



Adam Frymoyer

- Clinical Associate Professor, Pediatrics - Neonatal and Developmental Medicine
- Clinical Associate Professor, Pediatrics

CLINICAL OFFICES

- **Packard Intermediate Care Nursery**

725 Welch Rd

Palo Alto, CA 94304

Tel (650) 723-5711

Fax (650) 725-8351

Bio

CLINICAL FOCUS

- Infant, Newborn
- Neonatology

ACADEMIC APPOINTMENTS

- Clinical Associate Professor, Pediatrics - Neonatal and Developmental Medicine
- Clinical Associate Professor, Pediatrics
- Member, Maternal & Child Health Research Institute (MCHRI)

HONORS AND AWARDS

- The President's Freshman Award, Penn State University (1996)
- Honors (B.S.), Penn State University (1999)
- Doris Duke Clinical Research Scholar, Doris Duke Charitable Foundation (2001-02)
- Junior Elected Member, Alpha Omega Alpha Honor Medical Society (2003)
- Cum Laude (M.D.), University of Pittsburgh (2004)
- Presidential Trainee Award, American Society for Clinical Pharmacology and Therapeutics (2010)
- PIDS Blue Ribbon Research Session, Pediatric Academic Societies Annual Meeting (2013)
- Early Career Investigator Highlight, Pediatric Research (2017)
- Jennifer Daru Memorial Award (original contribution with most potential to impact clinical care), Hospital Pediatrics (2019)
- Laura Bachrach Faculty Mentor Award (outstanding mentor for early career faculty), Department of Pediatrics, Stanford University (2020)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Fellow, American Academy of Pediatrics (AAP) (2004 - present)
- Member, American Society for Clinical Pharmacology and Therapeutics (ASCPT) (2007 - present)
- Member, Bay Area Pharmacokinetic and Pharmacodynamic (BAPKPD) Network (2009 - present)

- Executive Committee, Section on Clinical Pharmacology & Therapeutics, AAP (2015 - present)

PROFESSIONAL EDUCATION

- Fellowship: UCSF Office of Graduate Medical Education (2009) CA
- Residency: UCSF Pediatric Residency (2007) CA
- Medical Education: University of Pittsburgh School of Medicine Registrar (2004) PA
- Board Certification: Pediatrics, American Board of Pediatrics (2007)

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Historically, children have represented an understudied, 'orphan' population in the field of therapeutics. Many medicines used in children have not been rigorously tested and lack the same level of evidence to help guide dosing as compared to adults. Yet, an in-depth understanding of a drug's clinical pharmacology is essential for its safe and effective use in children. Further, traditional "one-size fits all" approaches to pediatric therapeutics will continue be inadequate due to the known heterogeneity in children resulting from ongoing growth and maturation. Individualized frameworks for dose decision-making during clinical care are imperative.

My clinical research program is focused on improving child health by promoting the safe and efficacious use of medications in children. It supports the advancement of pediatric therapeutics through the application of quantitative pharmacokinetic (PK) and pharmacodynamic (PD) frameworks to inform dose-decision. Translation of research findings back to clinical care is essential and facilitated through the development of clinical decision support dosing platforms integrated within the electronic health record (EHR), allowing real-time precision dosing at the point of care. My work further supports the clinical development of re-purposed and novel therapies in infants and children.

Learn about the Importance of Children in Clinical Studies - <https://www.nih.gov/health-information/nih-clinical-research-trials-you/parents-children>

Publications

PUBLICATIONS

- **Theophylline dosing and pharmacokinetics for renal protection in neonates with hypoxic-ischemic encephalopathy undergoing therapeutic hypothermia.** *Pediatric research*
Frymoyer, A., Van Meurs, K. P., Drover, D. R., Klawitter, J., Christians, U., Chock, V. Y.
2020
- **Area Under the Curve Achievement of Once Daily Tobramycin in Children with Cystic Fibrosis during Clinical Care.** *Pediatric pulmonology*
Brockmeyer, J. M., Wise, R. T., Burgener, E. B., Milla, C., Frymoyer, A.
2020
- **Aminophylline for renal protection in neonatal hypoxic-ischemic encephalopathy in the era of therapeutic hypothermia.** *Pediatric research*
Chock, V. Y., Cho, S., Frymoyer, A.
2020
- **Repurposing Drugs for Acute Myeloid Leukemia: A Worthy Cause or a Futile Pursuit?** *Cancers*
Wojcicki, A. V., Kadapakkam, M., Frymoyer, A., Lacayo, N., Chae, H., Sakamoto, K. M.
2020; 12 (2)
- **Pharmacokinetics of Dexmedetomidine in Infants and Children After Orthotopic Liver Transplantation** *ANESTHESIA AND ANALGESIA*
Damian, M. A., Hammer, G. B., Elkomy, M. H., Frymoyer, A., Drover, D. R., Su, F.
2020; 130 (1): 209–16
- **Model-Informed Precision Dosing of Vancomycin in Hospitalized Children: Implementation and Adoption at an Academic Children's Hospital.** *Frontiers in pharmacology*

