Dominic Tong, Ph.D.

Principal Bioengineer Data Scientist | Pharmacometrics, Machine Learning & AI
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Profile

Pharmacometrician and data scientist who pioneered hybrid machine learning/population PK/PD methods for precision dosing, with models deployed across 1,000+ U.S. hospitals. Now applying agentic AI to model-informed drug development (MIDD) as domain expert, validation lead, and demo presenter for an AI-native clinical pharmacology analysis platform built for pharma. Developed the first population PK model to pool multiple aminoglycosides across the human lifespan. Led cross-institutional research with Memorial Sloan Kettering, LPCH Stanford, Children's Hospital of Philadelphia, and Brigham and Women's Hospital. Eleven peer-reviewed publications translating real-world evidence and hybrid ML/PK modeling into clinical impact. Chair-elect of the ISoP/ACCP Clinical Pharmacometrics Special Interest Group.

Professional Experience

Principal Bioengineer Data Scientist — Feb. 2025 – present
Senior Bioengineer Data Scientist — Nov. 2020 – Feb. 2025
Bioengineer Data Scientist — Jan. – Nov. 2020
InsightRX — San Francisco, CA / remote

I lead pharmacometric and machine learning model development for a precision-dosing platform deployed across 1,000+ U.S. hospitals; five of my population PK models are live in the platform.

- Shaped an AI-native agentic workflow that runs clinical pharmacology analyses for pharma drug development (InsightRX Astra) as its domain expert: ran user testing, recommended UI and workflow fixes, and presented product demos to 5 pharma clients and 45 participants in an ACoP workshop
- Designed the GxP validation package for this agentic AI platform: human testing plus programmatic validation of nondeterministic outputs, intended to run each release
- Led scientific direction and a large-scale quasi-experimental study across 90,295 patients in 19 hospital systems, demonstrating that pharmacokinetic model selection meaningfully improves vancomycin AUC target attainment and reduces AKI rates in precision dosing contexts
- Developed the first population PK model to pool multiple aminoglycosides across the human lifespan, using real-world data from 5,659 patients across 130+ sites; now deployed in the platform
- Identified and corrected a systematic serum creatinine rounding bias in elderly patients that degraded renal function estimation and vancomycin/aminoglycoside dosing accuracy; the corrected model is now deployed in routine clinical care
- Developed and validated a novel vancomycin population PK model for critically ill patients on continuous renal replacement therapy using real-world data from 2,409 patients across 91 sites, outperforming five published models in predictive accuracy; now deployed in the platform
- Led ML development on a cross-institutional collaboration with Memorial Sloan Kettering — feature engineering, algorithm selection, and evaluation — producing a hybrid PK/PD-ML model that improved grade 3–4 neutropenia prediction precision from 47% to 61% across 9,121 patients
- Directed simulation-based analysis identifying precision dosing failures in a pharma client's conditioning regimen; presented recommendations directly to clinical decision-makers, resulting in a redesigned trial dosing strategy
- Built the analytics ETL pipeline behind real-time monitoring software supporting pharma drug development decisions, and presented the platform at ACoP
- Mentored a summer intern, now a senior engineer in medical devices
- Prototyped an LLM agent-based tool (GPT-4o) to assist pharmacometricians in NONMEM model development, then partnered with Pfizer to evaluate a more advanced version of this tool for pharmacometric model development against a manual workflow
- Led a tri-institutional collaboration with Lucile Packard Children's Hospital (Stanford) and Children's Hospital of Philadelphia to develop a pediatric voriconazole population PK model and optimized sampling strategies for model-informed precision dosing

Health Data Science Fellow June – Dec. 2019
Insight Data Science — San Francisco, CA

- Built a support vector machine classifier to predict the toxicity of 1,036 drugs in the FDA's Drug Induced Liver Injury data set using scikit-learn and pandas with 77% accuracy

Doctoral Researcher Aug. 2014 – June 2019
University of California, San Francisco — San Francisco, CA

- Developed a novel computational model that mimics complex diseases based on genetic data and evolutionary parameters to enable GWAS performance comparisons
- Showed that sampling cases and controls from the extremes of a quantitative trait gives rare-variant association tests their highest statistical power
- Discovered that methods for finding rare mutations causing disease are missing a vast amount of causal mutations when rare mutations explain most of the disease
- Demonstrated that using inexpensive genotyping arrays and imputation detects 90% of the associations identified by the much more expensive whole genome sequencing, potentially increasing sample size by 10-fold in any association study

Leadership & Service

Chair-elect Oct. 2026 – present
Vice-Chair Jan. – Oct. 2026
Scientific Secretary Jan. – Dec. 2025
ISoP/ACCP Clinical Pharmacometrics Special Interest Group

- A joint special interest group of the International Society of Pharmacometrics (ISoP) and the American College of Clinical Pharmacology (ACCP), the field's principal professional societies, focused on advancing pharmacometrics in patient care
- Promote application of pharmacometrics to direct patient care and foster an international group of scientists and clinicians across therapeutic areas

