



Multidisciplinary Approaches and Training PGx Practitioners at the University of Florida

Kristin Weitzel, PharmD, FAPhA

Associate Director, UF Health Personalized Medicine Program

Clinical Associate Professor

Pharmacotherapy and Translational Research

University of Florida College of Pharmacy

UF Health Personalized Medicine Program- Moving Pharmacogenetics to the Clinic



Healing ▾ Learning ▾ Discovery ▾ Community ▾ [visit University of Florida](#)



Division of Cardiovascular Medicine
Department of Medicine, College of Medicine

Intranet Department of Medicine COM



[Request a Patient Appointment: \(352\) 265-0820](#)

 About Us ▾ Patient Care ▾ Education ▾ Research ▾ Resources Contact Us ▾

UF delivers promise of personalized medicine to heart patients

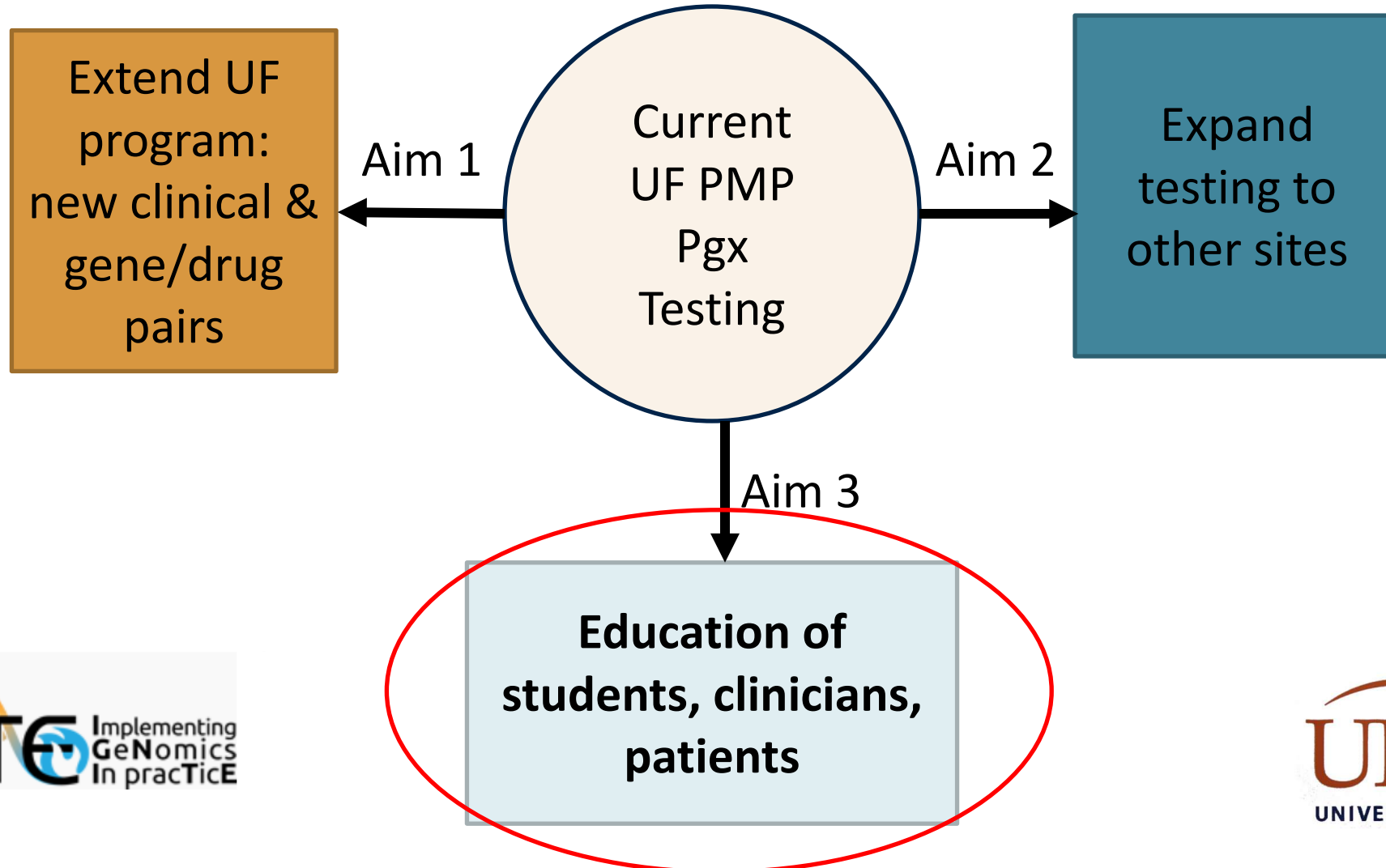
Personalized medicine — a concept in which an understanding of a patient's genetic makeup is used to enhance treatment — has arrived at UF&Shands, the University of Florida Academic Health [...]

[Read More >](#)

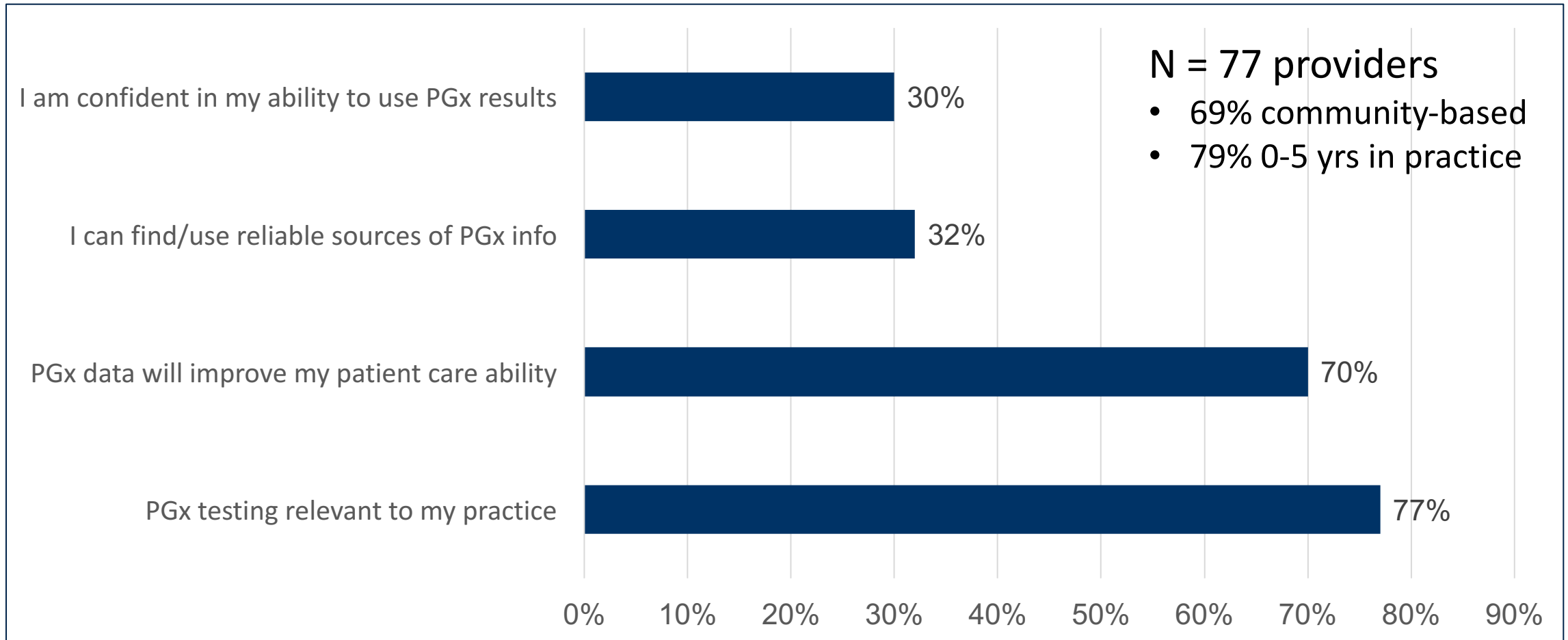


<https://ufandshands.org/news/2012/uf-delivers-promise-personalized-medicine-heart-patients#!/-1/>

