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COMMENTARY

Pharmacogenomics competencies in pharmacy practice:
A blueprint for changeMary W. Roederer*, Grace M. Kuo, David F. Kisor, Reginald F. Frye,
James M. Hoffman, Jean Jenkins, Kristin Wiisanen Weitzel

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ABSTRACT

The emerging use of genomic data to inform medication therapy populates the medical literature and provides evidence for guidelines in the prescribing information for many medications. Despite the availability of pharmacogenomic studies, few pharmacists feel competent to use these new data in patient care. The first pharmacogenomics competency statement for pharmacists was published in 2002. In 2011, the Pharmacogenomics Special Interest Group of the American Association of Colleges of Pharmacy led a process to update this competency statement with the use of a consensus-based method that incorporated input from multiple key professional pharmacy organizations to reflect growth in genomic science as well as the need for pharmacist application of genomic data. Given the rapidly evolving science, educational needs, and practice models in this area, a standardized competency-based approach to pharmacist education and training in pharmacogenomics is needed to equip pharmacists for leadership roles as essential members of health care teams that implement clinical utilization strategies for genomic data.

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Advances in pharmacogenomic discovery are urging rapid and effective translation of genomic science into clinical practice, with more than 137 medications now containing pharmacogenomic data in their U.S. Food and Drug Administration prescribing information.¹ This heightened rate of scientific discovery is driving change in practice, and clinicians consistently recognize the clinical impact of genomic data. As a profession, pharmacy has long assumed a valued role in the leadership of therapeutic drug monitoring (e.g., pharmacokinetics) and pharmacotherapy services owing to pharmacy's specialized training and an established practice record in medication management. In the same way, pharmacists are

uniquely qualified to be on the front line of efforts to translate pharmacogenomic data into clinical practice across multiple diverse practice settings.²

The pharmacist's role in pharmacogenomics

The pharmacist's role as a practice-based leader in pharmacogenomics is becoming clearer as an increasing number of pharmacists are engaging in clinical pharmacogenomics practice. Indeed, pharmacists are rapidly emerging as professional trailblazers in this area.^{3–5} The Clinical Pharmacogenetics Implementation Consortium (CPIC)⁶ guidelines provide clinically useful guidance to enable the use of genetic laboratory test results for drug therapy recommendations in practice for 40 drug-gene pairs. CPIC is a pharmacist-led initiative, and many of the published guidelines have been developed and authored by pharmacists.⁶

There is a clear consensus among national pharmacy organizations regarding the important role of the pharmacist in applying pharmacogenomics to patient care. In 2011, the American Pharmacists Association (APhA) issued a white paper encouraging the development and integration of pharmacogenomics into pharmacy practice through medication therapy management (MTM).⁴ More recently, the American

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* **Correspondence:** Mary W. Roederer, 1011 Genetic Medicine Building, Mason Farm Road, CB# 7361, Chapel Hill, NC 27599-7361.

E-mail address: mary.roederer1@gmail.com (M.W. Roederer).

Key Points**Background:**

- Pharmacists believe pharmacogenomic data is part or will be a part of pharmacotherapy management in the near future.
- Pharmacist competencies for pharmacogenomics elucidate a framework for a basic knowledge to provide essential pharmacotherapy recommendations based on available genomic data.

Findings:

- The Clinical Pharmacogenomics Working Group (CPIC) create and update guidelines for using available genomic data to influence medication use.
- The updated pharmacogenomics competencies provide a launching pad for educational efforts for both students and practicing pharmacists.

Society of Health-Systems Pharmacists (ASHP) developed a formal policy statement on the pharmacist's role in clinical pharmacogenomics.⁵ The ASHP statement describes a need for all pharmacists to have a basic understanding of the use of pharmacogenomic data for patient care and for pharmacists with specialized expertise to lead the implementation of pharmacogenomics. The ASHP Residency Directory (<http://ashp.org>) currently recognizes 3 post-graduate year 2 (PGY2) pharmacogenetics specialty residencies that are accredited or seeking accreditation, and the number of pharmacists with specialized training in this area is growing.

With guidelines available and national organizations releasing statements elucidating the pharmacist as a clinician integral to the use of pharmacogenomic data, clinical pharmacogenomics is also becoming the standard of care in some practice environments and its applications are expected to grow. In a recent survey of health system pharmacy directors, pharmacogenomic testing was used in 7% of hospitals.⁷ In a report on the future of pharmacy practice, 79% of participants expect that at least 1 academic medical center in their area will have a pharmacy-based pharmacogenomics service within the next 5 years.⁸

Pharmacy at a crossroads in pharmacogenomics

Despite these advances, practicing pharmacists consistently report feeling ill-prepared to evaluate pharmacogenomic test results and discuss implications of these results with patients and other health care professionals.⁹⁻¹² This perceived lack of competency is supported by published descriptions that show a lack of formal training and understanding among pharmacists regarding pharmacogenomics knowledge and document its limited inclusion in pharmacy education.^{13,14} In the present paper, we argue that the profession of pharmacy is at a crossroads within clinical pharmacogenomics. Although pharmacists are being recognized as leaders in clinical pharmacogenomics, both within

and outside of pharmacy, individual pharmacists consistently report being underprepared to assume practice-based responsibilities in pharmacogenomics, pointing to significant clinical and educational gaps within the profession.

There is an urgent need for the profession to address these gaps through development and dissemination of educational and clinical practice models that can equip practicing pharmacists, new graduates, and students with the knowledge and skills needed to integrate pharmacogenomic data into individualized medication therapy choices in the current patient care paradigm.

An essential step in meeting this need is the development of current practice-based pharmacogenomic educational competencies. Pharmacist competencies for pharmacogenomics were last updated in 2002.¹⁴ In a manner similar to that employed by other health care professionals to systematically address pharmacogenomics, the creation of practice-based pharmacogenomic competencies fulfills a need to identify the core areas of knowledge, skill, and attitudes required for pharmacist proficiency in this area.^{15,16} Moving forward, the maintenance and widespread dissemination of such competencies will be essential to create a dynamic professional "blueprint" that can be used to standardize and improve education and practice expectations for pharmacists in clinical pharmacogenomics.¹⁷⁻¹⁹ Furthermore, leading this competency development and revision process from within the profession allows the unique perspective and background of pharmacists to consistently be at the forefront of revised pharmacogenomics competencies.^{14,15}

Using a systematic process to update pharmacist competencies

In 2011, the National Institutes of Health National Human Genome Research Institute (NHGRI) invited pharmacy education stakeholders, including representatives from 11 national pharmacy organizations, other medical associations, government agencies, and colleges and schools of pharmacy, to participate in such a process to explore needs for pharmacist education in the era of genomics.¹⁵ This meeting resulted in plans to address perceived gaps in pharmacist education around pharmacogenomics, including the need for developing updated pharmacist competencies in pharmacogenomics and increasing pharmacy contributions to established educational and practice-based resources in this area, such as NHGRI's Genetics and Genomics Competency Center (G2C2; www.g-2-c-2.org).¹⁶

As with the 2002 competencies, the American Association of Colleges of Pharmacy (AACP) Pharmacogenetics/Pharmacogenomics Special Interest Group (SIG) was charged to lead this process. In 2012, a SIG subcommittee analyzed the needs for pharmacist competencies and assembled an updated competencies inventory, which included the need for increased coverage of the clinical applications of genomics to MTM.

Based on the desired outcome that "pharmacy graduates should possess competent knowledge and skills to seek coordination and collaboration of care with an interdisciplinary team of health professionals when assessing genetic information," the AACP SIG led a systematic process to revise the existing competencies. This process was conducted from 2012

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