

# Stanford

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## Teri Klein

Professor (Research) of Biomedical Data Science, of Medicine (BMIR) and, by courtesy, of Genetics

### CONTACT INFORMATION

- **Alternate Contact**

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### Bio

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### CURRENT ROLE AT STANFORD

Principal Investigator, PharmGKB

Principal Investigator, CPIC

Principal Investigator, PharmCAT

Principal Investigator, ClinGen

### ACADEMIC APPOINTMENTS

- Professor (Research), Biomedical Data Science
- Professor (Research), Medicine - Biomedical Informatics Research
- Professor (Research) (By courtesy), Genetics
- Member, Maternal & Child Health Research Institute (MCHRI)

### HONORS AND AWARDS

- Fellow, American Association for the Advancement of Science (2021)
- Fellow, American College of Medical Genetics and Genomics (2015)
- Fellow, American College of Medical Informatics (2001)

### PROFESSIONAL EDUCATION

- B.A., UC Santa Cruz , Chemistry/Biology (1980)
- Ph.D., UC San Francisco , Medical Information Sciences (1987)

### COMMUNITY AND INTERNATIONAL WORK

- PharmGKB PI
- Co-founder, Pacific Symposium on Biocomputing

## LINKS

- NIH Biosketch in SciENcv: <https://www.ncbi.nlm.nih.gov/myncbi/teri.klein.1/cv/608454/>

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

My research interests extend over the broad spectrum of pharmacogenomics, personalized medicine, computational biology and bioinformatics. Applications include the development of a pharmacogenomics knowledge base, clinical dosing guidelines for pharmacogenomics, annotation of human genome, de novo modeling and the structural basis of disease.

My current research areas involve the studies of the following:

- \* development of an integrated knowledge base about how variation in human genetics leads to variation in our response to drugs
- \* the stability of the collagen triple helix
- \* the relationship and prediction of lethal mutations for the genetic collagenous disease Osteogenesis imperfecta

## Teaching

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### COURSES

#### 2023-24

- Best practices for developing data science software for clinical and healthcare applications: BIODS 235 (Win)
- Software Engineering For Scientists: BIODS 253 (Win)

#### 2022-23

- Best practices for developing data science software for clinical and healthcare applications: BIODS 235 (Aut)
- Software Engineering For Scientists: BIODS 253 (Win)

#### 2021-22

- Best practices for developing data science software for clinical and healthcare applications: BIODS 235 (Win)
- Software Engineering For Scientists: BIODS 253 (Win)

#### 2020-21

- Software Engineering For Scientists: BIODS 253 (Win)

### GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biomedical Informatics (Masters Program)
- Biomedical Informatics (Phd Program)
- Genetics (Phd Program)

## Publications

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### PUBLICATIONS

- **Frequencies of pharmacogenomic alleles across biogeographic groups in a large-scale biobank.** *American journal of human genetics*  
Li, B., Sangkuhl, K., Whaley, R., Woon, M., Keat, K., Whirl-Carrillo, M., Ritchie, M. D., Klein, T. E.  
2023
- **PharmVar Tutorial on CYP2D6 Structural Variation Testing and Recommendations on Reporting.** *Clinical pharmacology and therapeutics*