- Frymoyer, A., Schwenk, H. T., Zorn, Y., Bio, L., Moss, J. D., Chasmawala, B., Faulkenberry, J., Goswami, S., Keizer, R. J., Ghaskari, S.
2020; 11: 551
- **Sustainability of a Clinical Examination-Based Approach for Ascertainment of Early Onset Sepsis in Late Preterm and Term Neonates.** *The Journal of pediatrics*
Frymoyer, A., Joshi, N. S., Allan, J. M., Cohen, R. S., Aby, J. L., Kim, J. L., Benitz, W. E., Gupta, A.
2020
 - **Serial clinical observation for management of newborns at risk of early-onset sepsis.** *Current opinion in pediatrics*
Berardi, A., Bedetti, L., Spada, C., Lucaccioni, L., Frymoyer, A.
2019
 - **Antimicrobial Disposition During Pediatric Continuous Renal Replacement Therapy Using an Ex Vivo Model.** *Critical care medicine*
Purohit, P. J., Elkomy, M. H., Frymoyer, A., Sutherland, S. M., Drover, D. R., Hammer, G. B., Su, F.
2019
 - **Individualized Empiric Vancomycin Dosing in Neonates Using a Model-Based Approach** *JOURNAL OF THE PEDIATRIC INFECTIOUS DISEASES SOCIETY*
Frymoyer, A., Stockmann, C., Hersh, A. L., Goswami, S., Keizer, R. J.
2019; 8 (2): 97–104
 - **4-Methylumbelliferyl glucuronide contributes to hyaluronan synthesis inhibition** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Nagy, N., Gurevich, I., Kuipers, H. F., Ruppert, S. M., Marshall, P. L., Xie, B. J., Sun, W., Malkovskiy, A. V., Rajadas, J., Grandoch, M., Fischer, J. W., Frymoyer, A. R., Kaber, et al
2019; 294 (19): 7864–77
 - **Management of Chorioamnionitis-Exposed Infants in the Newborn Nursery Using a Clinical Examination-Based Approach.** *Hospital pediatrics*
Joshi, N. S., Gupta, A., Allan, J. M., Cohen, R. S., Aby, J. L., Kim, J. L., Benitz, W. E., Frymoyer, A.
2019
 - **An Evaluation of Vancomycin Area Under the Curve Estimation Methods for Children Treated for Acute Pulmonary Exacerbations of Cystic Fibrosis Due to Methicillin-Resistant Staphylococcus aureus** *JOURNAL OF CLINICAL PHARMACOLOGY*
Stockmann, C., Olson, J., Rashid, J., Lubsch, L., Young, D. C., Hersh, A. L., Frymoyer, A., Ampofo, K., Liu, X., Wang, Y., Sherwin, C. T., Zobell, J. T.
2019; 59 (2): 198–205
 - **Model-Informed Precision Dosing at the Bedside: Scientific Challenges and Opportunities** *CPT-PHARMACOMETRICS & SYSTEMS PHARMACOLOGY*
Keizer, R. J., ter Heine, R., Frymoyer, A., Lesko, L. J., Mangat, R., Goswami, S.
2018; 7 (12): 785–87
 - **Pharmacokinetics of Dexmedetomidine in Infants and Children After Orthotopic Liver Transplantation.** *Anesthesia and analgesia*
Damian, M. A., Hammer, G. B., Elkomy, M. H., Frymoyer, A., Drover, D. R., Su, F.
2018
 - **Renal Saturation and Acute Kidney Injury in Neonates with Hypoxic Ischemic Encephalopathy Undergoing Therapeutic Hypothermia** *JOURNAL OF PEDIATRICS*
Chock, V. Y., Frymoyer, A., Yeh, C. G., Van Meurs, K. P.
2018; 200: 232–+
 - **A safety, tolerability, and pharmacokinetic analysis of two phase I studies of multitargeted small molecule tyrosine kinase inhibitor XL647 with an intermittent and continuous dosing schedule in patients with advanced solid malignancies** *CANCER CHEMOTHERAPY AND PHARMACOLOGY*
Das, M., Padda, S. K., Frymoyer, A., Molina, J., Adjei, A., Lensing, J. L., Miles, D., Sikic, B. I., Wakelee, H. A.
2018; 82 (3): 541–50
 - **Renal Saturation and Acute Kidney Injury in Neonates with Hypoxic Ischemic Encephalopathy Undergoing Therapeutic Hypothermia.** *The Journal of pediatrics*
Chock, V. Y., Frymoyer, A., Yeh, C. G., Van Meurs, K. P.
2018
 - **Clinical Monitoring of Well-Appearing Infants Born to Mothers With Chorioamnionitis** *PEDIATRICS*
Joshi, N. S., Gupta, A., Allan, J. M., Cohen, R. S., Aby, J. L., Weldon, B., Kim, J. L., Benitz, W. E., Frymoyer, A.
2018; 141 (4)

