CHIEF > JERRY AVORN, M.D. (1998–PRESENT)
Change is accelerating in the scientific basis of drug development, as well as in concern about the safety and cost of medications. Rapidly growing understanding of the molecular basis of disease is leading to enormously effective new treatments, often at great cost. This new knowledge is also leading to an intensifying debate over how new medications are to be assessed, and the relative roles of their effects on biomarkers versus clinical outcomes, as the basis for approval. After years of relative quiescence, drug expenditures have begun to grow, comprising a larger share of the healthcare dollar. This in turn has raised questions about the appropriateness of current approaches to drug pricing and policies concerning exclusivity and patent life.

Interest has also grown in what has come to be called “real-world analysis” of medication effects – their results not just in the context of clinical trials, but also in the setting of routine use in large populations of typical patients. Often, these results differ in important ways from effects seen in the more artificial world of controlled clinical trials. Fortunately, expertise is growing in the use of large databases describing the prescription drug use and clinical outcomes of millions of patients covered by both public and commercial insurers. This has made it possible to examine both patterns of medication use (by prescribers as well as patients) and actual clinical outcomes on a very large scale.
Ethical and regulatory policy issues have also come to the fore in important and interesting ways. What should be the right of a severely ill patient to access an unapproved drug treatment if they have no other option? How can society pay for important new pharmaceutical advances if one regimen is priced at $1,000 per pill, or another costs $300,000 per year? What is the most appropriate relationship between a clinician and a healthcare system in determining which drugs should be prescribed and covered? Still reacting to the debacle of rofecoxib (Vioxx), which was on the market for five years before the Food and Drug Administration (FDA) became aware that it doubled the risk of heart attack and stroke, governmental and private-sector entities are developing ever more powerful ways of performing “pharmacovigilance” – the surveillance of enormous numbers of patients to develop an early sense of possible drug safety problems. We continue to see dramatic increases in the digital resources available to do such work, in terms of hardware, software, and methodological sophistication. The Division of Pharmacoepidemiology and Pharmacoeconomics, drawing as it does on the disciplines of medicine, epidemiology, law, biostatistics, and health policy, is well situated to take on these pressing research and public issues. With its highly interdisciplinary faculty, roots in clinical medicine, and expertise in cutting-edge methodologic approaches to analyzing data from large populations, it has the tools to take on questions that require the combination of several kinds of expertise to address effectively.

Internationally, the disciplines of pharmacoepidemiology and pharmacoeconomics have grown dramatically in recent years. Pharmacoepidemiology – the study of the safety and effectiveness of medications in large populations of patients seen in routine clinical care – has become increasingly central to our understanding of optimal prescription drug use. Awareness is growing that the initial clinical trials on which FDA approval rests often do not provide enough information about the actual benefits and risks that drugs will cause when used in large, heterogeneous populations of typical patients. Pharmacoeconomics – which studies the clinical and economic consequences of a drug’s use compared to its costs – likewise looms large in a healthcare system concerned about affordability, especially at a time of rising drug costs. One particularly fruitful area of work is the union of both disciplines to perform comparative effectiveness research – the systematic assessment of how well different treatment alternatives compare with one another in terms of patient benefit, side effects, and cost-effectiveness.

Observational studies that tap into the enormous clinical information that resides in the “big data” of healthcare utilization patterns are particularly well suited for this kind of research. As vital as smaller randomized controlled trials (RCTs) are, their cost and difficulty mean that the healthcare system cannot mount a new RCT to compare every new drug with each of its alternatives on an ongoing basis. By contrast, rigorous observational assessment of the clinical outcomes of treatments in very large populations of patients – based on data from sources such as Medicare, Medicaid, and commercial insurance companies – can yield important insights about which agents produce the best clinical outcomes and fewest side effects, and are the most cost-effective. For one area of intense study in the division, the effects of medication use in pregnancy, observational studies are the likeliest source of important information on the effects of drugs on pregnant women and their offspring.

When pre-approval studies only compare a new agent against a placebo, or determine its efficacy only in terms of achieving a surrogate measure of success such as an improved laboratory test, they can leave unanswered many important questions facing all participants in the healthcare system. Accelerating changes in healthcare delivery have only intensified this need for information on how medications actually perform in typical populations of patients receiving routine care. Such studies can also study how these outcomes vary across subgroups of patients with specific characteristics of gender, age, co-morbidity, concomitant drug use, and genotype. Many clinical trials do not enroll adequate numbers of such subgroups to make this kind of patient-centered
actionable insights on how the nation can best address the substantial “hidden epidemic” of non-compliance. A new dimension of this work is the conduct of prospective randomized trials involving thousands of patients in routine care, to determine which adherence-enhancing strategies are the most effective and practical.

Working with the FDA and colleagues at Harvard Medical School (HMS) and throughout the country, division faculty play a leading role in shaping an emerging approach to studying drug safety by means of pooled datasets describing the medication use and clinical outcomes of tens of millions of patients. Regulatory changes and growing pressure to approve drugs more quickly and on the basis of intermediary outcomes have led to greater emphasis on post-market studies to accurately assess both effectiveness and safety. New opportunities are developing to link the details of patients’ electronic medical records (after extensive anonymization to protect privacy) with additional healthcare utilization data from programs such as Medicare, to provide a powerful and nuanced understanding of risk factors and clinical events related to medication use. As the healthcare delivery system itself becomes accessible for study and can be harnessed as an experimental system in its own right, division members are conducting both observational studies and randomized trials to clarify how doctors, patients, and policymakers can deploy medications so as to maximize their benefit, minimize their risk, and optimize their cost-effectiveness.

THE DIVISION HAS BECOME A WORLD LEADER IN THE DEVELOPMENT OF ADVANCED APPROACHES TO SEPARATE OUT MEDICATION EFFECTS FROM SUCH CONTAMINATION BY CONFOUNDING; DIVISION FACULTY HAVE DEVELOPED SOPHISTICATED COMPUTATIONAL APPROACHES TO DO SO RIGOROUSLY AND EFFICIENTLY.
Initiated in 1998 with just four researchers, the division has grown to over 60 researchers and support staff, including 21 faculty members representing the fields of general internal medicine, geriatrics, rheumatology, anesthesiology, epidemiology, biostatistics, law, health services research, computer science, and health policy. It serves as a training site for fellows and house officers from Brigham and Women’s Hospital (BWH) and other HMS-affiliated institutions, as well as for HMS students and master’s degree and doctoral students in epidemiology from the Harvard T.H. Chan School of Public Health (HSPH). Examples of current research projects include the use of new statistical methods to assess vaccine safety; the relative effectiveness and safety of new anticoagulants; the risks of medications in pregnancy; the problem of patient non-adherence to prescribed regimens, and how it can be addressed; methodological approaches to controlling for confounding in observational studies of drug risks, including the creation of computer-based approaches to scan for possible drug risks quickly, efficiently, and rigorously; the clinical and economic consequences of changes in drug reimbursement policies; the effects of laws and regulations on medication approval, utilization, and cost; and creating, implementing, and evaluating innovative programs to improve physician prescribing practices and patient adherence.

The division has become one of the most active programs nationally in research on medication outcomes, adverse effects, and cost-effectiveness. We have also established ongoing research relationships with some of the nation’s largest health insurers and with a large national pharmacy chain to use their data to study patterns of medication use and outcomes. Collaborations have also been established or strengthened with faculty at other HMS-affiliated institutions, HSPH, and other university divisions.

Ongoing developments in the American healthcare system promise to further increase the relevance of the division’s work. The growth of accountable care-type organizations is creating greater demand for research to inform and improve physicians’ choices of treatment, as well as for studies of how patients use (or don’t use) the therapies they are prescribed. In addition to defining the most-important issues in medication utilization and safety, division faculty are also engaging in proactive programs and studies to generate change in the healthcare system, through rigorous assessment of current medication-related policies, further development of proactive drug-safety surveillance programs, and educating healthcare professionals on how best to improve physician prescribing practices.