- Turner, A. J., Nofziger, C., Ramey, B. E., Ly, R. C., Bousman, C. A., Agúndez, J. A., Sangkuhl, K., Whirl-Carrillo, M., Vanoni, S., Dunnenberger, H. M., Ruano, G., Kennedy, M. A., Phillips, et al  
2023
- **How to Run the Pharmacogenomics Clinical Annotation Tool (PharmCAT).** *Clinical pharmacology and therapeutics*  
Li, B., Sangkuhl, K., Keat, K., Whaley, R. M., Woon, M., Verma, S., Dudek, S., Tuteja, S., Verma, A., Whirl-Carrillo, M., Ritchie, M. D., Klein, T. E.  
2022
  - **PharmGKB, an Integrated Resource of Pharmacogenomic Knowledge.** *Current protocols*  
Gong, L., Whirl-Carrillo, M., Klein, T. E.  
2021; 1 (8): e226
  - **An evidence-based framework for evaluating pharmacogenomics knowledge for personalized medicine.** *Clinical pharmacology and therapeutics*  
Whirl-Carrillo, M., Huddart, R., Gong, L., Sangkuhl, K., Thorn, C. F., Whaley, R., Klein, T. E.  
2021
  - **ACMG SF v3.0 list for reporting of secondary findings in clinical exome and genome sequencing: a policy statement of the American College of Medical Genetics and Genomics (ACMG).** *Genetics in medicine : official journal of the American College of Medical Genetics*  
Miller, D. T., Lee, K., Chung, W. K., Gordon, A. S., Herman, G. E., Klein, T. E., Stewart, D. R., Amendola, L. M., Adelman, K., Bale, S. J., Gollob, M. H., Harrison, S. M., Hershberger, et al  
2021
  - **Recommendations for reporting of secondary findings in clinical exome and genome sequencing, 2021 update: a policy statement of the American College of Medical Genetics and Genomics (ACMG).** *Genetics in medicine : official journal of the American College of Medical Genetics*  
Miller, D. T., Lee, K., Gordon, A. S., Amendola, L. M., Adelman, K., Bale, S. J., Chung, W. K., Gollob, M. H., Harrison, S. M., Herman, G. E., Hershberger, R. E., Klein, T. E., McKelvey, et al  
2021
  - **Expanding evidence leads to new pharmacogenomics payer coverage.** *Genetics in medicine : official journal of the American College of Medical Genetics*  
Empey, P. E., Pratt, V. M., Hoffman, J. M., Caudle, K. E., Klein, T. E.  
2021
  - **PharmGKB tutorial for pharmacogenomics of drugs potentially used in the context of COVID-19.** *Clinical pharmacology and therapeutics*  
Huddart, R., Whirl-Carrillo, M., Altman, R. B., Klein, T. E.  
2020
  - **Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2C9 and Nonsteroidal Anti-inflammatory Drugs.** *Clinical pharmacology and therapeutics*  
Theken, K. N., Lee, C. R., Gong, L., Caudle, K. E., Formea, C. M., Gaedigk, A., Klein, T. E., Agundez, J. A., Grosser, T.  
2020
  - **PGxMine: Text mining for curation of PharmGKB.** *Pacific Symposium on Biocomputing. Pacific Symposium on Biocomputing*  
Lever, J. n., Barbarino, J. M., Gong, L. n., Huddart, R. n., Sangkuhl, K. n., Whaley, R. n., Whirl-Carrillo, M. n., Woon, M. n., Klein, T. E., Altman, R. B.  
2020; 25: 611–22
  - **A Call for Clear and Consistent Communications Regarding the Role of Pharmacogenetics in Antidepressant Pharmacotherapy.** *Clinical pharmacology and therapeutics*  
Hicks, J. K., Bishop, J. R., Gammal, R. S., Sangkuhl, K., Bousman, C. A., Leeder, J. S., Llerena, A., Mueller, D. J., Ramsey, L. B., Scott, S. A., Skaar, T. C., Caudle, K. E., Klein, et al  
2019
  - **PharmVar GeneReview: CYP2D6.** *Clinical pharmacology and therapeutics*  
Nofziger, C., Turner, A. J., Sangkuhl, K., Whirl-Carrillo, M., Agundez, J. A., Black, J. L., Dunnenberger, H. M., Ruano, G., Kennedy, M. A., Phillips, M. S., Hachad, H., Klein, T. E., Gaedigk, et al  
2019
  - **Are Randomized Controlled Trials Necessary to Establish the Value of Implementing Pharmacogenomics in the Clinic?** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Huddart, R., Sangkuhl, K., Whirl-Carrillo, M., Klein, T. E.  
2019; 106 (2): 284–86