UF IGNITE Project Aims

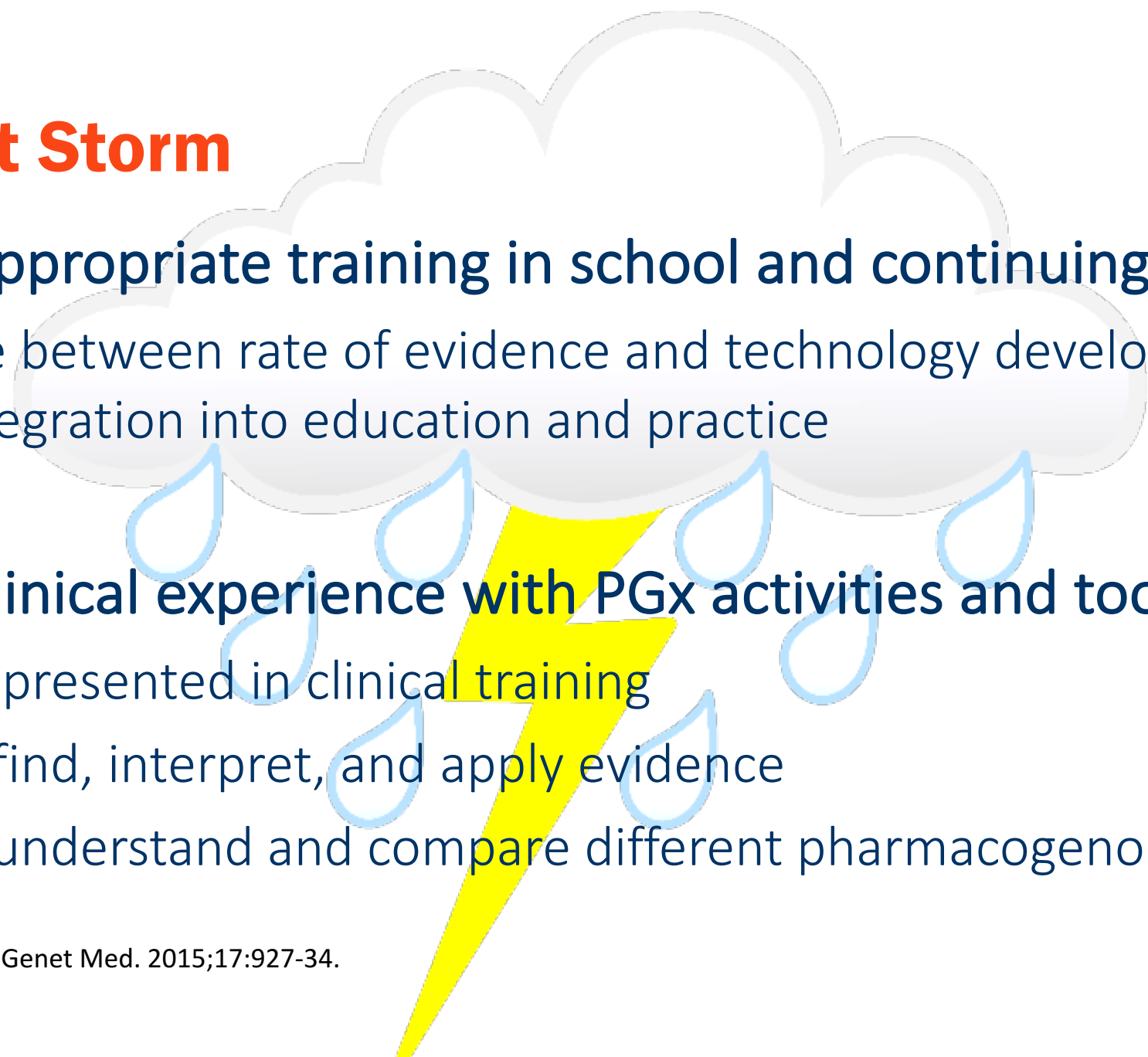


IGNITE Provider Survey Data: PGx Providers



Unpublished IGNITE Network data. Owusu-Obeng A, Mount Sinai Icahn School of Medicine, Provider Adoption Barriers and Education WG.

A Perfect Storm



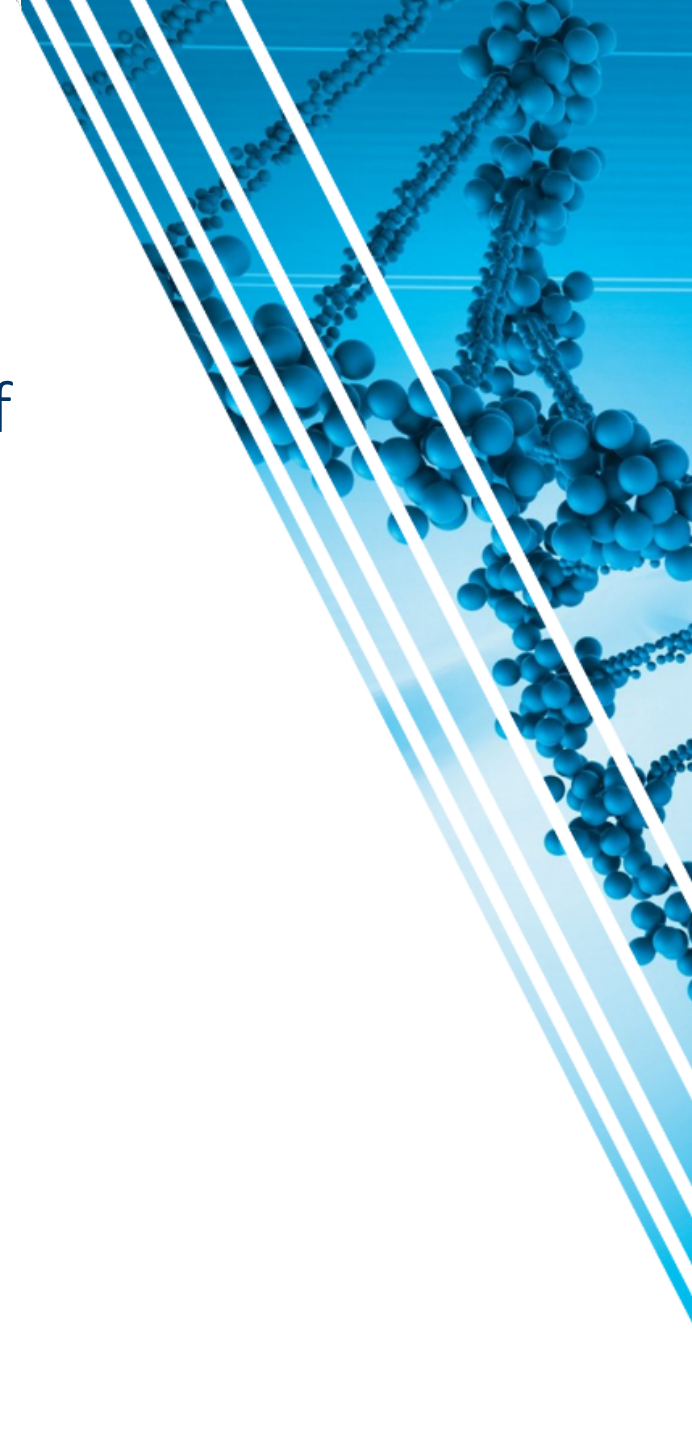
- **Lack of appropriate training in school and continuing education**
 - Lag time between rate of evidence and technology development and their integration into education and practice
- **Lack of clinical experience with PGx activities and tools**
 - Underrepresented in clinical training
 - How to find, interpret, and apply evidence
 - How to understand and compare different pharmacogenomics tests

Getting Past the Perfect Storm



UF Health Personalized Medicine Program

- Working to add to the knowledge base about the role of genetic variation on drug response
- Establishing models and implementing use of genetic information to guide clinical decisions about drug use
- Developing educational programs and strategies to improve genomics education