While the division does not maintain a clinical program of its own, a number of faculty are active clinicians participating on the general medicine service (Dr. Fischer) and the hospitalist service (Dr. Choudhry), as well as in primary care (Drs. Fischer and Kesselheim), rheumatology (Drs. Kim and Solomon), and anesthesiology (Dr. Bateman).
Division faculty are active teachers throughout HMS and its affiliated institutions, and teach BWH house officers and fellows as well as HMS students as part of their patient care activities while attending on the hospitalist service (Dr. Choudhry) and Integrated Teaching Unit (Drs. Choudhry and Fischer). Our faculty members also actively see ambulatory patients and precept house officers in the Phyllis Jen Center for Primary Care (Drs. Fischer and Kesselheim) and the rheumatology clinic (Drs. Kim and Solomon).

Faculty also lecture in the BWH house officer noon lecture series, take resident morning reports, present grand rounds at local divisions and departments (Drs. Choudhry, Kesselheim, and Avorn), and participate as mentors in the medical residents’ Evidence-Based Medicine Journal Club and Resident Research Report.

Division faculty have developed and teach multiple courses at HSPH, including “Epidemiologic Methods in Health Services Research” (Dr. Schneeweiss), “Database Analytics for Pharmacoepidemiology” (Drs. Schneeweiss and Gagne), Public Health Law (Dr. Sarpatwari), and “Topics in Medical Device Comparative Effectiveness Research” (Dr. Gagne).

Drs. Schneeweiss and Fischer developed a new course, “Comparative Effectiveness Research Using Longitudinal Databases,” as part of the Harvard Program on Clinical Effectiveness. Based on its success, it was repeated at Harvard in 2016 and also taught in Italy by Drs. Schneeweiss and Patorno. Drs. Bateman, Gagne, Kim, Patorno, Sarpatwari, Solomon, and Wang also taught in this course. Drs. Fischer, Gagne, Huybrechts, and Schneeweiss served as faculty members for the clinical epidemiology course in the HMS-HSPH Clinical Effectiveness Program. Dr. Schneeweiss worked with Dr. Sonia Hernandez-Diaz of HSPH to develop a postgraduate training program in comparative effectiveness research.

Dr. Glynn is course director and instructor for a core HSPH course in biostatistics, “Analysis of Rates and Proportions.” He also co-teaches a course on biostatistics in the Harvard summer school and teaches about propensity score methods and methodological issues in observational comparative effectiveness research for the Harvard Catalyst.

Dr. Kesselheim is a core faculty member at the new Harvard Center for Bioethics at HMS. At the Center, he co-teaches the “Health Law, Policy, and Bioethics” core course and a second course based on a monthly series of public seminars addressing current controversies relating to ethical issues in prescription drug and medical device development and use. He has continued to serve as a faculty affiliate at the Petrie-Flom Center for Health Law Policy, Biotechnology, and Bioethics at Harvard Law School. He also serves as a visiting associate professor of law at Yale Law School, where he teaches a new course in FDA Law.

Dr. Sarpatwari is also a faculty affiliate with the Petrie-Flom Center at Harvard Law School and with the Behavioral Insights Group based in the Center for Public Leadership at the Harvard Kennedy School.

He teaches a Public Health Law course at HSPH and lectures in the “Health Law, Policy, and Bioethics” course co-directed by Dr. Kesselheim, the “Advanced Pharmacoepidemiology” course co-directed by Drs. Schneeweiss and Gagne, and the “Comparative Effectiveness Research Using Longitudinal Databases” course co-directed by Drs. Schneeweiss and Fischer. He additionally supervises Master’s students in the Harvard Center for Bioethics and L.L.M. students at Harvard Law School.

Dr. Avorn offers the main lectures on medication benefit-risk assessment in the HMS core course in clinical epidemiology and social medicine. He also offers the main lectures in the HMS Therapeutics Graduate Program, the Leder Human Biology Program, the Master’s Program in Clinical and Translational Investigation, the Harvard-MIT Health Sciences & Technology (HST) “Introduction to Clinical Medicine” course, and the HMS Global Clinical Scholars Research Training Program.
Dr. Franklin lectures in an HSPH course on health services research and in courses at the Boston University School of Public Health, including “Drug Epidemiology” and “Novel Analytical Methods for Epidemiology.”

Dr. Choudhry runs the Department of Medicine’s (DOM) Center for Healthcare Delivery Sciences, focused on the design and conduct of pragmatic clinical trials designed to improve medication adherence and other related health behaviors. Through the Center he supervises advanced trainees from BWH, Massachusetts General Hospital (MGH), Harvard Business School, and HSPH. He also serves as the director of Implementation Research and Education for Harvard Catalyst; he has developed and directs several new courses on implementation research, comparative effectiveness, and cost-effectiveness analysis. He also teaches in the Harvard Catalyst courses “Introduction to Clinical Investigation” and “Fundamentals of Clinical and Translational Research.” Along with Dr. Avorn, he lectures in the Harvard Global Clinical Scholars Research Training Program. He also lectures in several courses at HSPH that are led by division faculty. He has received numerous awards for teaching excellence, including the George W. Thorn Award and the Jean Jackson Distinguished Bedside Teacher Award. He has twice been awarded a Distinguished Faculty Mentor Award from the DOM.

Dr. Seoyoung Kim teaches in the “Program in Clinical Effectiveness” as a core faculty member, and in the HSPH course, “Effectiveness Research with Longitudinal Healthcare Databases.” She taught at MCPHS University and served as a doctoral thesis committee member in the Program for Pharmaceutical Sciences. She received the 2014 BWH DOM Early Career Mentoring Award.

Dr. Huybrechts teaches a drug epidemiology course at the Boston University School of Public Health, and lectures in the HSPH courses “Epidemiologic Methods in Health Services Research,” “Advanced Methods in Pharmacoepidemiology” and “Database Analytics in Pharmacoepidemiology.” She also lectures in the HMS courses T3/T4 Research “Translating Effective Interventions into Practice” and “Translational Pharmacology: Pharmacoepidemiology, pharmaco-economics, and pharmaco-vigilance,” and in the Harvard Catalyst online course “Comparative Effectiveness Research.”
Division faculty and staff are working with several states and other healthcare organizations to provide educational outreach to physicians about optimal evidence-based care for several common clinical conditions. In 2010, Drs. Fischer and Avorn founded the federally funded National Resource Center for Academic Detailing (NaRCAD), designed to accelerate the adoption of innovative methods of educational outreach to improve health care delivery and outcomes. The resource center is currently funded through 2018 and has worked with national, state, and local public health programs as well as employers and insurers to support them in designing and implementing interventions to educate clinicians and improve care across a range of clinical topics, including diabetes control, pain management, cancer screening, and many others. To date NaRCAD has trained over 250 health professionals in the techniques of academic detailing. It is currently partnering with other groups on large federally funded studies to improve the treatment of cardiovascular disease risk factors and the use of smoking-cessation treatments in patients with severe mental illness. An additional grant resulting from NaRCAD’s work makes possible an annual conference series on academic detailing each November.

BWH housestaff, fellows, and faculty have identified the division as a site for closely mentored research in pharmacoepidemiology and pharmacoconomics, and in 2012 the division became a training site for the Harvard-wide fellowship program in general internal medicine, under the direction of Dr. Kesselheim. The division also serves as the training site for doctoral dissertation work and other graduate training for students in the HSPH Department of Epidemiology. Dr. Gagne directs the division’s training program for students and research fellows in pharmacoepidemiology.

The division also offers a postdoctoral fellowship in medical product law and policy, under the direction of Dr. Kesselheim, through the PORTAL research center. Past and current fellows have studied FDA regulation, patents, drug access and costs, advances in pre-approval clinical trial design, and competition in the therapeutic marketplace. Other PORTAL areas of focus include intellectual property, ethics, and comparative effectiveness, as well as the development, approval, and evidence-based use of drugs, devices, vaccines, procedures, and diagnostics. Dr. Kesselheim has overseen and published with several HMS students in their Scholars in Medicine projects related to these topics.

**RESEARCH**

Since its founding, the division has achieved substantial growth in research support from the National Institutes of Health (NIH), including the National Institute on Aging (NIA); the National Heart, Lung, and Blood Institute (NHLBI); the National Institute on Arthritis and Musculoskeletal Diseases (NIAMS); the National Institute of Mental Health (NIMH); the National Cancer Institute (NCI); the National Institute of Allergy and Infectious Diseases (NIAID); the National Institute of General Medical Sciences (NIGMS); the National Library of Medicine (NLM); and the National Center for Advancing Translational Sciences (NCATS). It also receives research grant support from the Agency for Healthcare Research and Quality (AHRQ), the FDA, the Patient-Centered Outcomes Research Institute (PCORI), and the Reagan-Udall Foundation for the FDA. Peer-reviewed support has also been provided by the Commonwealth Fund, the Greenwall Foundation, Harvard Catalyst, the Laura and John Arnold Foundation, the Robert Wood Johnson Foundation, and additional unrestricted research support from the corporate sector.