- **Pharmacogenomics Clinical Annotation Tool (PharmCAT).** *Clinical pharmacology and therapeutics*  
Sangkuhl, K., Whirl-Carrillo, M., Whaley, R. M., Woon, M., Lavertu, A., Altman, R. B., Carter, L., Verma, A., Ritchie, M. D., Klein, T. E.  
2019
- **Standardized Biogeographic Grouping System for Annotating Populations in Pharmacogenetic Research** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Huddart, R., Fohner, A. E., Whirl-Carrillo, M., Wojcik, G. L., Gignoux, C. R., Popejoy, A. B., Bustamante, C. D., Altman, R. B., Klein, T. E.  
2019; 105 (5): 1256–62
- **Are Randomized Controlled Trials Necessary to Establish the Value of Implementing Pharmacogenomics in the Clinic?** *Clinical pharmacology and therapeutics*  
Huddart, R., Sangkuhl, K., Whirl-Carrillo, M., Klein, T. E.  
2019
- **The Clinical Pharmacogenetics Implementation Consortium: 10 Years Later.** *Clinical pharmacology and therapeutics*  
Relling, M. V., Klein, T. E., Gammal, R. S., Whirl-Carrillo, M. n., Hoffman, J. M., Caudle, K. E.  
2019
- **Standardized biogeographic grouping system for annotating populations in pharmacogenetic research.** *Clinical pharmacology and therapeutics*  
Huddart, R., Fohner, A. E., Whirl-Carrillo, M., Wojcik, G. L., Gignoux, C. R., Popejoy, A. B., Bustamante, C. D., Altman, R. B., Klein, T. E.  
2018
- **The Case for Pharmacogenetics-Guided Prescribing of Codeine in Children.** *Clinical pharmacology and therapeutics*  
Gammal, R. S., Caudle, K. E., Quinn, C. T., Wang, W. C., Gaedigk, A., Prows, C. A., Haidar, C. E., Taylor, A. K., Klein, T. E., Sangkuhl, K., Hankins, J. S., Crews, K. R.  
2018
- **PharmCAT: A Pharmacogenomics Clinical Annotation Tool** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Klein, T. E., Ritchie, M. D.  
2018; 104 (1): 19–22
- **Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2D6 and Tamoxifen Therapy** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Goetz, M. P., Sangkuhl, K., Guchelaar, H., Schwab, M., Province, M., Whirl-Carrillo, M., Symmans, W., McLeod, H. L., Ratain, M. J., Zembutsu, H., Gaedigk, A., van Schaik, R. H., Ingle, et al  
2018; 103 (5): 770–77
- **PharmGKB: A worldwide resource for pharmacogenomic information.** *Wiley interdisciplinary reviews. Systems biology and medicine*  
Barbarino, J. M., Whirl-Carrillo, M., Altman, R. B., Klein, T. E.  
2018
- **PharmCAT: A Pharmacogenomics Clinical Annotation Tool.** *Clinical pharmacology and therapeutics*  
Klein, T. E., Ritchie, M. D.  
2017
- **Recommendations for reporting of secondary findings in clinical exome and genome sequencing, 2016 update (ACMG SF v2.0): a policy statement of the American College of Medical Genetics and Genomics** *GENETICS IN MEDICINE*  
Kalia, S. S., Adelman, K., Bale, S. J., Chung, W. K., Eng, C., Evans, J. P., Herman, G. E., Hufnagel, S. B., Klein, T. E., Korf, B. R., McKelvey, K. D., Ormond, K. E., Richards, et al  
2017; 19 (2): 249-255
- **Standardizing terms for clinical pharmacogenetic test results: consensus terms from the Clinical Pharmacogenetics Implementation Consortium (CPIC).** *Genetics in medicine*  
Caudle, K. E., Dunnenberger, H. M., Freimuth, R. R., Peterson, J. F., Burlison, J. D., Whirl-Carrillo, M., Scott, S. A., Rehm, H. L., Williams, M. S., Klein, T. E., Relling, M. V., Hoffman, J. M.  
2016
- **Prediction of CYP2D6 phenotype from genotype across world populations.** *Genetics in medicine*  
Gaedigk, A., Sangkuhl, K., Whirl-Carrillo, M., Klein, T., Leeder, J. S.  
2016