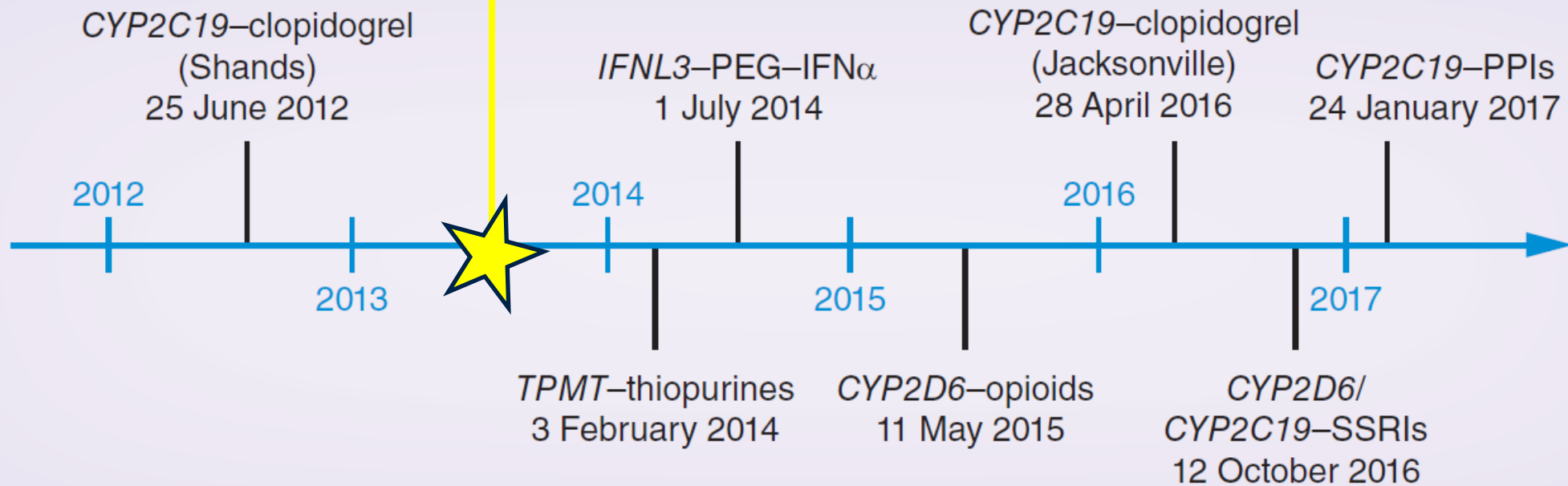


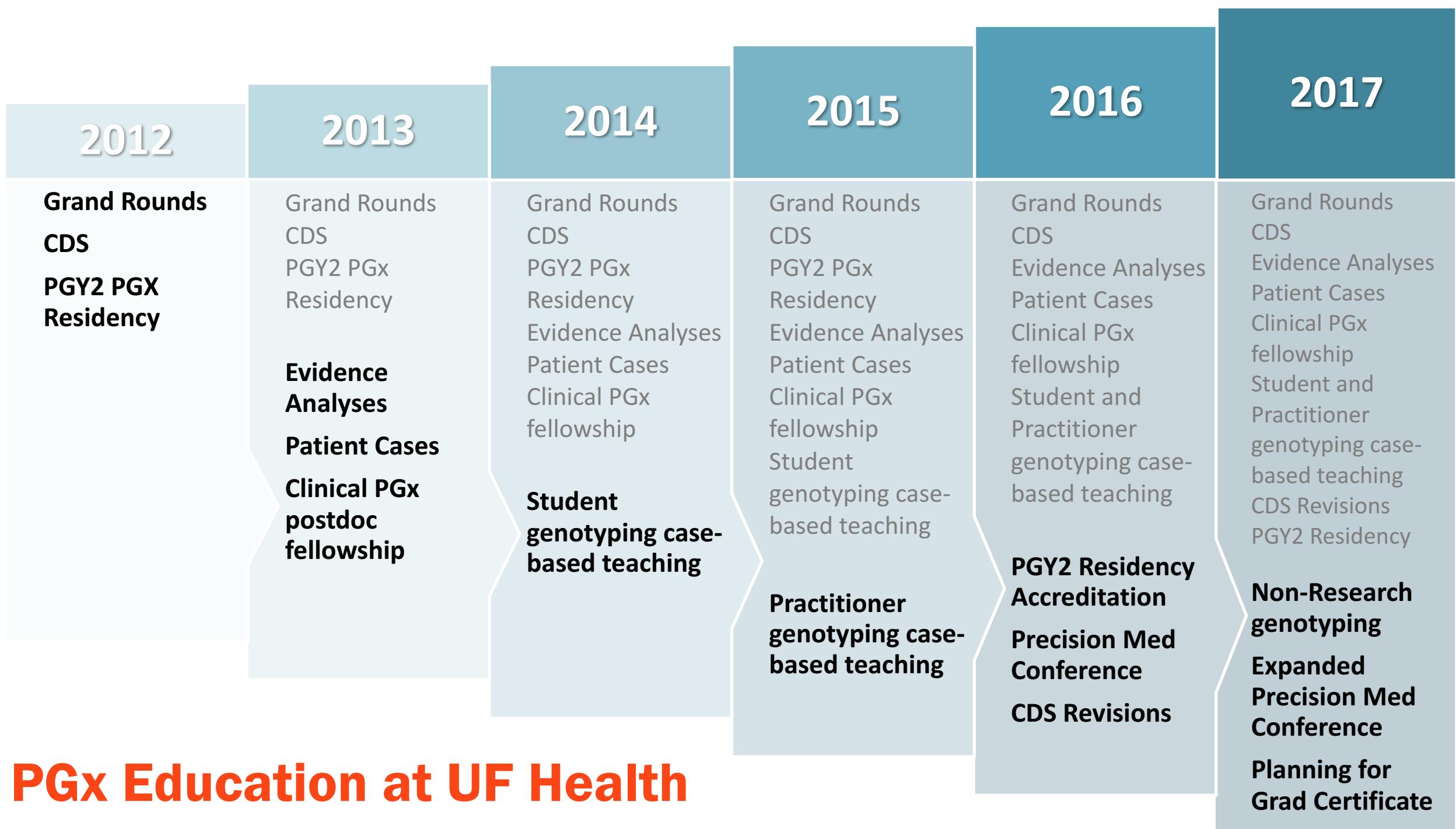
Pharmacogenetic Testing at UF Health

Test	Drug	Number of tests	Ordering Service
<i>CYP2C19</i>	Clopidogrel	1694	Cardiology, UF Health Shands
		634	Cardiology, UF Health Jacksonville
		13	Neurology, Neurosurgery
<i>TPMT</i>	Thiopurines	43	Hematology/Oncology
		67	Gastroenterology
		42	Other*
<i>IFNL3</i>	PEG-interferon- α based regimens	96	Gastroenterology
<i>CYP2D6</i>	Opioids	202	Family Medicine
		33	Internal Medicine
		34	Chronic Pain Clinic
		3	Adult Oncology
<i>CYP2D6</i>	SSRIs	12	Psychiatry
<i>CYP2C19</i>	SSRIs	13	Psychiatry
<i>CYP2C19</i>	PPIs	40	Gastroenterology

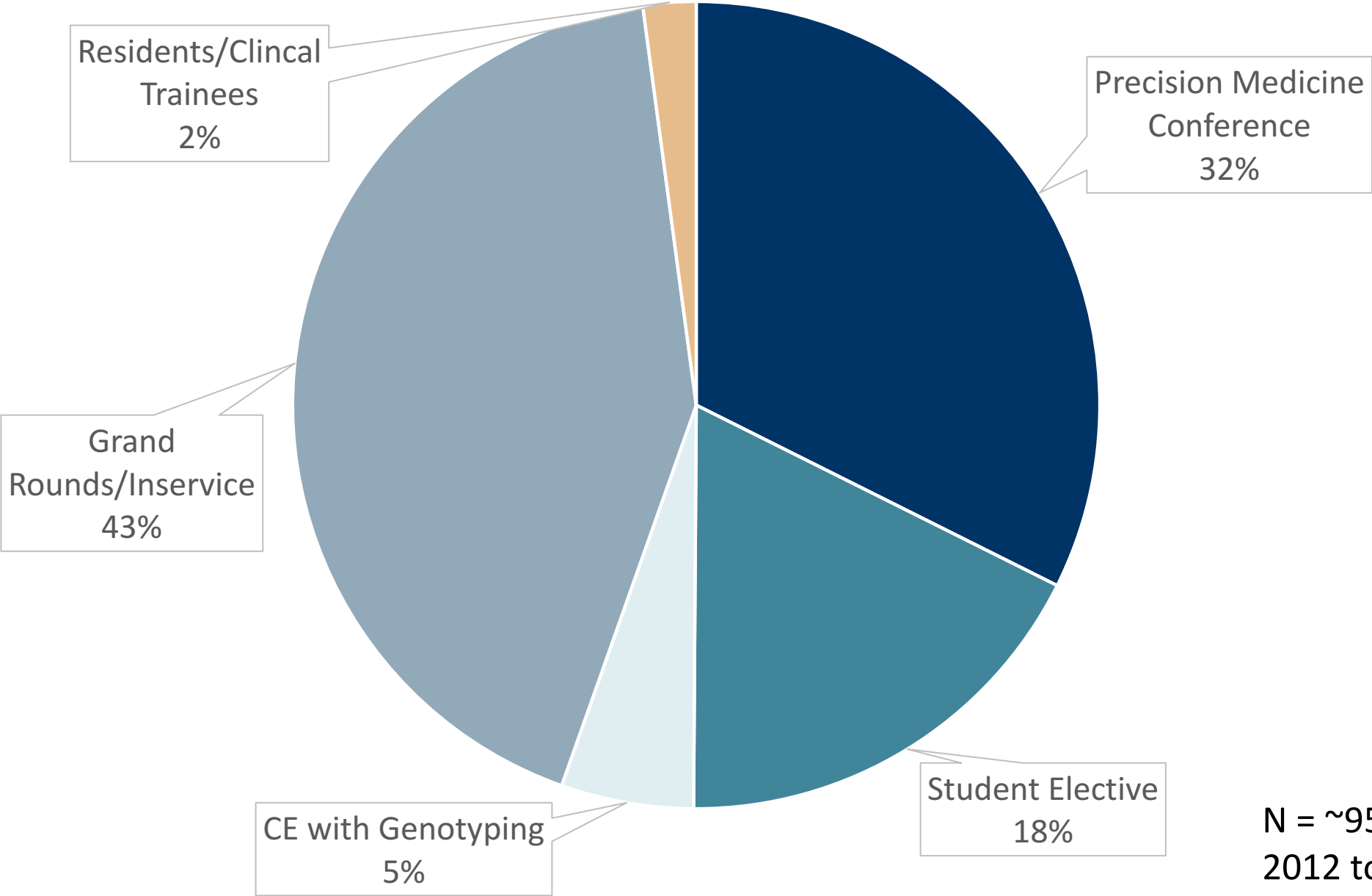
*Dermatology, Rheumatology, Neurology, Internal Medicine, Family Medicine, Surgery