Funded studies focus on quantification of the efficacy, risks, and cost-effectiveness of specific medications or medication classes, detection and assessment of signals of adverse events from large-population databases, analysis of patterns of drug use by physicians and patients, the development of new methods for pharmacoepidemiology, and programs to improve the appropriateness of medication use.
Selected sample of research projects:

**Replicability of Protocol-Based Findings in Pharmacoepidemiology**

*Principal Investigator:*
Joshua J. Gagne, Pharm.D., Sc.D.

*Source of Support:*
Reagan-Udall Foundation for the FDA

*Overview:*
This project evaluates three FDA assessments of drug risk, and investigates and explains sources of discrepancies in results between these and the original large-population-based assessments in the FDA's Sentinel System.

**Guidance for Follow-up of a Safety Signal from Prospective Surveillance**

*Principal Investigator:*
Joshua J. Gagne, Pharm.D., Sc.D.

*Source of Support:*
FDA

*Overview:*
This project is developing practical guidance to specify appropriate follow-up steps when a safety signal arises during prospective surveillance, based on tools currently available or in production in the FDA's Sentinel System.

**Causal Inference for Effectiveness Research Using Secondary Data**

*Principal Investigator:*
Sebastian Schneeweiss, M.D., Sc.D.

*Source of Support:*
PCORI

*Overview:*
This three-year study is implementing and adapting two novel algorithmic approaches for improved assessment of drug outcomes in comparative-effectiveness research using large healthcare databases, and will evaluate their performance in specific case studies.

**Improved Methods to Assess the Comparative Safety of New Psychiatric Medications**

*Principal Investigator:*
Krista Huybrechts, Ph.D.

*Source of Support:*
NIMH

*Overview:*
The project will develop, adapt, and rigorously validate several approaches for near-real-time monitoring of adverse drug effects, and methods to address confounding and outcome misclassification in the study of medications used to treat mental illness.

**Study of a Telepharmacy Intervention for Chronic Disease to Improve Treatment Adherence (STIC 2 IT)**

*Principal Investigator:*
Niteesh K. Choudhry, M.D., Ph.D.

*Source of Support:*
NHLBI

*Overview:*
This RCT is evaluating the ability of a novel “telepharmacist” intervention in a large multispecialty group practice to improve patient adherence and clinical outcomes. It will assess the cost-effectiveness of the intervention, and validate the potential of using pharmacy data and self-reported data to evaluate patient adherence to prescribed regimens.

**A Scalable Collaborative Infrastructure for a Learning Health System (SCILHS)**

*Co-Principal Investigator:*
Sebastian Schneeweiss, M.D., Sc.D.

*Source of Support:*
PCORI

*Overview:*
This project implements a distributed clinical data research network infrastructure based on electronic medical records and claims data, with provisions for access to patients and clinicians to conduct expedited randomized and observational comparative-effectiveness research.
Developing Targeted Adherence Interventions for Patients: Epidemiology and Prediction of Non-adherence Behaviors

Co-Principal Investigators:
Niteesh K. Choudhry, M.D., Ph.D., and Jessica Franklin, Ph.D.

Source of Support:
Merck Sharp & Dohme

Overview: This predictive analytics study evaluates the capacity of electronic health-record data to predict patient adherence to evidence-based therapies.

Access to Drugs and Devices that Have Limited Supporting Data: Ethical Implications for Patients and Physicians

Principal Investigator:
Aaron S. Kesselheim, M.D., J.D.

Source of Support:
Greenwall Faculty Scholarship in Bioethics

Overview: This project assesses the ethical issues that arise concerning the evaluation and availability of drugs for rare diseases as well as early-access programs for medications. It is designed to inform ethical considerations for patients, physicians, manufacturers, and payers, when regulators approve experimental drugs and devices on the basis of limited data.

BEST-CLI Trial: Cost-effectiveness of Treatments for Critical Limb Ischemia

Principal Investigator:
Niteesh K. Choudhry, M.D., Ph.D.

Co-Principal Investigator:
Jerry Avorn, M.D.

Source of Support:
NHLBI

Overview: As part of a large nationwide NIH-sponsored multicenter randomized trial of alternative strategies to manage critical limb ischemia, this study is evaluating the functional and economic outcomes of each study arm in order to assess the comparative cost-effectiveness of surgical vs. endovascular treatments for peripheral arterial disease.

Xanthine Oxidase Inhibitors and Risks of Myocardial Infarction and Diabetes

Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
NIAMS

Overview: This project examines the risk of onset of Type 2 diabetes and myocardial infarction in patients with gout who start a xanthine oxidase inhibitor, compared to comparable untreated hyperuricemic patients.

Methods for Studying Treatment Heterogeneity Using Large Observational Databases

Principal Investigator:
Shirley Wang, Ph.D.

Source of Support:
AHRQ

Overview: This study investigates methods for estimating and communicating heterogeneity in drug effectiveness at the level of the individual patient. It will develop and disseminate patients’ personalized risk predictions through clinical decision support tools integrated into routine clinician workflow.

Analytical Methods to Assess the Robustness of Drug Safety Monitoring Results

Principal Investigator:
Sebastian Schneeweiss, M.D., Sc.D.

Source of Support:
FDA

Overview: The project implements methods for sensitivity analyses and quantitative bias analysis in a network of distributed healthcare databases.
Selected sample of research projects (continued):

**Impact of Drug Innovation Incentive Strategies on Drug Development and Costs**  
*Principal Investigator:*  
Aaron S. Kesselheim, M.D., J.D.  

*Co-Investigators:*  
Ameet Sarpatwari, Ph.D., J.D., and Jerry Avorn, M.D.  

*Source of Support:*  
Laura and John Arnold Foundation  

*Overview:* To examine the outcomes of programs intended to incentivize drug innovation, to identify the most successful aspects of these programs, and to determine how efficiently these programs facilitate the introduction of important new products by grading the innovativeness, efficacy, and safety of the products whose approval they have facilitated.

**Automated Detection of Drug Interactions in Post-Marketing Electronic Databases**  
*Principal Investigator:*  
Joshua J. Gagne, Pharm.D., Sc.D.  

*Source of Support:*  
Harvard Catalyst  

*Overview:* This project evaluates the performance of epidemiological methods for assessing clinically important drug-drug interactions; it also develops and tests a semi-automated program for rapid, high-throughput drug-drug interaction screening in electronic healthcare databases.

**Prospective Observational Monitoring Program Tools (PROMPT): Rivaroxaban Surveillance**  
*Principal Investigator:*  
Joshua J. Gagne, Pharm.D., Sc.D.  

*Source of Support:*  
FDA  

*Overview:* This project applies a semi-automated program previously developed by Drs. Gagne, Wang, and Schneeweiss to prospectively assess the safety of the novel oral anticoagulant rivaroxaban in comparison to warfarin, using the FDA’s Sentinel Distributed Database.

**Reducing Health System Complexity to Increase Adherence to Evidence-based Medications**  
*Principal Investigator:*  
Niteesh K. Choudhry, M.D., Ph.D.  

*Source of Support:*  
Pharmaceutical Research and Manufacturers of America Foundation  

*Overview:* This study estimates the potential of programs that synchronize prescription-dispensing schedules to improve patient adherence. It will do so by designing a prospective trial of the effect of reducing drug-regimen complexity.

**Protocol for Assessment of a New Molecular Entity – Dabigatran**  
*Principal Investigator:*  
Joshua J. Gagne, Pharm.D., Sc.D.  

*Source of Support:*  
FDA  

*Overview:* This project develops and implements a protocol to assess the comparative safety of the novel oral anticoagulant dabigatran relative to warfarin, in the FDA’s Sentinel Distributed Database.

**Identifying and Predicting Narcotic Dependence after Common Surgical Procedures**  
*Principal Investigators:*  
Brian Bateman, M.D., and Niteesh K. Choudhry, M.D., Ph.D.  

