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Evaluation of pharmacy students' knowledge and perceptions of pharmacogenetics before and after a simulation activity

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ABSTRACT

Background and purpose: The purpose of this study was to evaluate students' knowledge and perceptions of the clinical application of pharmacogenetics through a simulation activity and to assess communication of pharmacogenetic-guided treatment recommendations utilizing standardized patients.

Educational activity and setting: Third-year students in the four-year doctor of pharmacy (PharmD) program at University of South Florida College of Pharmacy completed a pharmacogenetics simulation involving a patient case review, interpretation of pharmacogenetic test results, completion of a situation, background, assessment, recommendation (SBAR) note with drug therapy recommendations, and patient counseling. Voluntary assessments were completed before and after the simulation, which included demographics, knowledge, and perceptions of students' ability to interpret and communicate pharmacogenetic results.

Findings: Response rates for the pre- and post-simulation assessments were 109 (98%) and 104 (94%), respectively. Correct responses in application-type questions improved after the simulation (74%) compared to before the simulation (44%, $p < 0.01$). Responses to perception questions shifted towards "strongly agree" or "agree" after the simulation ($p < 0.01$).

Discussion and summary: The simulation gave students an opportunity to apply pharmacogenetics knowledge and allowed them to gain an appreciation of pharmacists' roles within the pharmacogenetics field.

Background and purpose

Pharmacogenetics information is present in the Food and Drug Administration (FDA) approved product labeling of over 150 medications. This labeling outlines the impact of genetic variations on pharmacokinetics, pharmacodynamics, and/or clinical outcomes, but provides little guidance on how that information should be implemented.[1] The Clinical Pharmacogenetics Implementation Consortium (CPIC) has developed guidelines for select drug-gene pairs to empower clinicians with an understanding of how to use labeled pharmacogenetics information in a clinically meaningful way.[2]

With ongoing research and initiatives aimed at personalizing patient care by integration of pharmacogenetic information into the clinical decision-making process as well as growing public interest, pharmacists, as pharmacotherapy experts, are expected to have a working knowledge-base of pharmacogenetics to address questions from the lay and medical communities.[3–6] As a way to address this growing need, pharmacogenetics is a required element of the didactic doctor of pharmacy (PharmD) curriculum as indicated by the

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Accreditation Council for Pharmacy Education (ACPE) "Standards 2016".[7] However, pharmacogenetic instruction varies from less than 10–60 hours content exposure, delivered through various methods, including didactic lectures, laboratory exercises, and patient care skills courses.[8–10] The guidance document published by the American Association of Colleges of Pharmacy (AACP) pharmacogenomics special interest group provides examples of pharmacogenetics content and assessment methods throughout PharmD curricula and how they align with the Center for the Advancement of Pharmacy Education (CAPE) Educational Outcomes 2013. The document concludes with a call to action for incorporation of pharmacogenetics into the clinical pharmacy core curricula.[10,11]

Previously published studies have demonstrated that an active learning exercise involving personal genetic testing enhanced knowledge of pharmacogenetics concepts among medical and pharmacy students.[12–14] Moreover, a clinical pharmacogenetics rotation experience for pharmacy students, residents, and fellows provided opportunities to interpret and apply genotype-guided therapy for the management of warfarin.[15] Knoell et al.[9] described a pharmacogenetic exercise that consisted of a counseling session where students obtained consent to perform a deoxyribonucleic acid (DNA) swab, interpreted the results, and created a plan. While the use of simulation-based activities has been shown to increase knowledge, confidence, clinical performance, and critical thinking skills, the application and communication of pharmacogenetics in a simulated clinical environment with standardized patients (SPs) is limited in the literature.[9,16]

The goal of our simulation was to mimic a clinical scenario a student may encounter during advanced pharmacy practice experiences (APPEs) while continuing to strengthen both written and verbal communication skills. Specific objectives of the simulation included: interpretation of pharmacogenetic results utilizing the CPIC guidelines, completion of a written situation, background, assessment, recommendation (SBAR) note detailing therapeutic recommendations, and patient counseling on the purpose of the pharmacogenetic test, results, and treatment plan. The objective of the research component of this activity was to evaluate students' knowledge and perceptions of the clinical application of pharmacogenetics through the simulation activity and to assess written and verbal communication of pharmacogenetic-guided treatment recommendations utilizing SPs. We hypothesized that students' ability to utilize course content would increase critical thinking skills through a patient case and students' understanding of pharmacists' roles in pharmacogenetics would be enhanced.