Pharmacogenetic Testing at UF Health





PGx Education at UF Health



N = ~950 participants
2012 to 2017 ¹¹

Personal Genotyping: Knowledge, Attitudes and Beliefs

	Krynetskiy et al (2009)	Adams et al (2016)	Weitzel et al (2016)	Frick et al (2016)	Surofchy et al (2017)	Remsberg et al (2017)
Student Genotyping	Single SNP analysis (rs1801280) within <i>NAT2</i>	Commercial laboratory testing (23andMe)	Panel-based testing in research laboratory for relevant clinical SNPs	Commercial laboratory testing (23andMe)	Single gene encoding drug metabolizing enzyme or pharmacodynamics-relevant protein	Single gene testing of <i>TAS2R38</i> with phenotype testing
Effect on Attitudes and Beliefs	Improved understanding of PGx analysis ↑ importance of this topic to future practice	↑ confidence ↑ student's self-perceived ability to empathize	↑ self-reported understanding ↑ comfort level and confidence	↑ confidence ↑ students' reflections and attitudes toward PGx	Positively impacted attitude towards PGx pre- vs. post	↑ perceptions of and confidence in abilities in PGx patient care skills

*Student knowledge improved pre- vs. post course across all studies

Krynetskiy et al. *Am J Pharm Ed.* 2009;73(4):71.; Adams et al. *Am J Pharm Ed.* 2016; 80(1):3.; Weitzel et al. *Am J Pharm Ed.* 2016;80(7):122.; Frick et al. *Front Pharmacol.* 2016;7:241.; Surofchy et al. *Innovations Pharm.* 2017;8(1):2.; Remsberg et al. *Am J Pharm Ed.* 2017;81(1):11.

Effects of Active Learning/Personal Genotyping on Student Knowledge and Self-Efficacy

Control (CTR)

Students enrolled in Required PGx Course

Intervention (INT)

Students enrolled in both Required PGx Course and Elective Clinical PGx Course

Option to undergo panel-based genotyping and used genetic data in patient cases

Knowledge-based metrics were compared between the CTR and INT group.

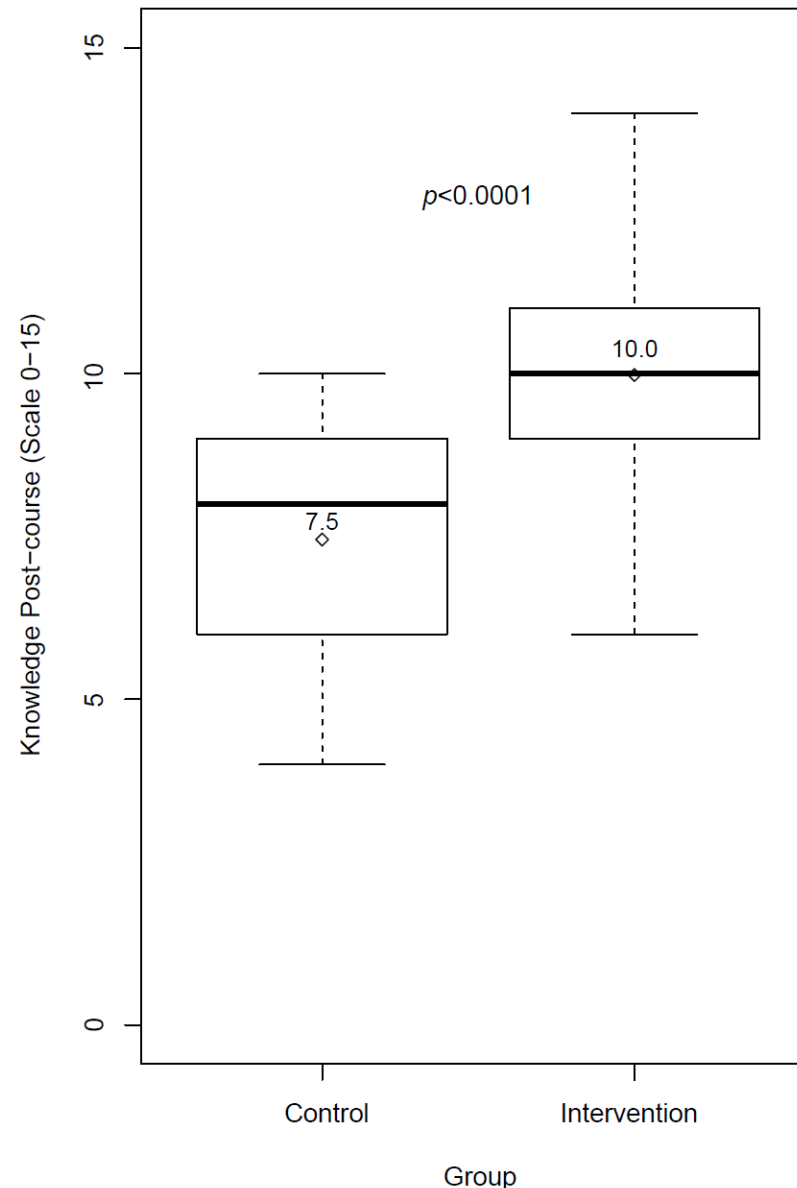
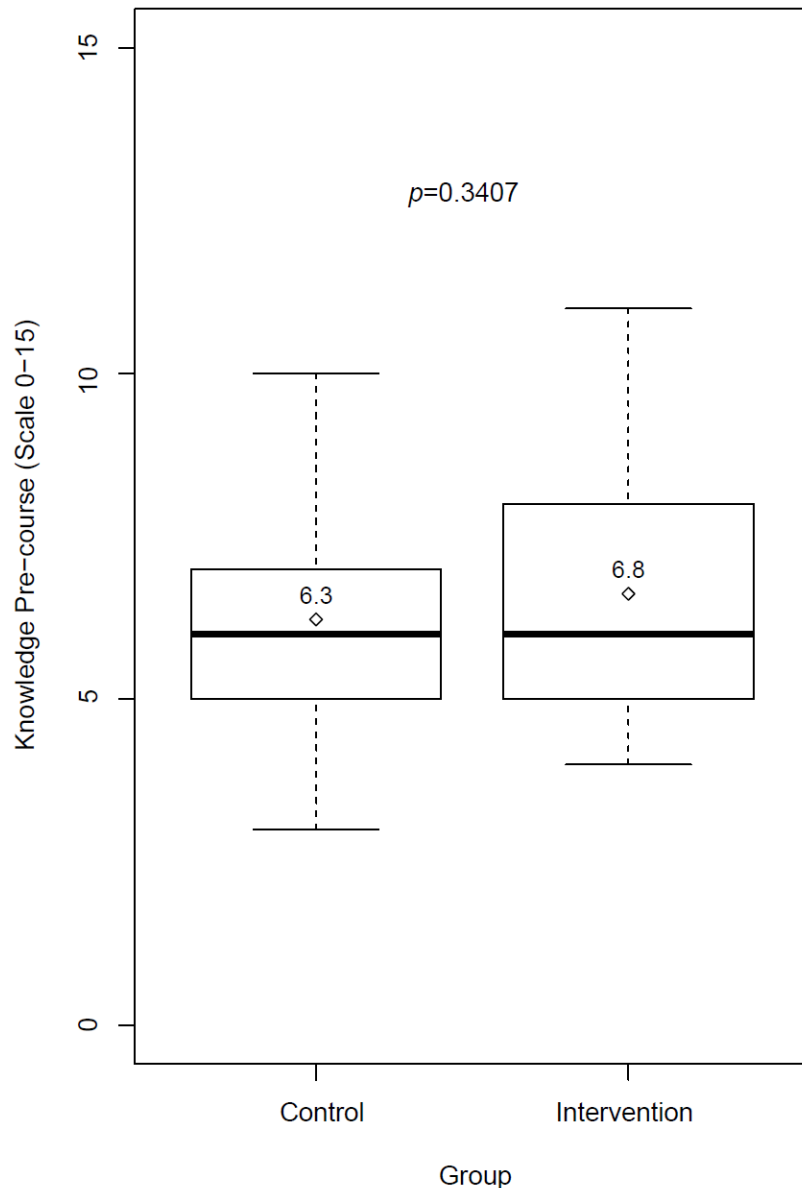
Collected via pre- and post-course survey