- **A Mobile Infiximab Dosing Calculator for Therapy Optimization in Inflammatory Bowel Disease.** *Inflammatory bowel diseases*
Piester, T., Frymoyer, A., Christofferson, M., Yu, H., Bass, D., Park, K. T.
2018; 24 (2): 227–34
- **Individualized Empiric Vancomycin Dosing in Neonates Using a Model-Based Approach.** *Journal of the Pediatric Infectious Diseases Society*
Frymoyer, A., Stockmann, C., Hersh, A. L., Goswami, S., Keizer, R. J.
2017
- **Application of Population Pharmacokinetic Modeling for Individualized Infiximab Dosing Strategies in Crohn Disease** *JOURNAL OF PEDIATRIC GASTROENTEROLOGY AND NUTRITION*
Frymoyer, A., Hoekman, D. R., Piester, T. L., de Meij, T. G., Hummel, T. Z., Benninga, M. A., Kindermann, A., Park, K. T.
2017; 65 (6): 639–45
- **Early career investigator highlight.** *Pediatric research*
Frymoyer, A.
2017; 81 (6): 850-?
- **Application of Population Pharmacokinetic Modeling for Individualized Infiximab Dosing Strategies in Crohn's Disease.** *Journal of pediatric gastroenterology and nutrition*
Frymoyer, A., Hoekman, D. R., Piester, T. L., de Meij, T. G., Hummel, T. Z., Benninga, M. A., Kindermann, A., Park, K. T.
2017
- **Decreased Morphine Clearance in Neonates With Hypoxic Ischemic Encephalopathy Receiving Hypothermia** *JOURNAL OF CLINICAL PHARMACOLOGY*
Frymoyer, A., Bonifacio, S. L., Drover, D. R., Su, F., Wustoff, C. J., Van Meurs, K. P.
2017; 57 (1): 64-76
- **Theophylline Population Pharmacokinetics and Dosing in Children Following Congenital Heart Surgery With Cardiopulmonary Bypass.** *Journal of clinical pharmacology*
Frymoyer, A., Su, F., Grimm, P. C., Sutherland, S. M., Axelrod, D. M.
2016; 56 (9): 1084-1093
- **The pharmacokinetics and dosing of oral 4-methylumbelliferone for inhibition of hyaluronan synthesis in mice.** *Clinical and experimental immunology*
Kuipers, H. F., Nagy, N., Ruppert, S. M., Sunkari, V. G., Marshall, P. L., Gebe, J. A., Ishak, H. D., Keswani, S. G., Bollyky, J., Frymoyer, A. R., Wight, T. N., Steinman, L., Bollyky, et al
2016; 185 (3): 372-381
- **Infiximab Dosing Strategies and Predicted Trough Exposure in Children With Crohn Disease** *JOURNAL OF PEDIATRIC GASTROENTEROLOGY AND NUTRITION*
Frymoyer, A., Piester, T. L., Park, K. T.
2016; 62: 723-727
- **Pharmacokinetics of Morphine and Its Metabolites in Infants and Young Children After Congenital Heart Surgery** *AAPS JOURNAL*
Elkomy, M. H., Drover, D. R., Glotzbach, K. L., Galinkin, J. L., Frymoyer, A., Su, F., Hammer, G. B.
2016; 18 (1): 124-133
- **Dovitinib and erlotinib in patients with metastatic non-small cell lung cancer: A drug-drug interaction** *LUNG CANCER*
Das, M., Padda, S. K., Frymoyer, A., Zhou, L., Riess, J. W., Neal, J. W., Wakelee, H. A.
2015; 89 (3): 280-286
- **Pharmacokinetics, Pharmacodynamics, and Safety of Lisinopril in Pediatric Kidney Transplant Patients: Implications for Starting Dose Selection** *CLINICAL PHARMACOLOGY & THERAPEUTICS*
Trachtman, H., Frymoyer, A., Lewandowski, A., Greenbaum, L. A., Feig, D. I., Gipson, D. S., Warady, B. A., Goebel, J. W., Schwartz, G. J., Lewis, K., Anand, R., Patel, U. D.
2015; 98 (1): 25-33
- **Population pharmacokinetics of etomidate in neonates and infants with congenital heart disease** *BIOPHARMACEUTICS & DRUG DISPOSITION*
Su, F., El-Komy, M. H., Hammer, G. B., Frymoyer, A., Cohane, C. A., Drover, D. R.
2015; 36 (2): 104-114
- **4-methylumbelliferone treatment and hyaluronan inhibition as a therapeutic strategy in inflammation, autoimmunity, and cancer.** *Frontiers in immunology*
Nagy, N., Kuipers, H. F., Frymoyer, A. R., Ishak, H. D., Bollyky, J. B., Wight, T. N., Bollyky, P. L.