- **Genetic variant in folate homeostasis is associated with lower warfarin dose in African Americans** *BLOOD*  
Daneshjou, R., Gamazon, E. R., Burkley, B., Cavallari, L. H., Johnson, J. A., Klein, T. E., Limdi, N., Hillenmeyer, S., Percha, B., Karczewski, K. J., Langae, T., Patel, S. R., Bustamante, et al  
2014; 124 (14): 2298-2305
- **CYP2D6 Genotype and Adjuvant Tamoxifen: Meta-Analysis of Heterogeneous Study Populations** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Province, M. A., Goetz, M. P., Brauch, H., Flockhart, D. A., Hebert, J. M., Whaley, R., Suman, V. J., Schroth, W., Winter, S., Zembutsu, H., Mushiroda, T., Newman, W. G., Lee, et al  
2014; 95 (2): 216-227
- **Clinical Implementation of Pharmacogenetics: More Than One Gene at a Time** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Johnson, J. A., Klein, T. E., RELLING, M. V.  
2013; 93 (5): 384-385
- **Pharmacogenomics Knowledge for Personalized Medicine** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Whirl-Carrillo, M., MCDONAGH, E. M., Hebert, J. M., Gong, L., Sangkuhl, K., Thorn, C. F., Altman, R. B., Klein, T. E.  
2012; 92 (4): 414-417
- **Clopidogrel: A Case for Indication-Specific Pharmacogenetics** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Johnson, J. A., Roden, D. M., Lesko, L. J., Ashley, E., Klein, T. E., Shuldiner, A. R.  
2012; 91 (5): 774-776
- **Clinical Pharmacogenetics Implementation Consortium (CPIC) Guidelines for Codeine Therapy in the Context of Cytochrome P450 2D6 (CYP2D6) Genotype** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Crews, K. R., Gaedigk, A., Dunnenberger, H. M., Klein, T. E., Shen, D. D., Callaghan, J. T., Kharasch, E. D., Skaar, T. C.  
2012; 91 (2): 321-326
- **CPIC: Clinical Pharmacogenetics Implementation Consortium of the Pharmacogenomics Research Network** *CLINICAL PHARMACOLOGY & THERAPEUTICS*  
Relling, M. V., Klein, T. E.  
2011; 89 (3): 464-467
- **Clinical assessment incorporating a personal genome** *LANCET*  
Ashley, E. A., Butte, A. J., Wheeler, M. T., Chen, R., Klein, T. E., Dewey, F. E., Dudley, J. T., Ormond, K. E., Pavlovic, A., Morgan, A. A., Pushkarev, D., Neff, N. F., Hudgins, et al  
2010; 375 (9725): 1525-1535
- **Estimation of the Warfarin Dose with Clinical and Pharmacogenetic Data** *NEW ENGLAND JOURNAL OF MEDICINE*  
Klein, T. E., Altman, R. B., Eriksson, N., Gage, B. F., Kimmel, S. E., Lee, M. M., Limdi, N. A., Page, D., Roden, D. M., Wagner, M. J., Caldwell, M. D., Johnson, J. A., Chen, et al  
2009; 360 (8): 753-764
- **Mutation and polymorphism spectrum in osteogenesis imperfecta type II: implications for genotype-phenotype relationships** *HUMAN MOLECULAR GENETICS*  
Bodian, D. L., Chan, T., Poon, A., Schwarze, U., Yang, K., Byers, P. H., Kwok, P., Klein, T. E.  
2009; 18 (3): 463-471
- **Generating Clinical-Grade Gene-Disease Validity Classifications Through the ClinGen Data Platforms.** *Annual review of biomedical data science*  
Wright, M. W., Thaxton, C. L., Nelson, T., DiStefano, M. T., Savatt, J. M., Brush, M. H., Cheung, G., Mandell, M. E., Wulf, B., Ward, T. J., Goehring, S., O'Neill, T., Weller, et al  
2024
- **Knowledge and attitudes on implementing cardiovascular pharmacogenomic testing.** *Clinical and translational science*  
Russell, C., Champion, M., Grove, M. E., Matsuda, K., Klein, T. E., Ashley, E., Naik, H., Wheeler, M. T., Scott, S. A.  
2024; 17 (3): e13737
- **CAGI, the Critical Assessment of Genome Interpretation, establishes progress and prospects for computational genetic variant interpretation methods** *GENOME BIOLOGY*  
Jain, S., Bakolitsa, C., Brenner, S. E., Radivojac, P., Moul, J., Repo, S., Hoskins, R. A., Andreoletti, G., Barsky, D., Chellapan, A., Chu, H., Dabir, N., Kollipara, et al  
2024; 25 (1): 53