Teaching strategies differed between the CTR and INT group

Teaching Strategies

	Elective Clinical PGx Course		Required PGx Course
Teaching strategies	Didactic, Interactive, Case-Based Teaching Strategies; Emphasis on Clinical Applications		Didactic Teaching Strategies; Emphasis on Foundations
Activities	• Pre-recorded lectures • Required readings • Regularly scheduled quizzes • Exams • Discussion board assignments • Journal evaluation assignments • Patient cases prior to in-class discussions	• Patient case discussion in class with faculty • Optional personal genotyping during the class • Option to use personal genotype results to solve patient cases	• Pre-recorded lectures • Required readings • Regularly scheduled quizzes • Exams

Pre- and Post-Course Knowledge Results



Pre-Course:

No difference in test scores between INT and CTR (6.8 vs 6.3; $p=0.3407$)

Post-Course:

Higher post-course knowledge test score in INT vs CTR group (10 vs 7.5; $p=0.0001$)

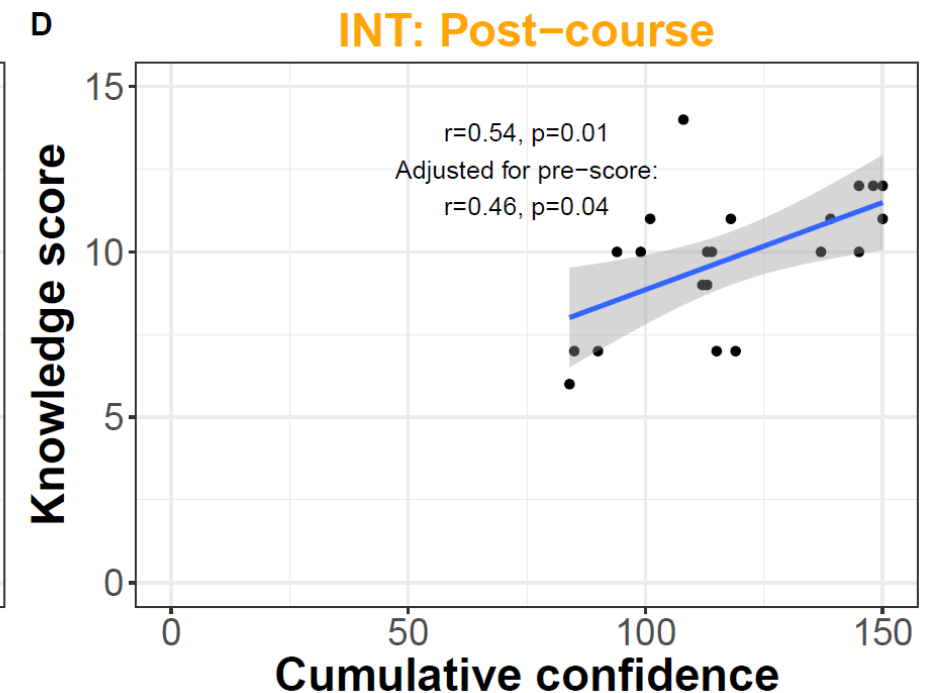
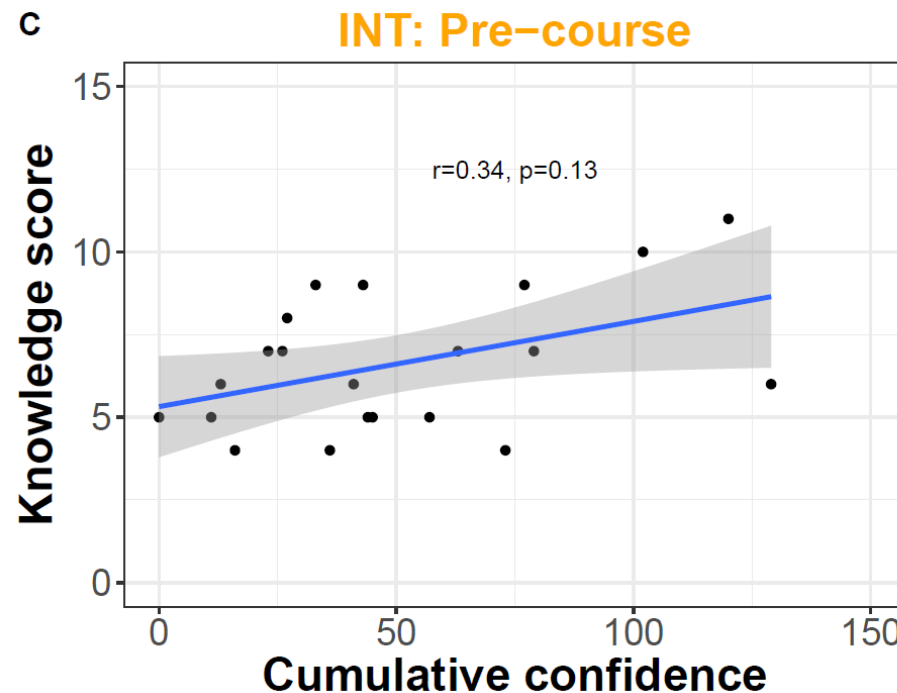
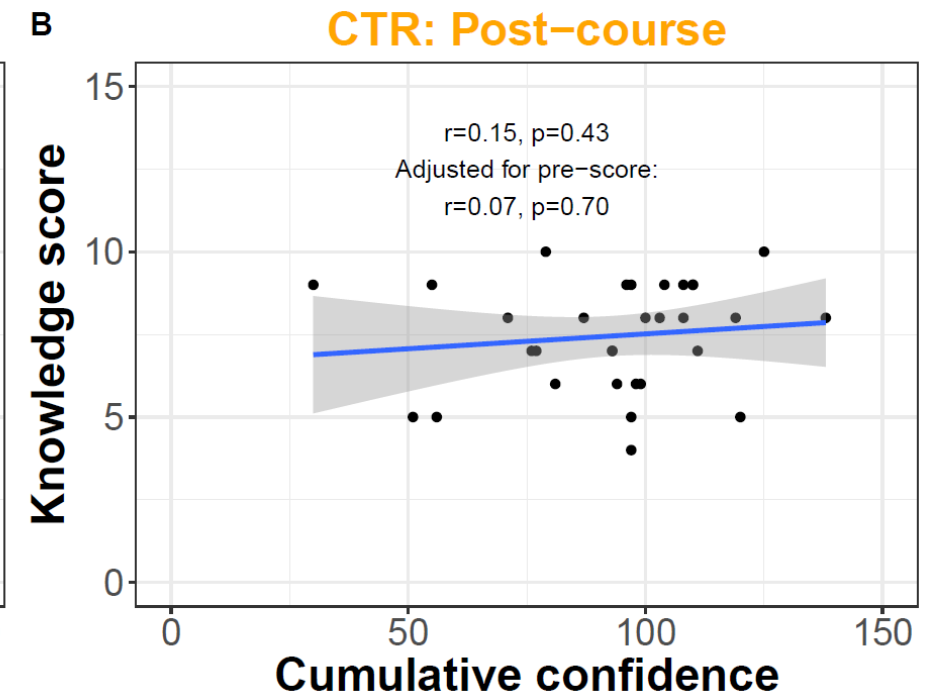
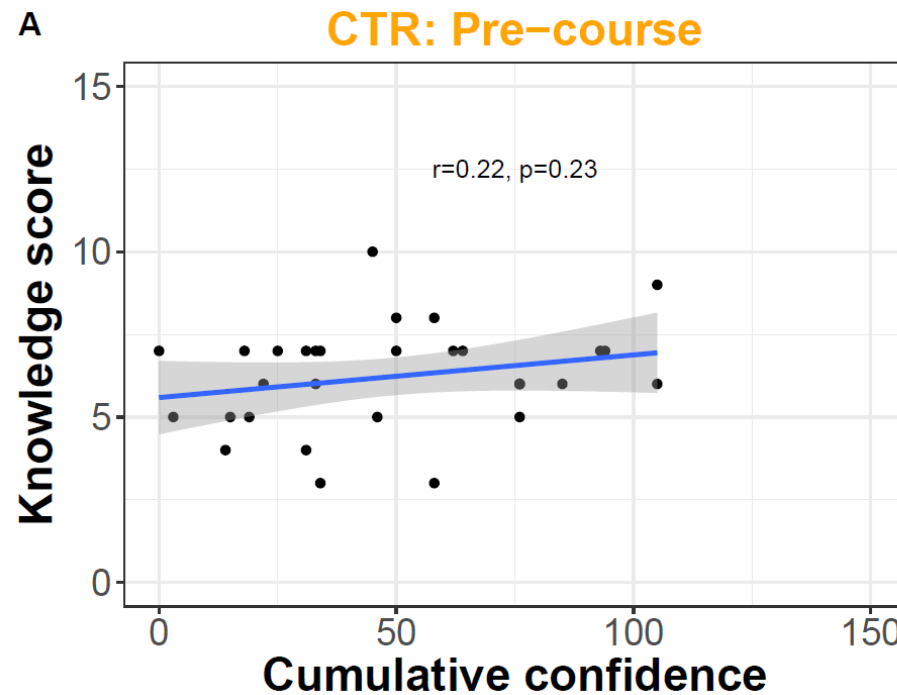
Correlation of Confidence and Knowledge