Abstract Committee Member, Clinical PMX SIG Representative 2025 – present
American Conference on Pharmacometrics (ACoP) Abstract Committee

- Serve as the Clinical Pharmacometrics SIG's representative to the ACoP abstract review committee, evaluating submitted abstracts for scientific merit and selecting recipients of the conference's trainee awards
- ACoP is the premier annual scientific meeting in the field

Peer Review

Invited manuscript reviewer for thirteen international peer-reviewed journals across pharmacometrics, antimicrobials, and clinical medicine. Seventeen reviews completed, 2025–2026:

- *Clinical Pharmacokinetics* (2026)
- *Journal of Pharmacokinetics and Pharmacodynamics* (2026, incl. two re-reviews) — pharmacometrics' dedicated methodological journal
- *Clinical Microbiology and Infection* (2026) — official journal of ESCMID
- *Antimicrobial Agents and Chemotherapy* (2026, incl. one re-review) — American Society for Microbiology
- *Cancer Chemotherapy and Pharmacology* (2026)
- *Frontiers in Pharmacology* (2026)
- *Frontiers in Antibiotics* (2025)
- *BMC Medical Research Methodology* (2026)
- *Journal of Clinical Pharmacy and Therapeutics* (2025–2026, incl. one re-review)
- *Journal of Clinical Medicine* (2025)
- *Therapeutic Drug Monitoring* (2026)
- *European Journal of Drug Metabolism and Pharmacokinetics* (2026)
- *Clinical Pharmacology & Therapeutics* (2026) — official journal of ASCPT

Skills and Expertise

- **Pharmacometrics:** population PK/PD modeling, model-informed precision dosing, simulation-based trial design
- **Machine Learning & AI:** hybrid ML/PK/PD modeling, agentic AI for MIDD, AI validation (GxP), deep learning
- **Software:** NONMEM, R (tidyverse, Shiny), Python (pandas, scikit-learn, XGBoost), Docker, git

Education

Ph.D. in Bioengineering June 2019
University of California, Berkeley – UC San Francisco
- Thesis: *Population genetic simulation study of power in association testing across genetic architectures and study designs* (advisor: Ryan D. Hernandez)

Bachelor of Applied Science in Engineering Physics (Electrical option) May 2014
University of British Columbia
- Combines electrical engineering, applied physics, and emphasis on innovation

Publications

11. **Tong DMH**, Faldasz JD, Keizer RJ, Hughes JH. One model to dose them all: a population pharmacokinetic model for multiple aminoglycosides across the human lifespan. *J Clin Pharmacol.* 2026;66(9). doi:10.1002/jcph.70231
10. **Tong DMH**, Brooks JT, Keizer RJ, Hughes JH. Vancomycin target attainment improved following population pharmacokinetic model switch: a large-scale quasi-experimental study of precision dosing. *JAC Antimicrob Resist.* 2026;8(1):dlag016. doi:10.1093/jacamr/dlag016 PMID: 41710913; PMCID: PMC12910383.
9. **Tong DMH**, Keizer RJ, Hughes JH. Improved prediction of vancomycin pharmacokinetics in patients receiving continuous renal replacement therapy using a novel population model validated with real-world data. *Ther Drug Monit.* 2026;48. doi:10.1097/FTD.0000000000001432
8. van Os W, O'Jeanson A, Troisi C, Liu C, Brooks JT, Hughes JH, **Tong DMH**, Keizer RJ. Machine learning–based model selection and averaging outperform single-model approaches for a priori vancomycin precision dosing. *CPT Pharmacometrics Syst Pharmacol.* 2025;14(10):1650–1660. doi:10.1002/psp4.70084
7. **Tong DMH**, Hughes MA, Hu J, Pearson JC, Kubiak DW, Dionne BW, Hughes JH. Comparing two-sample log-linear exposure estimation with Bayesian model-informed precision dosing of tobramycin in adult patients with cystic fibrosis. *Antimicrob Agents Chemother.* 2025;69:e01040-24. doi:10.1128/aac.01040-24
6. Hughes JH, **Tong DMH**, Faldasz JD, Frymoyer A, Keizer RJ. Evaluation of neonatal and paediatric vancomycin pharmacokinetic models and the impact of maturation and serum creatinine covariates in a large multicentre data set. *Clin Pharmacokinet.* 2023;62:67–76. doi:10.1007/s40262-022-01185-4
5. Hughes JH, **Tong DMH**, Burns VM, Daly B, Razavi P, Boelens JJ, Goswami S, Keizer RJ. Clinical decision support for chemotherapy-induced neutropenia using a hybrid pharmacodynamic/machine learning model. *CPT Pharmacometrics Syst Pharmacol.* 2023;12:1–13. doi:10.1002/psp4.13019
4. **Tong DMH**, Hughes JH, Keizer RJ. Evaluating and improving neonatal gentamicin pharmacokinetic models using aggregated routine clinical care data. *Pharmaceutics.* 2022;14(10):2089. doi:10.3390/pharmaceutics14102089
3. **Tong DMH**, Hughes JH, Keizer RJ. Use of age-adjusted serum creatinine in a vancomycin pharmacokinetic model decreases predictive performance in elderly patients. *Ther Drug Monit.* 2021;43(1):139–140. doi:10.1097/FTD.0000000000000819
2. Hughes JH, **Tong DMH**, Lucas SS, Faldasz JD, Goswami S, Keizer RJ. Continuous learning in model-informed precision dosing: a case study in pediatric dosing of vancomycin. *Clin Pharmacol Ther.* 2021;109(1):233–242. doi:10.1002/cpt.2088
1. **Tong DMH**, Hernandez RD. Population genetic simulation study of power in association testing across genetic architectures and study designs. *Genet Epidemiol.* 2020;44(1):90–103. doi:10.1002/gepi.22264