*Source of Support:*  
Division Funds  

*Overview:* This project examines the relationship between in-hospital pain medication use and post-discharge overuse of opioids.
Medication Safety and Effectiveness Studies Using Securely Pooled Healthcare Data and Adjusted Analyses
Principal Investigators:
Sebastian Schneeweiss, M.D., Sc.D.

Source of Support:
NIH/National Center for Advancing Translational Sciences

Overview: This project develops and tests techniques for pooling data on medication use and outcomes from very large heterogeneous patient-care-data sources. The techniques developed allow for full multivariate adjustment without sharing private patient information. This approach can facilitate comparative effectiveness and medication safety analyses using such large-population databases.

Mail Outreach to Increase Vaccination Acceptance Through Engagement (MOTIVATE) Trial
Principal Investigator:
Niteesh K. Choudhry, M.D., Ph.D.

Source of Support:
Laura and John Arnold Foundation

Overview: This grant supports a large-scale randomized controlled trial conducted in collaboration with the U.S. Behavioral Insights Team and the Centers for Medicare and Medicaid Services, designed to increase rates of influenza vaccination.

Perioperative Management and Outcomes in Orthopedic Surgery
Principal Investigator:
Elisabetta Patorno, M.D., Dr.P.H.

Co-Principal Investigator:
Brian Bateman, M.D.

Source of Support:
Division Funds

Overview: This study investigates the use of medications in patients undergoing orthopedic surgery and assesses several in-hospital outcomes.

Risk of Non-vertebral Fracture and Gout: A Cohort Study
Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
Division Funds

Overview: This is a large-population-based cohort study to examine the risk of non-vertebral fracture in patients with gout compared to those without gout.

Use of Antibiotics and Risk of Otitis Media in Children: A Cross-national Study
Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
Division Funds

Overview: This cross-national project describes the patterns of antibiotic use for otitis media and the subsequent development of acute mastoiditis in children in seven countries (Denmark, Germany, Israel, Italy, South Korea, Spain, and the United States).

Methods for Comparative Effectiveness and Safety Analyses in a High-dimensional Covariate Space with Few Events
Principal Investigator:
Jessica Franklin, Ph.D.

Source of Support:
PCORI

Overview: The objective of this project is to evaluate and improve analytic strategies for observational analyses studying rare outcome events in the face of many potential confounders.
Selected sample of research projects (continued):

**Leukotriene Modifiers and the Risk of Coronary Events in Patients with Coronary Heart Disease**
*Principal Investigator:*
Elisabetta Patorno, M.D., Dr.P.H.

*Co-Principal Investigator:*
Sebastian Schneeweiss, M.D.

*Source of Support:*
Division Funds

*Overview:* This study evaluates the risk of coronary events following use of leukotriene modifiers compared with other respiratory agents in elderly patients with coronary heart disease.

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**Combined Risk-Benefit Assessment in Prospective Monitoring of Newly Marketed Drugs**
*Principal Investigator:*
Joshua J. Gagne, Pharm.D., Sc.D.

*Source of Support:*
Novartis

*Overview:* This project reviews and compares risk-benefit metrics that can be used in prospective drug monitoring programs to simultaneously evaluate the relative net benefit of new versus existing drugs.

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**Serum Uric Acid Level and Bone Mineral Density**
*Principal Investigator:*
Seoyoung C. Kim, M.D., Sc.D.

*Source of Support:*
Harvard Catalyst

*Overview:* The study describes baseline demographic, hormonal, anthropometric, and nutritional characteristics and assesses sequential changes in serum uric acid levels in women undergoing menopause enrolled in the Study of Women’s Health Across the Nation (SWAN) at MGH.

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**Linking Medical Records to Medicare Claims**
*Principal Investigator:*
Daniel Solomon, M.D.

*Co-Investigators:*

*Source of Support:*
NIH

*Overview:* This project involves a coordinated series of comparative effectiveness and safety studies, exploration of natural language processing, as well as methodological investigations using electronic medical records and/or insurance-based claims data.

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**FDA Drug Safety Announcements’ Impact on Use of Bisphosphonates Among Patients with Hip Fracture**
*Principal Investigator:*
Seoyoung C. Kim, M.D., Sc.D.

*Source of Support:*
Division Funds

*Overview:* This study assessed the effect of the FDA drug-safety announcements on the use of bisphosphonates in patients following hospitalization for hip fracture over the past decade.

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**Uptake of the First Biosimilar Infliximab Since its Approval in South Korea**
*Principal Investigator:*
Seoyoung C. Kim, M.D., Sc.D.

*Source of Support:*
Division Funds

*Overview:* This study examined the utilization patterns of both branded and biosimilar infliximab and other TNF medications in South Korea before and after the introduction of biosimilar infliximab.
Comparative Safety and Effectiveness of Denosumab and Zoledronic Acid in Patients with Osteoporosis

Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
Division Funds

Overview: This study assesses the beneficial and harmful effects of denosumab versus zoledronic acid in patients with osteoporosis.

Comparative Safety of Biologic DMARDs in RA patients with Cardiovascular, Metabolic and Pulmonary Comorbidities: a Large-Population-based Cohort Study

Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
Bristol-Myers Squibb

Overview: The primary objectives of this proposal are to provide detailed and high-quality evidence on comparative safety of biologic disease-modifying antirheumatic drug in patients with rheumatoid arthritis and seropositivity, as well as important comorbid conditions including cardiovascular, metabolic, and pulmonary disease.

Risk of Cardiovascular Events in Patients Using Tocilizumab as Compared with Other Biologics in Multiple Large Healthcare Databases

Co-Principal Investigators:
Sebastian Schneeweiss, M.D., Sc.D., and Daniel H. Solomon, M.D.

Co-Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
AstraZeneca

Overview: This study assesses the risk of cardiovascular events in patients with rheumatoid arthritis who start tocilizumab versus another agent using three large healthcare databases.

Perioperative Pharmacological Treatments and Outcomes in Surgery

Principal Investigator:
Elisabetta Patorno, M.D., Dr.P.H.

Co-Principal Investigator:
Brian Bateman, M.D.

Source of Support:
Division Funds

Overview: This study investigates temporal patterns, patient characteristics, and outcomes associated with the use of beta-blockers and statins in patients undergoing intermediate- to high-risk non-cardiac surgery.

ENhancing outcomes through Goal Assessment and Generating Engagement in Diabetes Mellitus: the ENGAGE-DM Trial

Principal Investigator:
Niteesh K. Choudhry, M.D., Ph.D.

Co-Investigator:
Julie C. Lauffenburger, Pharm.D., Ph.D.

Source of Support:
Division Funds

Overview: This grant supports a randomized trial evaluating the impact of a two-stage process of shared decision-making and behavioral interviewing on outcomes and medication adherence among patients who have poorly controlled diabetes.

Advanced Analytic Methods for Evaluating and Mitigating Threats to Validity in Perinatal Epidemiologic Research

Co-Principal Investigators:
Brian Bateman, M.D., and Krista Huybrechts, Ph.D.

Source of Support:
Division Funds

Overview: This project evaluates newer analytic methods in observational studies of drug effects in pregnancy, reviews considerations for choosing alternative research strategies, and assesses the strengths and weaknesses of specific analytic approaches to the identification of medication-related birth defects.
Selected sample of research projects (continued):

**Comparative Safety of Commonly Prescribed Psychotropic Drugs in Pregnant Women**

*BWH Principal Investigator:*
Krista Huybrechts, Ph.D.

*Source of Support:*
NIMH

*Overview:* The objective of this study, conducted in collaboration with Dr. Sonia Hernandez-Diaz at HSPH, is to quantify the risks and benefits of alternative approaches to manage mental disorders during pregnancy – in particular to compare the safety and effectiveness of specific anticonvulsants/mood stabilizers, antipsychotics, and stimulants, and continuing versus discontinuing these drugs during pregnancy.

**Observational Studies to Assess Maternal and Fetal Outcomes Following Exposure to Duloxetine**

*Principal Investigator:*
Krista Huybrechts, Ph.D.

*Co-Principal Investigators:*
Brian Bateman, M.D., and Sonia Hernandez-Diaz, M.D., Dr.P.H.

*Sources of Support:*
Eli Lilly

*Overview:* To evaluate maternal and fetal/infant outcomes associated with exposure to duloxetine in order to meet FDA requirements for post-marketing surveillance.