CTR Group:

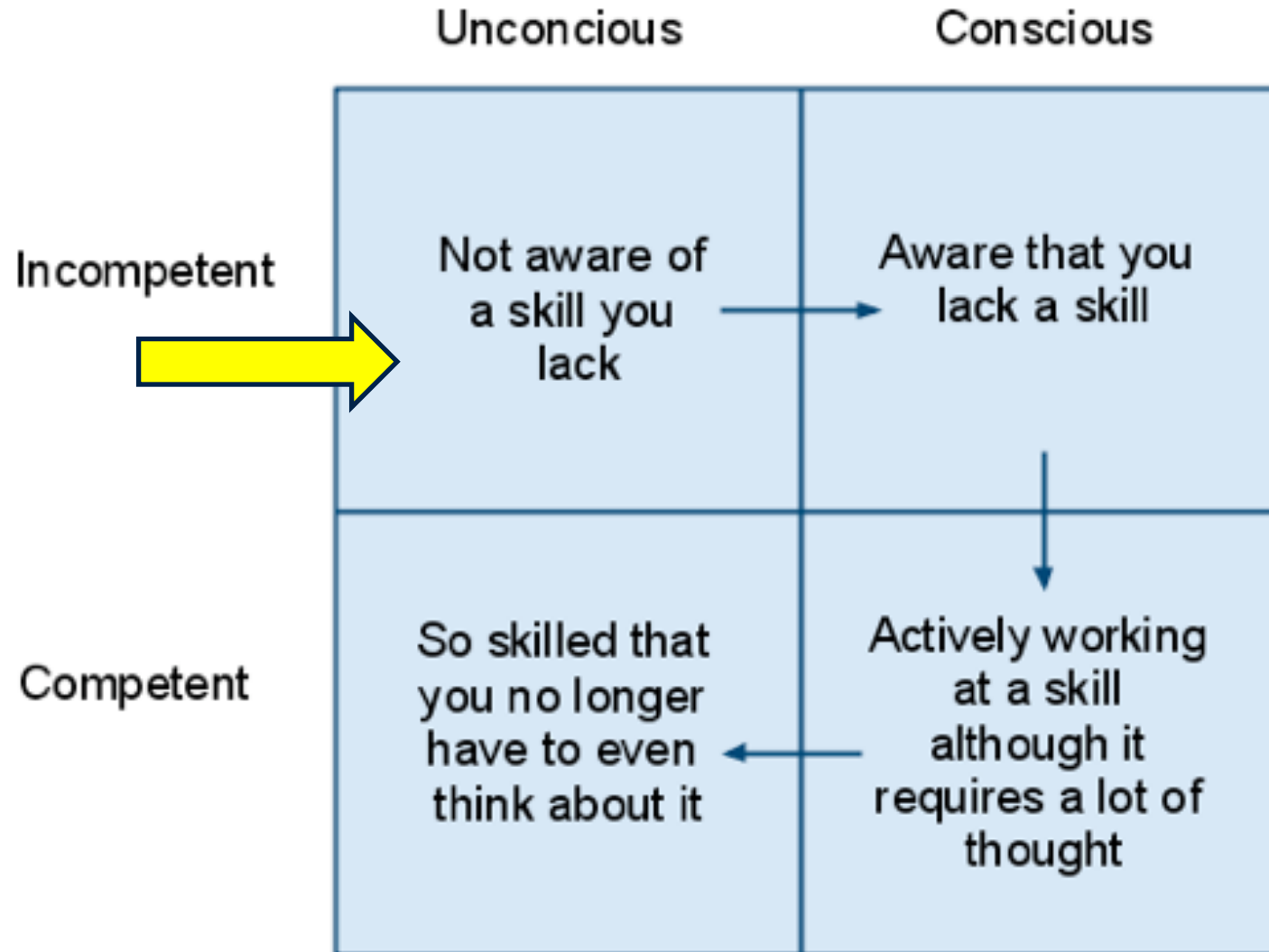
No correlation between students' confidence and knowledge for pre-course ($r=0.22$, $p=0.23$) or post-course (adjusted $r=0.07$, $p=0.70$)

INT Group:

Students' confidence and knowledge were not correlated pre-course ($r=0.34$, $p=0.13$), but did correlate post-course (adjusted $r=0.46$, $p=0.04$)



Correlation of Confidence and Knowledge



UF Precision Medicine Conference 2016-2017

 **Precision Medicine Conference**
College of Pharmacy

Conference Location View Agenda

Search Our Site 

 Overview ▾ 2017 Conference Highlights ▾ 2018 Conference

UF Precision Medicine Conference draws attention to pharmacy's role in precision medicine

Attendees of the 2017 UF Precision Medicine Conference learned how they can lead efforts to apply the emerging field of pharmacogenomics into their daily practice.

[Read More >](#)