Presentations

- **Tong DMH**, Brooks JT, Hughes JH, Keizer RJ. Towards a structured workflow for semi-automated data cleaning and outlier removal in real-world pharmacometric data (Poster). *American Conference on Pharmacometrics (ACoP)*, National Harbor, MD, USA. Oct. 2026.
- **Tong DMH**, Faldasz JD, Keizer RJ, Hughes JH. One model to dose them all: a population pharmacokinetic model for multiple aminoglycosides across the human lifespan (Oral presentation; presented by Hughes JH). *IATDMCT Annual Congress*, Rennes, France. Sept. 2026.
- **Tong DMH**, Bio L, Downes KJ, Sharova A, Hughes JH, Hughes MA. Early sampling improves voriconazole target attainment in pediatric patients dosed with MIPD tools: a simulation study (Poster). *American Conference on Pharmacometrics (ACoP)*, Aurora, CO, USA. Oct. 2025.

- **Tong DMH**, Keizer RJ, Hughes JH. Evaluation of population pharmacokinetic model predictive performance in adults on hemodialysis treated with vancomycin (Poster). *Population Approach Group Europe (PAGE)*, Thessaloniki, Greece. June 2025.
- Bergeron M, Goswami S, **Tong DMH**, Shahin M, Singh R, Corrigan B, Keizer RJ. Leveraging agentic workflows for PK/PD analysis: enhancing clinical pharmacology decision-making (Poster; presented by Bergeron M). *ASCPT Annual Meeting*, Washington, DC, USA. May 2025.
- **Tong DMH**, Hughes MA, Hu J, Pearson JC, Kubiak DW, Dionne BW, Hughes JH. Comparing two-sample log-linear exposure estimation with Bayesian model-informed precision dosing of tobramycin in adult patients with cystic fibrosis (Poster). *IATDMCT Congress*, Banff, Canada. Oct. 2024.
- Hughes MA, **Tong DMH**, Hughes JH. Improved vancomycin target attainment following a quasi-experimental change in pharmacokinetic model for Bayesian precision dosing (Poster). *IDWeek*, Los Angeles, CA, USA. 2024.
- **Tong DMH**, Keizer RJ, Hughes JH. Cystatin C complements but does not exceed serum creatinine as a renal function marker: evidence from vancomycin pharmacokinetic model performance in a clinical context (Poster). *American Conference on Pharmacometrics (ACoP)*, Phoenix, AZ, USA. 2024.
- **Tong DMH**, Burns VM, Daly R, Razavi P, Boelens JJ, Goswami S, Keizer RJ, Hughes JH. Prediction of severe neutropenia in chemotherapy patients is significantly improved by using a hybrid pharmacokinetic/pharmacodynamic and machine learning approach (Poster). *American Conference on Pharmacometrics (ACoP)*, National Harbor, MD, USA. 2023.
- **Tong DMH**, Hughes JH, Keizer RJ. Comparing full Bayesian estimation to maximum a posteriori (MAP) Bayesian estimation in three routine clinical care scenarios (Poster). *Population Approach Group Europe (PAGE)*, Ljubljana, Slovenia. 2022.
- **Tong DMH**, Hughes JH, Keizer RJ. Evaluating and improving neonatal gentamicin pharmacokinetic models using aggregated routine clinical care data (Oral presentation). *IATDMCT Congress*, Prague, Czechia. 2022.
- **Tong DMH**, Burns VM, Hughes JH, Goswami S, Keizer RJ. Real-time monitoring and analytics software to support drug development decision making (Poster). *American Conference on Pharmacometrics (ACoP)*, Virtual. Nov. 2021.

Awards

Top Poster Ribbon 2025
American Society for Clinical Pharmacology and Therapeutics (ASCPT) Annual Meeting
- Agentic AI platform for PK/PD analysis, developed with Pfizer

Postgraduate Scholarship – Doctoral (PGS D) 2015
Natural Sciences and Engineering Research Council of Canada (NSERC)
- National award for academic performance, research potential, and excellence in natural sciences and engineering