**Safety of Anticonvulsants/mood Stabilizers in Pregnant Women**

*Principal Investigators:*
Elisabetta Patorno, M.D., Dr.P.H.; Krista Huybrechts, Ph.D.; and Brian Bateman, M.D.

*Source of Support:*
NIMH

*Overview:* The objective of this research, conducted in collaboration with Dr. Sonia Hernandez-Diaz at HSPH, is to compare the safety and effectiveness of specific anticonvulsants/mood stabilizers during pregnancy.

**Hypnotics and the Risk of All-cause Mortality**

*Principal Investigator:*
Elisabetta Patorno, M.D., Dr.P.H.

*Co-Principal Investigators:*
Krista Huybrechts, Ph.D., and Robert Glynn, Ph.D., Sc.D.

*Source of Support:*
Division Funds

*Overview:* This study investigates the risk of mortality associated with the use of hypnotics, to address treatment barriers and channeling bias associated with the use of a non-active comparator.

**Impact of Trimming on Summary Confounder Scores on the Validity of Causal Inference in Comparisons Between Alternative Therapies**

*Principal Investigator:*
Robert Glynn, Ph.D., Sc.D.

*Source of Support:*
NIA

*Overview:* Emerging evidence supports the value of trimming the target population for causal inference to focus on subjects for whom treatment equipoise exists, as defined by overlap between treatment groups in summary confounder scores. This project compares alternative trimming strategies applied to propensity and disease-risk scores with the goal of optimizing the validity of such comparisons.
Innovations in Regulatory Science
Principal Investigator:
Aaron S. Kesselheim, M.D., J.D.
Source of Support:
Harvard Program in Therapeutic Science
Overview: This research program studies the novel questions and issues that face the FDA in its assessment of new technologies. Areas of study include policy approaches to encouraging research in unmet areas of need, and trends in FDA approvals of drugs and medical devices.

Ethical Issues in Prescription Drug Access Under Restricted Distribution Programs
Principal Investigator:
Ameet Sarpatwari, J.D., Ph.D.
Overview: This project entails a series of quantitative and qualitative investigations to understand the benefits and limitations of risk evaluation and mitigation strategies with elements to ensure safe use for patients, prescribers, manufacturers, and regulators with the goal of developing an ethical framework for the implementation such programs.

Comparative Effectiveness Research and Usage Patterns for New Oral Anticoagulants (NOACs)
Principal Investigator:
Sebastian Schneeweiss, M.D., Sc.D.
Co-Principal Investigators:
Krista Huybrechts, Ph.D., and John Seeger, Pharm.D., Dr.P.H.
Source of Support:
Boehringer Ingelheim
Overview: This project is documenting the effectiveness and safety endpoints in patients with atrial fibrillation who are prescribed anticoagulants. It will also define warfarin- and NOAC-utilization patterns, and analyze the clinical characteristics of patients beginning or switching between warfarin and NOACs.

Comparative Safety and Effectiveness of Antihypertensive Medications in Pregnancy
Principal Investigator:
Brian Bateman, M.D.
Source of Support:
NICHD
Overview: This study assesses the outcomes of medications commonly used to manage high blood pressure in pregnancy, through the study of medication use and outcomes in a large cohort of Medicaid beneficiaries.

Covariate Selection for Confounding Adjustment in the Face of Infrequent Outcomes
Principal Investigator:
Elisabetta Patorno, M.D., Dr.P.H.
Source of Support:
Division Funds
Overview: This study compares the adequacy of controlling for confounders by using alternative covariate selection strategies in studying rare adverse events.

The Use and Comparative Safety of Oral Hypoglycemic Agents
Principal Investigator:
Sebastian Schneeweiss, M.D., Sc.D.
Co-Principal Investigator:
Elisabetta Patorno, M.D., Dr.P.H.
Source of Support:
Boehringer Ingelheim
Overview: This study is analyzing patterns of oral hypoglycemic medication use, particularly the dipeptidyl peptidase-4 (DPP-4) inhibitors, and will establish an active safety and effectiveness surveillance system for the novel DPP-4 inhibitor linagliptin in relation to several diabetes-related outcomes.
Selected sample of research projects (continued):

**Non-interventional Study of the Safety and Effectiveness of Empagliflozin in Patients with Type 2 Diabetes Compared with DPP-4 Inhibitors in the United States: A Near-real-time Monitoring Program.**

*Principal Investigator:*
Elisabetta Patorno, M.D., Dr.PH.

*Co-Principal Investigator:*
Sebastian Schneeweiss, M.D., Sc.D.

*Source of Support:*
Boehringer Ingelheim

*Overview:* To establish a framework for the production of timely, rigorous evidence on long-term safety and effectiveness outcomes in patients with Type 2 diabetes prescribed empagliflozin.

**Cardiovascular Safety of Glucagon-like Peptide-1 (GLP-1) Receptor Agonists and Other Antidiabetic Agents in Routine Care**

*Principal Investigator:*
Elisabetta Patorno, M.D., Dr.PH.

*Co-Principal Investigators:*
Seoyoung C. Kim, M.D., Sc.D., and Robert Glynn, Ph.D., Sc.D.

*Source of Support:*
Division Funds

*Overview:* This study evaluates the effect of GLP-1 receptor agonists on the risk of cardiovascular events compared with other antidiabetic agents.

**Methodological Limitations in Observational Studies of the Association Between Glucose-lowering Medications and Cancer**

*Principal Investigator:*
Elisabetta Patorno, M.D., Dr.PH.

*Co-Principal Investigators:*
Jessica Franklin, Ph.D., and John Seeger, Pharm.D., Dr.P.H.

*Source of Support:*
Division Funds

*Overview:* This study critically evaluates the existing literature evaluating the association between antidiabetic medications and malignancies, and assesses the methodological approaches used.

**Linkage of a National Stroke Registry to Claims Data to Identify Factors That Lead to Better Healthcare Outcomes After Post-stroke Discharge**

*Principal Investigator:*
Elisabetta Patorno, M.D., Dr.PH.

*Co-Principal Investigator:*
Sebastian Schneeweiss, M.D., Sc.D.

*Source of Support:*
Division Funds

*Overview:* The objectives of this research project are to (1) assess the feasibility of establishing a linkage between the National Acute Stroke Registry and healthcare utilization data from national and commercial insurers; (2) investigate utilization of secondary prevention therapy in patients with stroke; (3) evaluate methods for confounding adjustment in assessment of the safety and effectiveness of inpatient and outpatient interventions for the secondary prevention of stroke.
Disease Risk Scores in Pharmacoepidemiology
Principal Investigator:
Robert Glynn, Ph.D., Sc.D.
Source of Support:
NIA
Overview: This study evaluates the utility of disease risk scores as summary measures of potential confounding in observational studies of medication safety and efficacy. Particular focus is placed on newly introduced drugs, in which propensity scores can change over time as physicians determine which patients are best suited for a new therapy. Also evaluated is the potential value of joint matching using both disease-risk and propensity scores, and whether this strategy reduces the impact of confounding.

Does Variation in the Physical Characteristics of Generic Drugs Affect Patients’ Experiences?
Principal Investigators:
Aaron S. Kesselheim, M.D., J.D., and Joshua J. Gagne, Pharm.D., Sc.D.
Source of Support:
FDA Office of Generic Drugs
Overview: While generic and brand-name drugs are chemically identical, their physical appearance may be different and is not directly regulated by the FDA. This study uses surveys of patients and pharmacists to assess perceptions of and reactions to changes in the physical appearance of generic drugs, as predictors of possible utilization problems.

The Impact of High-deductible Health Plans and Their Structure on Medication Adherence, Healthcare Spending, and Racial Disparities
Principal Investigator:
Niteesh K. Choudhry, M.D., Ph.D.
Source of Support:
Pharmaceutical Research and Manufacturers of America Foundation
Overview: This project is evaluating how insurance coverage plans that impose high patient deductibles affect healthcare utilization, spending, and disparities.

Use and Safety of Aliskiren in Patients with Hypertension
Principal Investigator:
Sebastian Schneeweiss, M.D., Sc.D.
Co-Principal Investigator:
John Seeger, Pharm.D., Dr.P.H.
Source of Support:
Novartis
Overview: This study applies observational methods to follow up on a safety signal that arose in randomized trials of this antihypertensive medication. It describes usage patterns of the drug and its cardiovascular safety, including subgroups of patients with diabetes and renal impairment.