- **From sample to star alleles: a long-read pharmacogenomics pipeline powered by Twist target enrichment and PacBio HiFi sequencing**  
Holt, S., Harting, J., Han, T., Arbiza, L., Kingan, S., Souppe, A., Zhang, S., Baybayan, P., Lambert, C., Ferrao, H., Li, B., Sangkuhl, K., Woon, et al  
SPRINGERNATURE.2024: 701-702
- **Investigation of genomic and transcriptomic risk factors in clopidogrel response in African Americans.** *medRxiv : the preprint server for health sciences*  
Yang, G., Alarcon, C., Chanfreau, C., Lee, N. H., Friedman, P., Nutescu, E., Tuck, M., O'Brien, T., Gong, L., Klein, T. E., Chang, K. M., Tsao, P. S., Meltzer, et al  
2023
- **Highly Scalable Pharmacogenomic Panel Testing with Hybrid Capture and Long-Read Sequencing**  
Gonzaludo, N., Kingan, S., Harting, J., Baybayan, P., Han, T., Arbiza, L., Li, B., Sangkuhl, K., Woon, M., Whaley, R., Whirl-Carrillo, M., Yang, Y., Klein, et al  
LIPPINCOTT WILLIAMS & WILKINS.2023: 183
- **Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for <i>CYP2D6</i>, <i>CYP2C19</i>, <i>CYP2B6</i>, <i>SLC6A4</i>, and <i>HTR2A</i> Genotypes and Serotonin Reuptake Inhibitor Antidepressants**  
Bousman, C. A., Stevenson, J. M., Ramsey, L. B., Sangkuhl, K., Hicks, J., Strawn, J. R., Singh, A. B., Ruano, G., Mueller, D. J., Tsermpini, E., Brown, J. T., Bell, G. C., Leeder, et al  
LIPPINCOTT WILLIAMS & WILKINS.2023: 181-183
- **PharmGKB summary: disulfiram pathway.** *Pharmacogenetics and genomics*  
Gonzalez-Suarez, A. D., Thorn, C. F., Whirl-Carrillo, M., Klein, T. E.  
2023
- **ACMG SF v3.2 list for reporting of secondary findings in clinical exome and genome sequencing: A policy statement of the American College of Medical Genetics and Genomics (ACMG).** *Genetics in medicine : official journal of the American College of Medical Genetics*  
Miller, D. T., Lee, K., Abul-Husn, N. S., Amendola, L. M., Brothers, K., Chung, W. K., Gollob, M. H., Gordon, A. S., Harrison, S. M., Hershberger, R. E., Klein, T. E., Richards, C. S., Stewart, et al  
2023: 100866
- **The Role of Epigenomics in Mapping Potential Precursors for Foot and Ankle Tendinopathy: A Systematic Review.** *Foot & ankle specialist*  
Williams, S., Ligas, C., Oloff, L., Klein, T. E.  
2023: 19386400231170967
- **Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2D6, CYP2C19, CYP2B6, SLC6A4, and HTR2A Genotypes and Serotonin Reuptake Inhibitor Antidepressants.** *Clinical pharmacology and therapeutics*  
Bousman, C. A., Stevenson, J. M., Ramsey, L. B., Sangkuhl, K., Hicks, J. K., Strawn, J. R., Singh, A. B., Ruano, G., Mueller, D. J., Tsermpini, E. E., Brown, J. T., Bell, G. C., Leeder, et al  
2023
- **Evaluating the frequency and the impact of pharmacogenetic alleles in an ancestrally diverse Biobank population.** *Journal of translational medicine*  
Verma, S. S., Keat, K., Li, B., Hoffecker, G., Risman, M., Sangkuhl, K., Whirl-Carrillo, M., Dudek, S., Verma, A., Klein, T. E., Ritchie, M. D., Tuteja, S.  
2022; 20 (1): 550
- **Expanded Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for Medication Use in the Context of G6PD Genotype.** *Clinical pharmacology and therapeutics*  
Gammal, R. S., Pirmohamed, M., Somogyi, A. A., Morris, S. A., Fornea, C. M., Elchynski, A. L., Oshikoya, K. A., McLeod, H. L., Haidar, C. E., Whirl-Carrillo, M., Klein, T. E., Caudle, K. E., Relling, et al  
2022
- **PharmVar GeneFocus: SLCO1B1.** *Clinical pharmacology and therapeutics*  
Ramsey, L. B., Gong, L., Lee, S., Wagner, J. B., Zhou, X., Sangkuhl, K., Adams, S. M., Straka, R. J., Empey, P. E., Boone, E. C., Klein, T. E., Niemi, M., Gaedigk, et al  
2022
- **PharmGKB summary: acyclovir/ganciclovir pathway.** *Pharmacogenetics and genomics*  
Maillard, M., Gong, L., Nishii, R., Yang, J. J., Whirl-Carrillo, M., Klein, T. E.  
2022; 32 (5): 201-208
- **ACMG SF v3.1 list for reporting of secondary findings in clinical exome and genome sequencing: A policy statement of the American College of Medical Genetics and Genomics (ACMG).** *Genetics in medicine : official journal of the American College of Medical Genetics*  
Miller, D. T., Lee, K., Abul-Husn, N. S., Amendola, L. M., Brothers, K., Chung, W. K., Gollob, M. H., Gordon, A. S., Harrison, S. M., Hershberger, R. E., Klein, T. E., Richards, C. S., Stewart, et al