2016

150 attendees

30 states; 2 countries

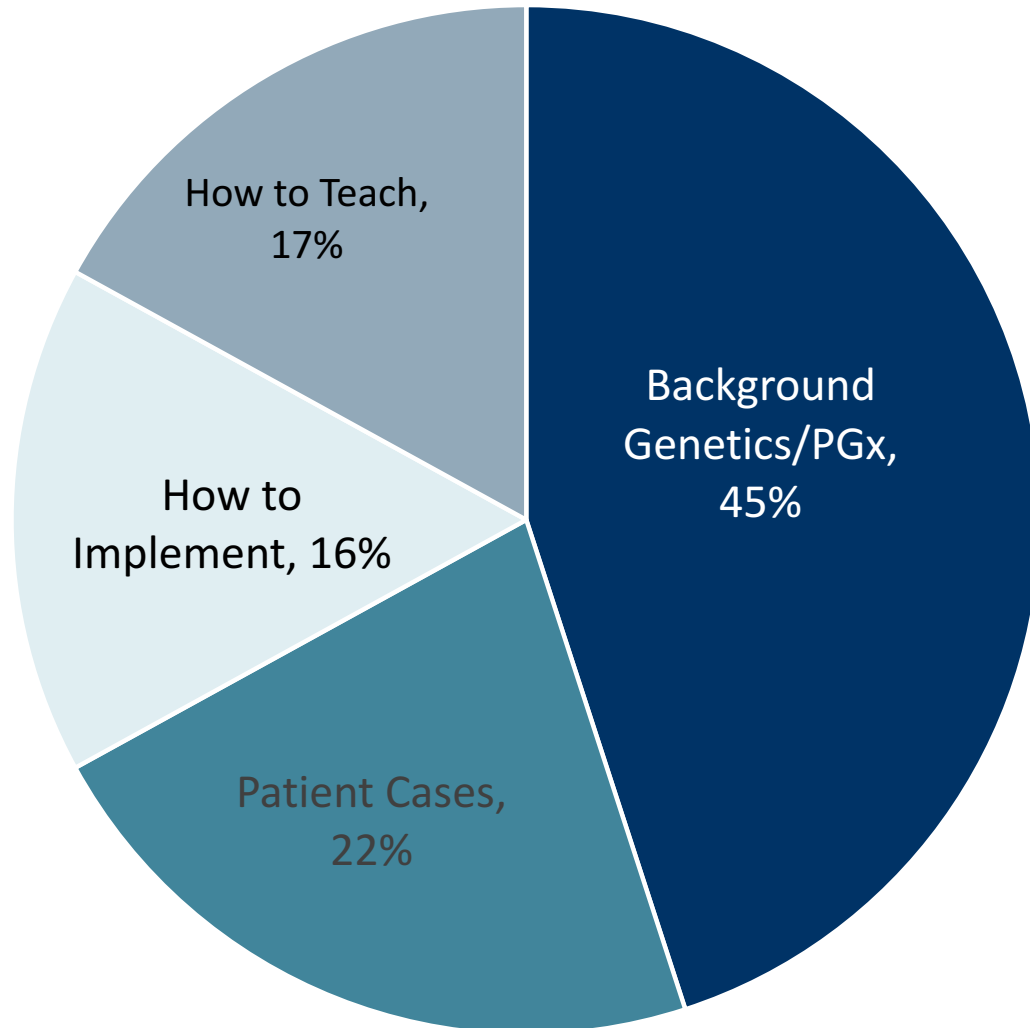
2017

165 attendees

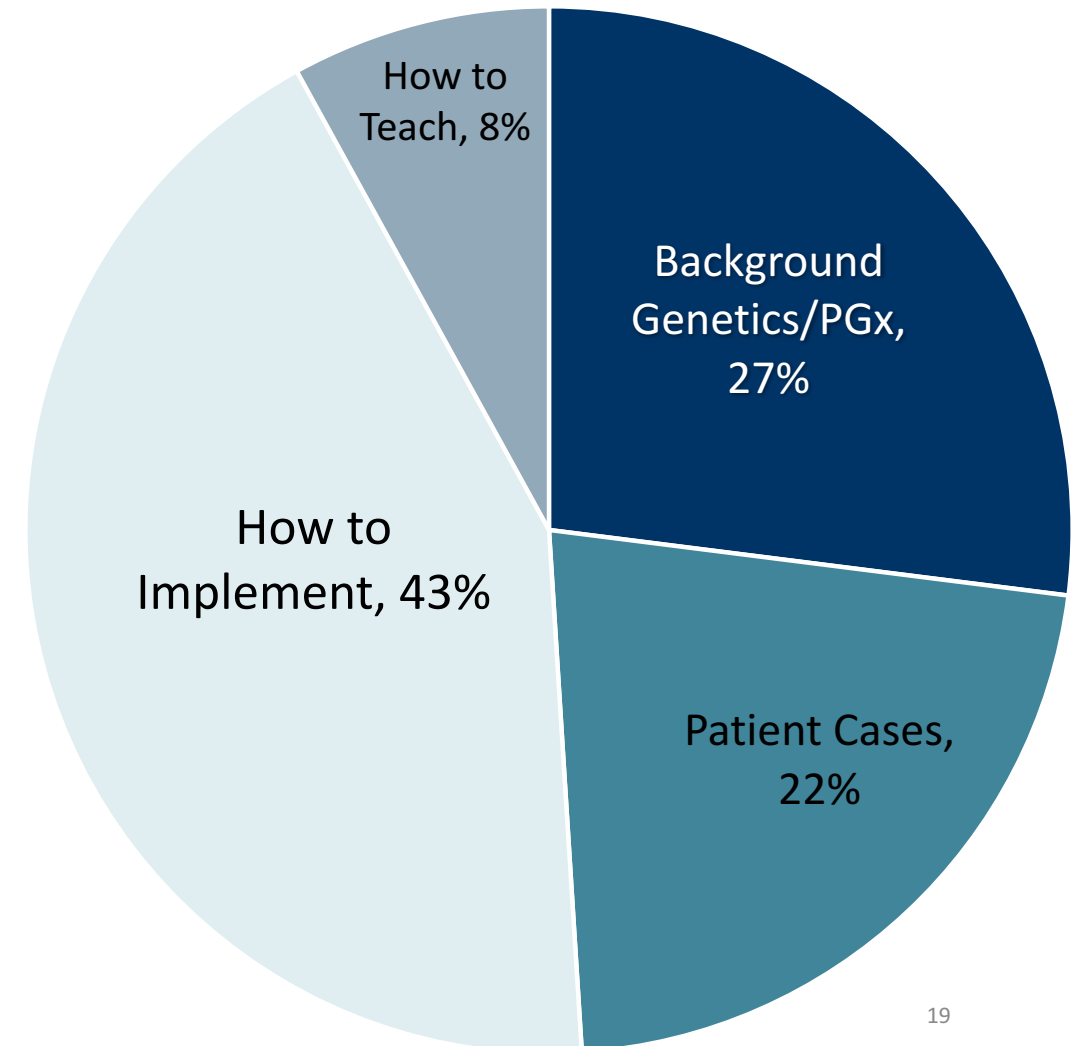
32 states; 5 countries

Precision Medicine Conference Content

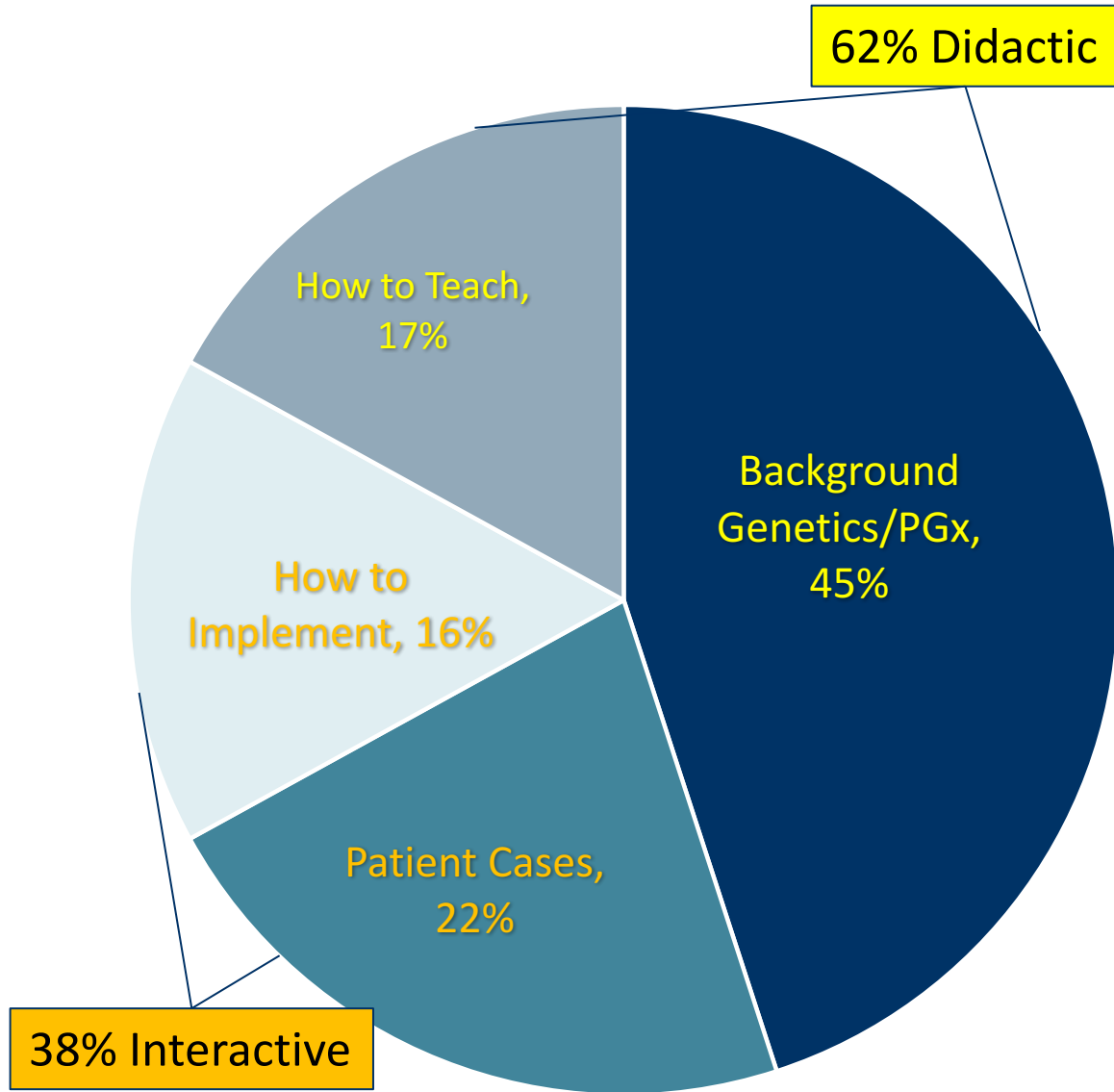
2016



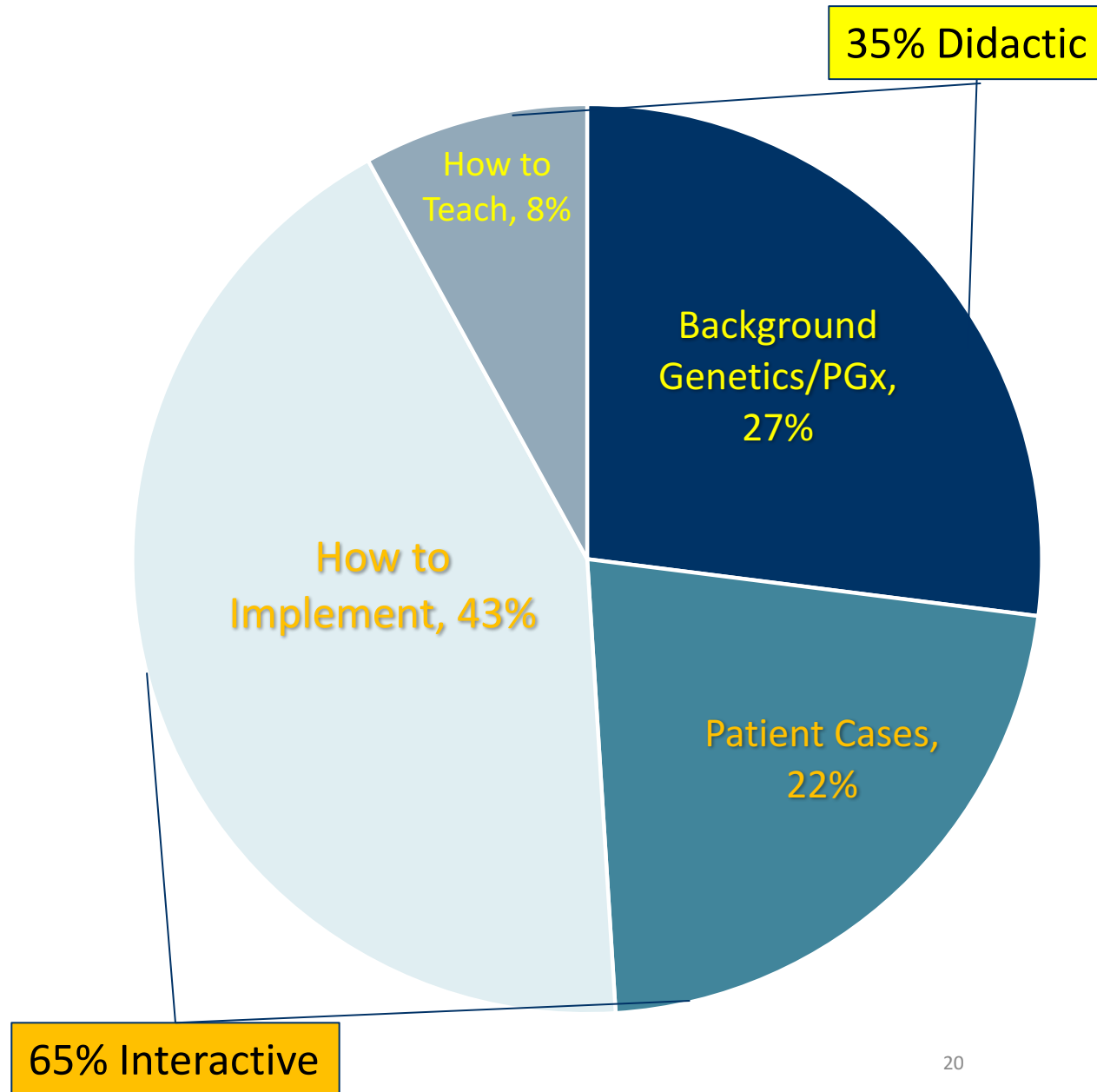
2017



2016



2017



Next steps

- 2018 Precision Medicine Conference
 - Interprofessional
 - Focus on implementation, current issues
- Precision Medicine Graduate Certificate in conjunction with College of Medicine
 - Foundations of Precision Medicine
 - Foundations of Precision Medicine Technology
 - Applications of Precision Medicine in Practice
 - Pharmacogenomics: Individualizing Drug Therapy Through Precision Medicine
 - Applications of Precision Medicine in Susceptibility Genomics
 - Ethical Considerations in Precision Medicine
 - Precision Medicine Seminar

Get Started

Implementing
Genomics in Practice?
Search **Clinical** Tools

Search...



Researching
Genomics in Practice?
Search **Research** Tools

Search...



Search **All** SPARK Tools

Search...



or

[Explore the SPARK Toolbox](#)



**IGNITE at the Genomic Medicine X:
Pharmacogenomics Meeting**

May 2-3, 2017 | Silver Spring, MD



**Monthly CDKSB informatics webinar
recordings now available in the
IGNITE SPARK Toolbox**

SPARK Toolbox



**Medical students learn how to care
for patients at the genetic level**

IGNITE in the News

+ CYP2C19 - Clopidogrel

+ CYP2D6-Opioids

+ CYP2D6 and CYP2C19-SSRIs

+ TPMT-Thiopurines

+ Family History

+ APOL1

— CYP2C19 - Clopidogrel

✚ Evidence Overview: CYP2C19 – Clopidogrel

✚ Clinical Implementation Publications: CYP2C19-Clopidogrel

✚ Clinical Pharmacogenetics Implementation Consortium Guideline Resources: CYP2C19-Clopidogrel

✚ PharmGKB Resources: CYP2C19

✚ Genotyping Resources: CYP2C19

✚ Implementation Workflow Examples: CYP2C19-Clopidogrel

✚ Clinical Decision Support: CYP2C19-Clopidogrel

✚ Data Collection and Implementation Metrics: CYP2C19-Clopidogrel

✚ Resources for Patients and Providers: CYP2C19-Clopidogrel