Randomized Trial of Targeted Approaches for Improving Glycemic Control and Persistence Among Diabetic Patients on Insulin: The TARGIT-Diabetes Trial
Principal Investigator:
Niteesh K. Choudhry, M.D., Ph.D.
Co-Investigator:
Julie C. Lauffenburger, Pharm.D., Ph.D.
Source of Support:
Sanofi
Overview: This grant supports a randomized trial evaluating the impact and cost-effectiveness of different methods to target and intervene upon patients with poorly controlled diabetes receiving treatment with insulin.
Selected sample of research projects (continued):

**Software for Near Real-Time Post-Market Drug and Vaccine Safety Surveillance**

*Principal Investigator:*
Martin Kulldorff, Ph.D.

*Source of Support:*
NIGMS

*Overview:*
Electronic health data are now available for post-market near-real-time drug and vaccine safety surveillance, making it possible to quickly detect rare but serious adverse events. In this project we are developing new sequential statistical methods for near-real-time pharmacovigilance, together with free public user-friendly statistical software.

**Spatial Scan Statistics Surveillance Software II**

*Principal Investigator:*
Martin Kulldorff, Ph.D.

*Source of Support:*
NCI

*Overview:*
SaTScan is a free software used by many scientists and public health officials around the world for disease-cluster detection and evaluation, and for the early detection of disease outbreaks. In this project, we are further developing the SaTScan software and the statistical methods on which it is based.

**Methods for Safety Evaluation of Vaccination Schedules**

*Principal Investigator:*
Martin Kulldorff, Ph.D.

*Source of Support:*
NIAID

*Overview:*
We are developing and evaluating new pharmacoepidemiological methods for studying the safety of different aspects and components of the childhood vaccination schedule. These include the timing of individual vaccines, the timing between doses of the same vaccine, the interaction effect between vaccines and concurrent health conditions or medications, the interaction effects of different vaccines given on the same day, the ordering of different vaccines, and the effect of cumulative summary metrics such as the total number of vaccines or the total amount of specific vaccine ingredients.

**Tree Scan Statistics for Pharmacovigilance**

*Principal Investigator:*
Martin Kulldorff, Ph.D.

*Source of Support:*
FDA

*Overview:*
Using electronic health data, we are developing tree scan statistics for simultaneous evaluation of thousands of unsuspected adverse events, while adjusting for multiple testing. The method is being evaluated for both vaccines and drugs.

**Impact of Medicare Drug Coverage on Antidepressant Quality and Outcomes**

*Principal Investigator:*
Sebastian Schneeweiss, M.D., Sc.D.

*Source of Support:*
NIMH

*Overview:*
This study examines the impact of the Medicare prescription-drug benefit on elderly patients with depression in terms of antidepressant use, quality of care, health, and economic outcomes.
Detection and Analysis of Adverse Events Related to Regulated Products in Automated Healthcare Data: Developing the Sentinel Initiative

Co-Investigators:
Sebastian Schneeweiss, M.D., Sc.D.;
Robert Glynn, Ph.D., Sc.D.;
Joshua J. Gagne, Pharm.D., Sc.D.;
Jessica Franklin, Ph.D.; and Shirley Wang, Ph.D.

Source of Support:
FDA

Overview: This work contributes to the FDA program that is building, testing, and establishing a national system for active drug-safety monitoring based on a network of linkable healthcare utilization and electronic medical-record databases.

Leveraging a National Academic Detailing Resource to Improve Clinical Decisions

Principal Investigator:
Michael Fischer, M.D.

Source of Support:
AHRQ

Overview: The National Resource Center for Academic Detailing supports initiatives to establish or improve programs of academic detailing, an innovative approach to medical outreach education to improve evidence-based care and patient outcomes. We are working with local, state, and federal groups on needs assessment, program development and implementation, and evaluation.

The Role of Academic Detailing in Healthcare Improvement

Principal Investigator:
Michael Fischer, M.D.

Source of Support:
AHRQ

Overview: This grant supports an annual conference series featuring leaders in healthcare quality improvement and clinician education both nationally and internationally, as well as interactive sessions on best practices in academic detailing.

Evaluation of Electronic Prior Authorization for Prescription Medications

Principal Investigator:
Michael Fischer, M.D.

Source of Support:
Surescripts

Overview: This research study evaluates the impact of a new clinician-directed intervention embedded in electronic health records that identifies the time of prescribing medications requiring authorization from the insurer, and enables clinicians to provide the needed information in real-time. Results will demonstrate the impact of this new technology on office processes and medication adherence by patients.

Adherence to Recommended Treatments - A Program of Interdisciplinary Research

Principal Investigator:
Niteesh K. Choudhry, M.D., Ph.D.

Source of Support:
CVS Caremark

Overview: This program brings together health services researchers, epidemiologists, social scientists, and other faculty from multiple Harvard schools and departments to define the factors associated with patient non-adherence to prescribed medications, and to develop interventions to improve adherence.
Selected sample of research projects (continued):

Cost-effectiveness of Novel Interferon-free Regimens for Treatment of Hepatitis C (HCV)

*Principal Investigators:*  
Niteesh K. Choudhry, M.D., Ph.D., and Mehdi Najafzadeh, Ph.D.

*Source of Support:*  
CVS Caremark

*Overview:* The approval of novel drugs for chronic hepatitis C infection is having a substantial effect on the treatment of these patients. These new drugs, although expensive, have high efficacy, can significantly shorten treatment duration, and do not require concomitant interferon therapy. This study uses a patient-level simulation model to define the cost-effectiveness of these new treatments versus current care for treatment of HCV.

Linking Randomized Clinical Trials and Claims Data: Opportunities and Feasibility

*Principal Investigators:*  
Mehdi Najafzadeh, Ph.D., and Joshua J. Gagne, Pharm.D., Sc.D.

*Source of Support:*  
Novartis

*Overview:* This project is performing foundational work to support development of the methodological capacity to link randomized trial and claims data, in order to bridge randomized and observational studies. The goals of the study are to demonstrate the feasibility of linking trial data with healthcare utilization data and to perform key analyses to assess the utility of such linkage.

Prescribers’ Participation in an Accountable Care Organization and its Impact on Patients’ Adherence to Medications

*Principal Investigator:*  
Mehdi Najafzadeh, Ph.D.

*Source of Support:*  
President and Fellows of Harvard College

*Overview:* This research is assessing whether prescriber participation in an Accountable Care Organization impacts their patients’ adherence to medications.

The Optimal Design of Prescription Drug Insurance Programs to Maximize Medication Adherence

*Principal Investigator:*  
Niteesh K. Choudhry, M.D., Ph.D.

*Source of Support:*  
Robert Wood Johnson Foundation

*Overview:* This study compares the impact of different methods of designing prescription drug programs for coverage of evidence-based medications. Using hundreds of copayment changes introduced for millions of patients, the study applies quasi-experimental time-series methods to measure how different policies impact medication adherence.

Eliciting Patients’ Preferences for Risk and Benefits of Anticoagulant Therapy Using Discrete Choice Experiments

*Principal Investigator:*  
Mehdi Najafzadeh, Ph.D.

*Source of Support:*  
Division Funds

*Overview:* This is a cross-sectional survey using discrete choice experiment methodology to assess patient preferences concerning the benefits and risks of different anticoagulants.
Eliciting Patients’ Preferences for Benefits and Risks of Lipid Lowering Drugs Using Discrete Choice Experiments
Principal Investigator:
Mehdi Najafzadeh, Ph.D.

Source of Support:
Division Funds

Overview: This is a cross-sectional survey using discrete choice experiment methodology to assess patient preferences concerning the benefits and risks of lipid-lowering drugs with particular emphasis on statins and PCSK9 inhibitors.

Using simulation for Generalizing RCT Results to Routine Care Populations
Principal Investigator:
Mehdi Najafzadeh, Ph.D.

Source of Support:
Division Funds

Overview: This project aims to develop a novel approach to expand RCT results to external patient populations in the presence of heterogeneity of treatment effect, and to apply the approach in the context of comparing results from an RCT to results from observational studies.

Linking Randomized Clinical Trials and Claims Data for Enhancing Randomized and Non-Randomized Patient-Centered Outcomes Evidence Generation.
Principal Investigator:
Mehdi Najafzadeh, Ph.D.