2015; 6: 123-?

- **Dovitinib and erlotinib in patients with metastatic non-small cell lung cancer: A drug-drug interaction.** *Lung cancer (Amsterdam, Netherlands)*
Das, M., Padda, S. K., Frymoyer, A., Zhou, L., Riess, J. W., Neal, J. W., Wakelee, H. A.
2015; 89 (3): 280–86
- **Predictive Performance of a Vancomycin Population Pharmacokinetic Model in Neonates.** *Infectious diseases and therapy*
Stockmann, C., Hersh, A. L., Roberts, J. K., Bhongsatiern, J., Korgenski, E. K., Spigarelli, M. G., Sherwin, C. M., Frymoyer, A.
2015
- **THE PHARMACOKINETICS OF ETOMIDATE IN NEONATES AND INFANTS WITH CONGENITAL HEART DISEASE**
Su, F., Cohane, C., Drover, D., El-Komy, M., Frymoyer, A., Hammer, G.
LIPPINCOTT WILLIAMS & WILKINS.2014
- **Association between Vancomycin Trough Concentration and Area under the Concentration-Time Curve in Neonates** *ANTIMICROBIAL AGENTS AND CHEMOTHERAPY*
Frymoyer, A., Hersh, A. L., El-Komy, M. H., Gaskari, S., Su, F., Drover, D. R., Van Meurs, K.
2014; 58 (11): 6454-6461
- **The Use of Betaine HCl to Enhance Dasatinib Absorption in Healthy Volunteers with Rabepazole-Induced Hypochlorhydria** *AAPS JOURNAL*
Yago, M. R., Frymoyer, A., Benet, L. Z., Smelick, G. S., Frassetto, L. A., Ding, X., Dean, B., Salphati, L., Budha, N., Jin, J. Y., Dresser, M. J., Ware, J. A.
2014; 16 (6): 1358-1365
- **Predictive Performance of a Gentamicin Population Pharmacokinetic Model in Neonates Receiving Full-Body Hypothermia** *THERAPEUTIC DRUG MONITORING*
Sampson, M. R., Frymoyer, A., Rattray, B., Cotten, C. M., Smith, P. B., Capparelli, E., Bonifacio, S. L., Cohen-Wolkowicz, M.
2014; 36 (5): 584-589
- **Prevalence of Acid-Reducing Agents (ARA) in Cancer Populations and ARA Drug-Drug Interaction Potential for Molecular Targeted Agents in Clinical Development** *MOLECULAR PHARMACEUTICS*
Smelick, G. S., Heffron, T. P., Chu, L., Dean, B., West, D. A., Du Vall, S. L., Lum, B. L., Budha, N., Holden, S. N., Benet, L. Z., Frymoyer, A., Dresser, M. J., Waret, et al
2013; 10 (11): 4055-4062
- **ERLOTINIB (E) AND DOVITINIB (TKI258) (D) IN PATIENTS (PTS) WITH METASTATIC NON-SMALL CELL LUNG CANCER (NSCLC): A SIGNIFICANT PHARMACOKINETIC (PK) INTERACTION**
Das, M., Padda, S. K., Zhou, L., Frymoyer, A., Neal, J. W., Wakelee, H. A.
LIPPINCOTT WILLIAMS & WILKINS.2013: S1185–S1186
- **Gastric Reacidification with Betaine HCl in Healthy Volunteers with Rabepazole-Induced Hypochlorhydria** *MOLECULAR PHARMACEUTICS*
Yago, M. R., Frymoyer, A. R., Smelick, G. S., Frassetto, L. A., Budha, N. R., Dresser, M. J., Ware, J. A., Benet, L. Z.
2013; 10 (11): 4032-4037
- **Desired Vancomycin Trough Serum Concentration for Treating Invasive Methicillin-resistant Staphylococcal Infections.** *Pediatric infectious disease journal*
Frymoyer, A., Guglielmo, B. J., Hersh, A. L.
2013; 32 (10): 1077-1079
- **Every 36-h gentamicin dosing in neonates with hypoxic-ischemic encephalopathy receiving hypothermia.** *Journal of perinatology*
Frymoyer, A., Lee, S., Bonifacio, S. L., Meng, L., LUCAS, S. S., Guglielmo, B. J., Sun, Y., Verotta, D.
2013; 33 (10): 778-782
- **Vancomycin Dosing Practices, Trough Concentrations, and Predicted Area Under the Curve in Children With Suspected Invasive Staphylococcal Infections** *JOURNAL OF THE PEDIATRIC INFECTIOUS DISEASES SOCIETY*
Frymoyer, A.
2013; 2 (3): 291–92
- **Gentamicin pharmacokinetics and dosing in neonates with hypoxic ischemic encephalopathy receiving hypothermia.** *Pharmacotherapy*
Frymoyer, A., Meng, L., Bonifacio, S. L., Verotta, D., Guglielmo, B. J.
2013; 33 (7): 718-726