2022; 24 (7): 1407-1414

- **Apixaban Concentrations in Routine Clinical Care of Older Adults With Nonvalvular Atrial Fibrillation.** *JACC. Advances*  
Thomas, A., Fang, M. C., Kogan, S., Hubbard, C. C., Friedman, P. N., Gong, L., Klein, T. E., Nutescu, E. A., O'Brien, T. J., Tuck, M., Perera, M. A., Schwartz, J. B.  
2022; 1 (2)
- **The Clinical Pharmacogenetics Implementation Consortium (CPIC) guideline for SLCO1B1, ABCG2, and CYP2C9 and statin-associated musculoskeletal symptoms.** *Clinical pharmacology and therapeutics*  
Cooper-DeHoff, R. M., Niemi, M., Ramsey, L. B., Luzum, J. A., Tarkiainen, E. K., Straka, R. J., Gong, L., Tuteja, S., Wilke, R. A., Wadelius, M., Larson, E. A., Roden, D. M., Klein, et al  
2022
- **Clinical pharmacogenomic testing and reporting: A technical standard of the American College of Medical Genetics and Genomics (ACMG).** *Genetics in medicine : official journal of the American College of Medical Genetics*  
Tayeh, M. K., Gaedigk, A., Goetz, M. P., Klein, T. E., Lyon, E., McMillin, G. A., Rentas, S., Shinawi, M., Pratt, V. M., Scott, S. A., ACMG Laboratory Quality Assurance Committee. Electronic address: documents@acmg.net.,  
2022
- **PharmGKB summary: heparin-induced thrombocytopenia pathway, adverse drug reaction.** *Pharmacogenetics and genomics*  
Miller, E., Norwood, C., Giles, J. B., Huddart, R., Karnes, J. H., Whirl-Carrillo, M., Klein, T. E.  
1800
- **An Investigation of the Knowledge Overlap between Pharmacogenomics and Disease Genetics.** *Pacific Symposium on Biocomputing. Pacific Symposium on Biocomputing*  
Li, B., Whirl-Carrillo, M., Wright, M. W., Babb, L., Rehm, H. L., Klein, T. E.  
2022; 27: 385-396
- **Clinical Pharmacogenetics Implementation Consortium Guideline for CYP2C19 Genotype and Clopidogrel Therapy: 2022 Update.** *Clinical pharmacology and therapeutics*  
Lee, C. R., Luzum, J. A., Sangkuhl, K., Gammal, R. S., Sabatine, M. S., Stein, C. M., Kisor, D. F., Limdi, N. A., Lee, Y. M., Scott, S. A., Hulot, J. S., Roden, D. M., Gaedigk, et al  
2022
- **PharmVar GeneFocus: CYP3A5.** *Clinical pharmacology and therapeutics*  
Rodriguez-Antona, C., Savieo, J. L., Lauschke, V. M., Sangkuhl, K., Drögemöller, B. I., Wang, D., van Schaik, R. H., Gilep, A. A., Peter, A. P., Boone, E. C., Ramey, B. E., Klein, T. E., Whirl-Carrillo, et al  
