pharmacy students. This increased empathy may be due to the fact that medical students were taking the placebo medications and developed a greater appreciation for the difficulties involving medication adherence, especially to a complex drug regimen. Another possible reason for differences in empathy is the focus placed on adherence to drug therapy in pharmacy curricula and not in medical curricula. This knowledge regarding the difficulties associated with adherence was not new knowledge to the pharmacy students, but it may have been new to the medical students.

**Limitations**

Monitoring medication adherence by pill count is an imperfect method of determining compliance and can lead to misinterpretations because it fails to measure whether the medication was taken as prescribed. Students in group C were more compliant with their drug regimen at the final adherence assessment than at the mid–adherence assessment. This finding was only observed in group C, as no pill counts were obtained at the midpoint of the study for the other groups. It is possible that students may have prepared for the pill count by “dumping” medications to boost their perceived compliance rate.

This study was not appropriately powered to detect differences in medication adherence between levels of medication counseling, nor was this a primary outcome of the study. Also, the use of health care providers as simulated patients and providers limits the results of this study being generalized to the public.

**Conclusion**

Overall, pharmacy and osteopathic medical students demonstrated positive attitudes toward interdisciplinary education through a medication adherence project. This project supports additional opportunities for faculty to integrate interdisciplinary education in their didactic curricula, which is important for the development of interprofessional relationships in the health care setting.

**Acknowledgment**

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**References**


