Tailoring Pharmacogenomics Education to Healthcare Students in the Era of Genomic Medicine

Y. W. Francis Lam, Pharm.D., FCCP
Department of Pharmacology and
Pharmacotherapy Education and Research Center,
University of Texas Health Science Center at San Antonio
and
College of Pharmacy, University of Texas at Austin

INTRODUCTION

• Need for educating healthcare students and preparing them to apply pharmacogenomics knowledge appropriately in practice
• Am J Pharmaceutical Ed (AJPE) report recommendation – Revise course offerings
• Logical for pharmacy education
  ♦ Core educational needs? Topics? Assessments? Mode of teaching and learning?
  ♦ Curriculum barriers? Placement? Faculty? Resources?
• Education of other healthcare disciplines?

METHODS

Graduate Level Course for Pharmacy and Pharmacology Graduate Students

• Three-credit hour course in one semester
• Broader scope and in more details
• Progression from molecular / basic science to clinical application / implementation
• Core topics (Primer of molecular medicine, overview of signal transduction and molecular techniques in genomic research, genomics of drug metabolizing enzymes, transporters, and targets; with optimization of drug therapy examples, pharmacogenomic aspect of drug development and regulation, social, ethical, legal, and economic issues, implementation barriers)
• Additional course activities (student presentation, journal club, debates on pharmacogenomic controversies)
• Enrichment course activities (pharmacogenomic protocol and informed consent, laboratory experience and web-based software utilization, tour of clinical microbiology/immunology/virology at an affiliated teaching hospital, tour of molecular research laboratory)
• Desirable competencies for pharmacy graduate students
  ♦ Identify patients who could benefit from pharmacogenomics-based drug therapy
  ♦ Make therapeutic recommendation based on up-to-date, acceptable guidelines and consideration of current limitation of utility
  ♦ Communicate pharmacogenomic information in an understandable, comprehensible, and sensitive ways to healthcare professionals and / or patients
  ♦ Coordinate pharmacogenomic recommendations with other healthcare professionals
  ♦ Consult with specialist’ (clinical geneticists and / or genetic counselors) help, when appropriate

Integrated Within Pharmacology Curriculum for First Year Physician Assistant Students

• Principles: codeine (general concept, FDA alert, incorporation into EMR)
• Cardiology: warfarin (VKORC1, CYP2C9, ethnicity, FDA dosing ranges, labeling), clopidogrel (CYP2C19, FDA dosing labeling)
• Psychiatry: carbamazepine (HLA and SJS, ethnicity, FDA alert, available testing)
• Oncology: tumor markers (KRAS, Her2, available testing), TPMT (genetic testing as SOP)
• Infectious Disease: interferon- (IL28B and HCV clearance), abacavir (HLA and SJS)

Clinical Pharmacology Elective for Medical Students

• General concept covered in freshman year
• Pharmacogenomics reading materials prior to class in senior year
• Case-based discussion and tutorial
• Perceived value to patients and healthcare system
• What to consider and do in the era of evidence-based medicine
• Clinical guidelines (CPIC, ESF) and resources (FDA, PharmGKB)
• Practical implementation considerations (cost and reimbursement, ethics and social issues, infrastructure support, regulatory decision)

RESULTS

• Graduate level stand-alone course
  ♦ “Varied format as great and made the quantity of material more enjoyable to lean and kept me engaged in the lectures and discussions everyday”
  ♦ “Very appropriate course format. Created more discussion and was a lot more exciting than traditional lecture”
  ♦ “The presentation and student participation in discussion best reflect the understanding and application materials”
• Integrated content and clinical pharmacology elective
  ♦ Consistent comments of great clinical correlations
  ♦ Achieves the goal of healthcare professional as CLINICAL PROBLEM SOLVER via applying basic knowledge of science of pharmacogenomics to optimize drug therapy
• Students in all courses understand how to use the science practically given cost vs. benefit

DISCUSSION

Contrasting Two Primary Delivery Methods

Dedicated Course

Advantages

• Sufficient time for discussion and achievement of specific competencies
• Easily adaptable for inclusion of new materials, trends and controversies
• Consistency, less repetitive core concepts
• Additional course-related activities possible

Concerns

• Placement of course within curriculum
• Assessment methods

Integration

Advantages

• Discussion throughout curriculum
• Integrated into therapeutic area
• Genetic variability emphasized as “monitoring” parameter or marker of patient response

Concerns

• Limited time and relevant topics not covered
• Faculty comfort level and expertise
• Faculty with varied level of interest to integrate
• Lack of coordination among interdisciplinary faculty members
• Repetitive assessment of core concepts

CONCLUSION

• Challenging course materials and content delivery
• For most entry-level health professional degree programs, an in-depth and / or required course above and beyond general concepts illustrated with some good examples would have diminishing returns
• Inclusion of laboratory exercise in entry-level curriculum likely of little value
• Tailored content and delivery minimize “book-to-bedside” disconnect
• Appropriate connection between concept and practice appreciated by all students

Lam YWF. Rethinking Pharmacogenomics Education Beyond health professionals: Addressing the "Know-Do" gap across the personalized medicine innovation ecosystem. Curr Pharmacogenomics Person Med 2012;10:277-87