2022
- **Correction to: ACMG SF v3.0 list for reporting of secondary findings in clinical exome and genome sequencing: a policy statement of the American College of Medical Genetics and Genomics (ACMG).** *Genetics in medicine : official journal of the American College of Medical Genetics*  
Miller, D. T., Lee, K., Chung, W. K., Gordon, A. S., Herman, G. E., Klein, T. E., Stewart, D. R., Amendola, L. M., Adelman, K., Bale, S. J., Gollob, M. H., Harrison, S. M., Hershberger, et al  
2021
- **PharmVar GeneFocus: CYP2C9.** *Clinical pharmacology and therapeutics*  
Sangkuhl, K., Claudio-Campos, K., Cavallari, L. H., Agundez, J., Whirl-Carrillo, M., Duconge, J., Del Tredici, A. L., Wadelius, M., Botton, M. R., Woodahl, E. L., Scott, S. A., Klein, T. E., Pratt, et al  
2021
- **PharmVar: A Global Resource and Repository for Pharmacogene Variation.** *Clinical pharmacology and therapeutics*  
Gaedigk, A., Casey, S. T., Whirl-Carrillo, M., Miller, N. A., Klein, T. E.  
2021
- **Clinical Pharmacogenetics Implementation Consortium (CPIC) guideline for the use of aminoglycosides based on MT-RNR1 genotype.** *Clinical pharmacology and therapeutics*  
McDermott, J. H., Wolf, J., Hoshitsuki, K., Huddart, R., Caudle, K. E., Whirl-Carrillo, M., Steyger, P. S., Smith, R. J., Cody, N., Rodriguez-Antona, C., Klein, T. E., Newman, W. G.  
2021
- **PharmVar GeneFocus: CYP2B6.** *Clinical pharmacology and therapeutics*

- Desta, Z. n., El-Boraie, A. n., Gong, L. n., Somogyi, A. A., Lauschke, V. M., Dandara, C. n., Klein, K. n., Miller, N. n., Klein, T. E., Tyndale, R. F., Whirl-Carrillo, M. n., Gaedigk, A. n.  
2021
- **Clinical Pharmacogenetics Implementation Consortium (CPIC) guideline for CYP2D6, OPRM1, and COMT genotype and select opioid therapy.** *Clinical pharmacology and therapeutics*  
Crews, K. R., Monte, A. A., Huddart, R. n., Caudle, K. E., Kharasch, E. D., Gaedigk, A. n., Dunnenberger, H. M., Leeder, J. S., Callaghan, J. T., Samer, C. F., Klein, T. E., Haidar, C. E., Van Driest, et al  
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  - **Verifying Nomenclature of DNA Variants in Submitted Manuscripts: Guidance for Journals.** *Human mutation*  
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