- **Population pharmacokinetics of unbound mycophenolic acid in adult allogeneic haematopoietic cell transplantation: effect of pharmacogenetic factors** *BRITISH JOURNAL OF CLINICAL PHARMACOLOGY*
Frymoyer, A., Verotta, D., Jacobson, P., Long-Boyle, J.
2013; 75 (2): 463-475
- **Drug Absorption Interactions Between Oral Targeted Anticancer Agents and PPIs: Is pH-Dependent Solubility the Achilles Heel of Targeted Therapy?** *CLINICAL PHARMACOLOGY & THERAPEUTICS*
Budha, N. R., Frymoyer, A., Smelick, G. S., Jin, J. Y., Yago, M. R., Dresser, M. J., Holden, S. N., Benet, L. Z., Ware, J. A.
2012; 92 (2): 203-213
- **Nevirapine pharmacokinetics and risk of rash and hepatitis among HIV-infected sub-Saharan African women** *AIDS*
Dong, B. J., Zheng, Y., Hughes, M. D., Frymoyer, A., Verotta, D., Lizak, P., Sawe, F., Currier, J. S., Lockman, S., Aweeka, F. T.
2012; 26 (7): 833-841
- **Impact of a Hospitalwide Increase in Empiric Pediatric Vancomycin Dosing on Initial Trough Concentrations** *PHARMACOTHERAPY*
Frymoyer, A., Guglielmo, B. J., Wilson, S. D., Scarpace, S. B., Benet, L. Z., Hersh, A. L.
2011; 31 (9): 871-876
- **Effect of Single-Dose Rifampin on the Pharmacokinetics of Warfarin in Healthy Volunteers** *CLINICAL PHARMACOLOGY & THERAPEUTICS*
Frymoyer, A., Shugarts, S., Browne, M., Wu, A. H., Frassetto, L., Benet, L. Z.
2010; 88 (4): 540-547
- **Prediction of Vancomycin Pharmacodynamics in Children With Invasive Methicillin-Resistant Staphylococcus aureus Infections: A Monte Carlo Simulation** *CLINICAL THERAPEUTICS*
Frymoyer, A., Hersh, A. L., Coralic, Z., Benet, L. Z., Guglielmo, B. J.
2010; 32 (3): 534-542
- **Current Recommended Dosing of Vancomycin for Children With Invasive Methicillin-Resistant Staphylococcus aureus Infections Is Inadequate** *PEDIATRIC INFECTIOUS DISEASE JOURNAL*
Frymoyer, A., Hersh, A. L., Benet, L. Z., Guglielmo, B. J.
2009; 28 (5): 398-402
- **Placebo-controlled comparison of a morphine/dextromethorphan combination with morphine on experimental pain and hyperalgesia in healthy volunteers** *JOURNAL OF PAIN*
Frymoyer, A. R., Rowbotham, M. C., Petersen, K. L.
2007; 8 (1): 19-25