Source of Support:
PCORI and Novartis Corporation

Overview: The overarching objective of this project is to develop and validate methods that can be employed to enrich randomized and non-randomized comparative effectiveness and patient-centered outcomes research studies by linking data from an RCT for a novel treatment for heart failure to insurance claims data.

The Cost-effectiveness of OBI-1 for Treatment of Acquired Hemophilia A: Analysis of Clinical Trial and Related Data
Principal Investigator:
Mehdi Najafzadeh, Ph.D.

Source of Support:
Baxalta

Overview: This project aims to compare the clinical and economic value of Antihemophilic Factor (Recombinant), Porcine Sequence (Obizur) with rFVIIa for treatment of acute hemorrhagic episodes in patients with acquired hemophilia A.

Analyzing Complex Healthcare Data to Determine Causality of Observed Drug Effects
Principal Investigator:
Sebastian Schneeweiss, M.D., Sc.D.

Source of Support:
National Library of Medicine

Overview: Studying the safety and effectiveness of medications in longitudinal electronic medical records databases is challenging, and confounding by indication is a major threat to validity. This project is developing and testing algorithms to empirically identify large numbers of confounders in claims databases with and without supplemental data from laboratory data and natural language information from electronic medical records.

Risk of High-grade Cervical Dysplasia and Cervical Cancer in Women with Systemic Inflammatory Diseases
Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
NIAMS

Overview: This project examined the risk of high-grade cervical dysplasia and cervical cancer in women taking medications for the treatment of rheumatoid arthritis, lupus, psoriasis, and inflammatory bowel disease.
Selected sample of research projects (continued):

**Multinational Observational Study to Assess Insulin Use: The MOSAIC Study**

*Principal Investigator:*
Seoyoung C. Kim, M.D., Sc.D.

*Source of Support:*
Eli Lilly & Co.

*Overview:* The goal of the study is to identify patient-, physician-, and health system-related factors that influence insulin use, glycemic control, and health outcomes in patients with Type 2 diabetes in 18 countries.

**Second-Line Osteoporosis Treatment**

*Principal Investigator:*
Daniel Solomon, M.D.

*Source of Support:*
Amgen

*Overview:* This study describes patterns of osteoporosis medication prescribing and the correlates of switching treatments.

**Assessment of Treatment Effects in High-dimensional, Routine Care Claims Data**

*Principal Investigator:*
Sebastian Schneeweiss, M.D., Sc.D.

*Source of Support:*
NHLBI

*Overview:* This study compares three novel methodologies to overcome common limitations in adjustment for confounding in observational studies using large healthcare utilization datasets. Using example studies and simulations, we are investigating the performance of propensity-score calibration, high-dimensional propensity-score adjustment, and instrumental variable analysis.

**Disparities in DMARD Treatment for Rheumatoid Arthritis**

*Principal Investigator:*
Daniel Solomon, M.D.

*Source of Support:*
NIAMS

*Overview:* This study analyzes differences in use of disease-modifying anti-rheumatic drugs (DMARDs) across a variety of patient groups in several different large-population data sources. The investigators are developing a pilot study to improve appropriate use of DMARD in community health centers.

**Use and Comparative Safety of Opioids and Other Pain Medications During Pregnancy**

*Principal Investigators:*
Brian Bateman, M.D., and Krista Huybrechts, Ph.D.

*Source of Support:*
Division Funds

*Overview:* This project evaluates the comparative safety of the pain-management strategies most commonly used in pregnant women. Findings will inform the question of which specific pain medication to recommend for women of childbearing age and for women at different gestational stages, and will contribute to optimizing the risk/benefit profile of pain medications during pregnancy.

**Optimizing the Safety of Analgesic Use Among Patients with Arthritis**

*Principal Investigator:*
Daniel Solomon, M.D.

*Source of Support:*
AHRQ

*Overview:* This project estimates the rates, relative risks, and risk differences of important adverse events seen with use of common analgesics in patients with osteoarthritis and rheumatoid arthritis. Adverse events studied include cardiovascular, gastrointestinal, renal, and hepatic outcomes, as well as falls and fractures.
Confounding by Health System Characteristics in Comparative Effectiveness Research
Principal Investigator:
Jessica Franklin, Ph.D.

Source of Support:
Merck Sharp & Dohme

Overview: This project investigates how healthcare-system characteristics are associated with variation in the provision of care and how this variation can be accounted for in comparative effectiveness studies of medications.

Secular Trends and Sequential Patterns of DMARD Use and Adherence to DMARDs in Rheumatoid Arthritis
Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Source of Support:
Pfizer

Overview: This study examines time trends and sequential patterns of disease-modifying antirheumatic drug (DMARD) use in patients with rheumatoid arthritis (RA) and evaluates patients’ adherence to DMARD and associated factors.

Towards Understanding the Potential Effects of Selective Uric Acid Reabsorption Inhibitors on Cardiometabolic Risk, Phase I: Serum Uric Acid Levels and Cardiometabolic Risk
Principal Investigator:
Seoyoung C. Kim, M.D., Sc.D.

Co-Principal Investigator:
Daniel Solomon, M.D.

Source of Support:
AstraZeneca

Overview: This is a cross-sectional study to determine the association between uric acid levels and systemic inflammation, insulin resistance, subclinical urate deposits, and coronary vascular function in a cross-sectional analysis.

Assessing the Post-marketing Safety of Authorized Generic Drug Products
Principal Investigator:
Joshua J. Gagne, Pharm.D., Sc.D.

Source of Support:
FDA Office of Generic Drugs

Overview: This study considers authorized generics as a tool to examine the extent to which negative perceptions of generic drugs affect acceptance and use of these treatments.

Adherence Prediction Algorithms to Explain Treatment Heterogeneity and Guide Adherence Improvement
Principal Investigator:
Joshua J. Gagne, Pharm.D., Sc.D.

Source of Support:
PCORI

Overview: This three-year project develops and compares algorithms for predicting patient adherence with prescribed medication regimens, and assesses whether predicted adherence explains the heterogeneity of treatment effects seen in patient-centered outcomes research studies.

Optimizing Treatment Combinations in Individuals with Multiple Chronic Conditions
Principal Investigator:
Joshua J. Gagne, Pharm.D., Sc.D.

Source of Support:
AHRQ

Overview: Depression commonly occurs in patients with other chronic conditions, and certain antidepressant drugs can interact with medications used to treat those conditions, potentially reducing the effectiveness of treatment or increasing the risk of side effects. This project will generate evidence about optimal treatment decisions for patients with multiple chronic conditions and depression.
Selected sample of research projects (continued):

**Improvements to PROMPT 2 Modular Codes and Documentation**

*Principal Investigator:* Joshua J. Gagne, Pharm.D., Sc.D.

*Source of Support:* FDA

*Overview:* The project implements several key enhancements to the FDA’s Sentinel Prospective Routine Observational Monitoring Program Tool’s (PROMPT) Cohort Matching module we previously developed.

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**Novel Approaches for Confounding Control in Observational Studies of Generic Drugs**

*Principal Investigator:* Rishi J. Desai, Ph.D.

*Co-Principal Investigator:* Joshua J. Gagne, Pharm.D., Sc.D.

*Source of Support:* FDA

*Overview:* Generic drugs account for approximately 86% of all prescriptions dispensed in the U.S. They are approved on the basis of bioequivalence with their brand-name counterparts and there is no formal requirement for post-marketing surveillance. However, the need for post-marketing surveillance of generics to ensure patient safety is highlighted by reports of suboptimal performance of certain generics. This research seeks to improve the methodology of post-marketing studies using data collected as a part of patients’ routine healthcare to address confounding, and to define how best to generate valid inferences from these data.

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**Disease Risk Score Methods Development Workgroup**

*Principal Investigator:* Rishi J. Desai, Ph.D.

*Source of Support:* FDA

*Overview:* The objective of this effort is to design and implement hybrid empirical/simulated experiments to compare the performance of methods for (1) disease risk score (DRS) development; and (2) incorporating DRSs for multiple outcomes into the analysis to improve inference. The team will evaluate different approaches for developing DRSs and use a novel “dry run” analysis approach to compare multiple analytic methods. The project will compare bias and mean square error resulting from (1) DRS models developed using “as-treated” and “intention-to-treat” follow-up approaches in a historical group of patients treated with a comparator treatment of interest; and (2) approaches that incorporate DRSs for multiple outcome simultaneously, including Mahalanobis distance, prognostic propensity scores, and simultaneous stratification.