Educational activity and setting

This was an online non-randomized, voluntary, unpaired pre- and post-assessment study assessing students' knowledge and perceptions of pharmacogenetics before and after a pharmacogenetic simulation activity. During the fall 2015 semester, 113 student pharmacists in their third professional year (P3) were concurrently enrolled in two 16-week three-credit required courses, translational pharmacogenomics and the pharmaceutical skills V course at the University of South Florida College of Pharmacy (USF COP) in Tampa, Florida. Pharmaceutical skills V is part of a longitudinal patient-care laboratory course comprised primarily of simulations with the use of SPs and interprofessional activities during the P3 year.

Specific pharmacogenetics content for the simulation was developed by the coordinator of the translational pharmacogenomics course, who is also a post graduate year 2 (PGY-2) trained pharmacogenetics clinical pharmacist. The simulation was focused on cytochrome P450 2C19 (CYP2C19) genotype-guided antiplatelet therapy given the availability of CPIC guidelines.[2] Student were lectured on this topic during week 8 and tested on this material during week 11 of the semester. In order to reinforce application, the simulation was conducted during week 13 of the semester. By the time of the simulation, the students had lectures on the pharmacogenomic applications of all major therapeutic areas with CPIC guidelines, including a primer in basic genetics. Genetics is also a required prerequisite for the college. Students had previously participated in similar simulations not related to pharmacogenetics earlier in the semester. Hence, the students were very familiar with the format and expectations of the simulation.

One week prior to the simulation, students were notified via an announcement in the Pharmaceutical Skills V course's learning management system to review the cardiology-related pharmacogenetics materials prior to the activity and were also provided with an electronic slide presentation regarding appropriate techniques for counseling patients on pharmacogenetics test results. Students were also notified the activity would be completed within their pre-assigned academic team (five to six students per team) and to bring their laptops/tablets.

The pharmacogenetics simulation was conducted in October 2015, during week 13 of the semester, at the Center for Advanced Clinical Learning (CACL) within the USF COP. The CACL is a state of the art simulation center with 12 clinical examination rooms equipped with digital video monitoring and a closed circuit computerized evaluation system, on the USF Health campus. Computers are located both inside and outside the room for student use, and all rooms are linked to master video monitoring within the simulation center control room. Each exam room also has a double-sided mirror that allows evaluators to view and hear the live encounter outside of the room. The CACL also oversees the SP program for university. The program recruits lay people through the Office of Curriculum and Medical Education at the USF Morsani College of Medicine. The SPs are trained using a pre-developed curriculum focused on role-playing and providing written and verbal feedback to students focusing on communication and interpersonal skills. Scripts are provided for specific activities in order to allow the SP to role play clinical encounters with the goal of training student learners. This well-established program provides approximately 60,000 SP encounters each year at USF Health.

The simulation only required two faculty members to orient and guide the students to their assigned rooms. On the day of the activity, each team arrived at the simulation center during their assigned time. The simulation was divided into three rounds of 40 min in order to accommodate all 20 academic teams during the three-hour class period. Prior to beginning the simulation, students received a 15-min orientation and were invited to individually complete a non-randomized, voluntary, anonymous pre-simulation assessment. The assessment was built in Qualtrics® (Provo, UT) and consisted of eight multiple-choice questions and four Likert scale questions (1 – "strongly disagree" to 5 – "strongly agree"). Three of the multiple-choice questions collected demographic information