Kristine R. Crews, PharmD, BCPS, FCCP

Your Contribution May Be in a Field That Has Not Yet Been Imagined

Kristine traces her clinical scientist career development, including how she and her husband manage two busy careers and raise three children. She describes the pharmacist-run, multidisciplinary personalized medicine service at St. Jude Children's Research Hospital that conducts upfront pharmacogenetics testing on all patients.

Kristine R. Crews is currently Translational Research Laboratory Director, Pharmaceutical Department, St. Jude Children's Research Hospital, and Program Director, ASHP-accredited postgraduate year (PGY) 2 residency in clinical pharmacogenetics. She is Assistant Professor, Department of Pharmacy, College of Pharmacy, University of Tennessee Health Science Center. Kristine received her BS in Pharmacy and PharmD degree from Rutgers University. She completed a pharmacy practice residency and a clinical pharmacokinetics specialty residency at the University of Kentucky Chandler Medical Center. Following her residencies, she completed a 2-year fellowship in clinical pharmacokinetics and pharmacodynamics at the University of North Carolina and Glaxo Wellcome, Inc.

Kristine's advice is: ***Be open to what the future brings and don't be bound by the choices for your career path that you can see currently. Your most exciting contribution may ultimately be in a field that has not yet been imagined.***

Dear Young Pharmacist,

We practice pharmacy at an exciting time. Advances in targeted agents and new, more specific diagnostic tools allow us to personalize a patient's therapy with improved outcomes. What will pharmacy practice look like in the next 20 years? We can't even imagine the breakthroughs and innovations to come. The one thing we know is that the roles of pharmacists will change with the changing

landscape. I practice in the relatively new field of clinical pharmacogenetics. On a day-to-day basis, I work with both laboratory-based researchers and clinicians to apply pharmacogenetic research findings to optimize patient care.

Pharmacists have known for a long time that medications do not work the same for everyone. Although most patients may benefit from a particular medication, others may see no effect and still others may suffer harm from a treatment that was intended to improve their health. Pharmacogenetics is the field that seeks to find differences in our genome, which influence how patients respond to specific medications.

Pharmacogenetics research is not very new. Laboratories have been reporting links between genes and treatment-induced toxicity for decades. What *is* new is the area of personalized medicine, which is taking these research findings and applying them as a way to individualize care for a particular patient. Personalized medicine is a broad area; clinical pharmacogenetics is one of the first subspecialties of this discipline to make differences in how patients are treated. At St. Jude Children's Research Hospital, we have implemented an ambitious and comprehensive program that offers upfront pharmacogenetic testing to all patients at our institution early in their therapy and places these preemptive test results into the patients' electronic health record to optimize the use of certain medications if they are needed. When one of these drugs is ordered, clinical decision support alerts let the prescriber know if the patient's genotype might impact his or her ability to respond to treatment. Pharmacists run this multidisciplinary, personalized medicine service and educate other clinicians in interpreting genotype results to individualize therapy.

Clinical pharmacogenetics, however, was not a specialty one could choose when I was a pharmacy student. Instead, I got involved in pharmacokinetics research as a PharmD student in the laboratory of Dr. Patty Fan-Havard at Rutgers University; it was an experience that sparked my love of research. Dr. Fan-Havard was the first of many strong mentors throughout my training who instilled in me both clinical pharmacy skills and the drive to ask and answer research questions. As a resident at the University of Kentucky, I worked with Dr. Mary H.H. Ensom, a clinical pharmacokineticist, who was a model for excellence in teaching, mentoring, and running a clinical pharmacokinetics service. During my residency, I heard Dr. Bill Evans from St. Jude speak about his innovative pharmacogenetics research of mercaptopurine in children with acute lymphoblastic leukemia. He told of how he and his collaborators had discovered that patients with one or two copies of a nonfunctional *TPMT* gene were at high risk of toxicity to mercaptopurine and shared data showing that upfront knowledge of the patient's genotype allowed the mercaptopurine dose to be decreased to safe and effective levels. I was inspired by