+ Clinical Pharmacogenetics Implementation Consortium Guideline Resources: CYP2C19-Clopidogrel

+ PharmGKB Resources: CYP2C19

+ Genotyping Resources: CYP2C19

+ Implementation Workflow Examples: CYP2C19-Clopidogrel

+ Clinical Decision Support: CYP2C19-Clopidogrel

+ Data Collection and Implementation Metrics: CYP2C19-Clopidogrel

— Resources for Patients and Providers: CYP2C19-Clopidogrel

- [Information on Genetic Testing for Clopidogrel \(Plavix\)](#)
Source: University of Florida Health Personalized Medicine Program
- [Video: CYP2C19 and Clopidogrel \(Plavix\) Response](#) ^{NEW}
Source: Coriell Personalized Medicine Collaborative
- [Patient Education Brochure for Clopidogrel](#) ^{NEW}
Source: Icahn School of Medicine at Mount Sinai
- [CYP2C19 Summary for Patients and Their Families](#) ^{NEW}
Source: St. Jude Children's Research Hospital
- [CYP2C19-Clopidogrel Pharmacogenomic Lab Test Summary](#)
Source: Mayo Clinic Center for Individualized Medicine
- [Guide for Patient Consultation about Pharmacogenomics](#)
Source: Indiana University
- [Medical Genetics Summary: Clopidogrel Therapy and CYP2C19 Genotype](#) ^{NEW}
Source: NIH National Center for Biotechnology Information
- [CYP2C19 Information Page](#) ^{NEW}
Source: St. Jude Children's Research Hospital
- [PMP Clopidogrel Handout](#)
Source: University of Florida Health Personalized Medicine Program
- [Education Handouts](#) ^{NEW}
Source: Cincinnati Children's Hospital

UF Health Personalized Medicine Program Acknowledgements

- UF PMP Leadership: Julie A. Johnson, PharmD (Director); Larisa Cavallari, PharmD (Assoc Director); Amanda Elsey, MHA (Asst Director); Michael Clare-Salzler, MD; David Nelson, MD
- Trainees/Faculty: Dyson Wake, PharmD, D. Max Smith, PharmD, Meghan Arwood, PharmD, Issam Hamadeh, PharmD, Aniwaa Owusu-Obeng, PharmD, Oyunbileg Magvanjav, MS, Scott Mosley, PharmD, Teresa Vo, PharmD, Ben Kong, PharmD
- Funded by NIH grants U01 GM074492 and U01 HL105198 (as part of TPP project in PGRN); NIH/NCATS UF CTSA UL1 TR000064, IGNITE Network grant U01 HG007269 and substantial institutional support from UF and UF Health