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**Evaluating the Role of Healthcare System Characteristics Based Instrumental Variables for Confounding Control in Observational Studies**

*Principal Investigator:* Rishi J. Desai, Ph.D.

*Co-Principal investigator:* Jessica Franklin, Ph.D.

*Source of Support:* Merck

*Overview:* Instrumental variable (IV) analysis technique has been used for decades in various applied research fields including econometrics and epidemiology to evaluate causal questions from observational data. Using an empirical example of the association between osteoporosis medication use and the risk of osteoporotic fractures compared to no use, this study aims to identify and test the validity of potential IVs based on healthcare system characteristics.
### TreeScan with Propensity Scores
**Principal Investigator:** Shirley Wang, Ph.D.

**Source of Support:** FDA

**Overview:** This project investigates the performance of incorporating signal detection through application of TreeScan as part of a semi-automated program previously developed by Drs. Gagne, Wang, and Schneeweiss to prospectively assess the safety of newly marketed medical products using the FDA’s Sentinel Distributed Database. TreeScan simultaneously evaluates thousands of potential adverse events while controlling for multiple testing.

### Optimal Propensity Score Matching Strategies for Subgroup Analyses
**Principal Investigator:** Shirley Wang, Ph.D.

**Source of Support:** FDA

**Overview:** This project investigates the performance of alternative methods which use the propensity score to match for subgroup analysis through plasmode simulation. The best performing method will be incorporated into a new release of a semi-automated program previously developed by Drs. Gagne, Wang, and Schneeweiss to prospectively assess the safety of newly marketed medical products using the FDA’s Sentinel Distributed Database.

### Screening for Drugs with Potential to Treat and Prevent Progression of Glaucoma
**Principal Investigator:** Shirley Wang, Ph.D.

**Source of Support:** Novartis

**Overview:** This project uses TreeScan Sequence symmetry analysis and other to screen for drugs that may have the potential to prevent progression of glaucoma.

### Development and Validation of a Frailty Index Using Claims Data for Pharmacoepidemiology Studies in Older Adults
**Principal Investigator:** Dae Kim, M.D., Sc.D.

**Source of Support:** NIA, American Federation For Aging Research, The John A Hartford Foundation, and The Atlantic Philanthropy

**Overview:** This project aims to develop and validate a frailty score from Medicare claims data for confounding adjustment and evaluation of treatment effect heterogeneity caused by frailty in pharmacoepidemiologic studies of drugs used by older adults.

### Development and Validation of a Laboratory Test Based Prognostic Score in Electronic Health Records
**Principal Investigator:** Dae Kim, M.D., Sc.D.

**Source of Support:** Division funds

**Overview:** This project aims to develop and validate a mortality prediction score using routinely performed laboratory tests in the Partners Research Patient Data Repository.
Selected sample of research projects (continued):

**Epidemiology and Risk of Antipsychotic Use in Hospitalized Elderly With Delirium**

*Principal investigator:*
Dae Kim, M.D., Sc.D.

*Source of support:*
Division funds

*Overview:*
This project is studying the epidemiology and risk of adverse events associated with off-label antipsychotic drug use in hospitalized older adults after major surgery.

**Clinical Outcomes of Dexmedetomidine Versus Propofol in Hospitalized Patients Undergoing Cardiac Surgery**

*Principal investigator:*
Dae Kim, M.D., Sc.D.

*Source of support:*
Division funds

*Overview:*
This project will compare dexmedetomidine and propofol with regard to the risk of adverse events and antipsychotic use in hospitalized older adults after cardiac surgery.

**Geographic Variation in the Price of Retail and Discounted Prescription Drugs**

*Principal Investigator:*
Jing Luo, M.D.

*Source of Support:*
Division Funds

*Overview:*
This study seeks to describe national-level variation in the price of retail and discounted prescription drugs using data from Goodrx.com. It also will analyze the relationship between median household income of a ZIP code and prescription-drug prices.

**Medication Adherence and Utilization Among Family Members**

*Principal Investigator:*
Julie C. Lauffenburger, Pharm.D., Ph.D.

*Source of Support:*
Division Funds

*Overview:*
This study examines the ability to predict adherence among patients initiating essential medications by measuring adherence by immediate family members, and explores whether family members follow similar patterns of medication-filling behavior.
Future Directions

The division is extending its work in the following directions:

- Investigating the epidemiology of heart failure treatment and assessing the feasibility of an active monitoring system for a newly marketed heart failure drug (Drs. Gagne, Najafzadeh, Wang)
- Developing a novel method for using quantitative bias analysis to determine stopping rules in medical record validation studies (Dr. Gagne)
- Comparing analytic strategies in variable-ratio propensity-score matching (Drs. Gagne and Wang)
- Developing and testing novel adherence-improvement interventions with large, simple clinical trials conducted in health insurance and healthcare delivery systems (Drs. Choudhry and Lauffenburger)
- Assessing the impact of federal privacy law on the conduct of observational research (Drs. Sarpatwari, Gagne, Kesselheim, and Schneeweiss)
- Developing a dual-time-control method for addressing multiple sources of time-varying confounding in self-controlled case-crossover studies (Drs. Gagne and Wang)
- Studying the comparative effectiveness and safety of corticosteroids in cardiac surgery (Drs. Gagne, Schneeweiss, Choudhry, Avorn, Franklin, and Bateman)
- Developing software using self-controlled designs with the option for exposure-time trend adjustments, as used for active surveillance of the safety and effectiveness of newly marketed medical products in a distributed-data network (Drs. Wang, Gagne, and Schneeweiss)
- Evaluating the safety and effectiveness of medications commonly used in the perioperative period (Drs. Bateman, Patorno, and Avorn)
- Evaluating the impact of the choice of comparator drug and of population characteristics in comparative safety research of medications used in elderly patients (Drs. Glynn, Huybrechts, and Patorno)
- Using large-scale healthcare utilization data to identify aberrant use of prescription opioid analgesics (Drs. Bateman, Choudhry, and Huybrechts)
- Analyzing the legal implications of “commercial free speech” arguments under the First Amendment in relation to pharmaceutical promotional practices (Drs. Kesselheim, Sarpatwari, and Avorn)
- Examining the comparative safety of immunosuppressive drugs and steroids in pregnant women with systemic inflammatory disease (Drs. S. Kim, Desai, and Solomon)
- Exploring the feasibility of pooling multiple national datasets from the United States and the Nordic countries to study rare in utero drug exposures and very rare outcomes (Drs. Huybrechts and Bateman)
- Evaluating the risk of new hypertension in patients with rheumatoid arthritis taking disease-modifying anti-rheumatic drugs (Drs. S. Kim and Solomon)
- Determining optimal assessment periods and the use of alternative referent groups to reduce information bias in comparative effectiveness research (Dr. Glynn)
- Assessing the risk of Type 2 diabetes in patients with gout-taking urate-lowering therapy versus anti-inflammatory drugs (Drs. S. Kim, Schneeweiss, Solomon, and Glynn)
• Exploring the use of electronic medical records and natural language processing analysis to capture mental health outcomes and to improve confounding control in comparative safety and effectiveness research in mental health (Drs. Huybrechts, Schneeweiss, and Avorn)

• Developing and validating innovative methods for estimating individual-level heterogeneity of treatment effects for observational comparative effectiveness research (Drs. Wang, Franklin, Gagne, and Schneeweiss)

• Leveraging health information technology (HIT) tools for clinical decision support, enhancing coordination of care, and dissemination of personalized evidence on safety and effectiveness to physicians and their patients (Drs. Wang, Schneeweiss, and Fischer)

• Refining methodological approaches to comparative effectiveness research to evaluate the benefits and risks of commonly used medications in routine care (Drs. Franklin, Schneeweiss, Glynn, and Avorn)

• Exploring the interface between biostatistics, epidemiology, decision science, policy decisions, and clinical practice in responding to early signals of adverse drug events (Drs. Avorn, Gagne, and Schneeweiss)

• Evaluating the capacity of high-dimensional data models to predict hospital readmission using linked electronic health records and insurance claims (Drs. Schneeweiss and Franklin)

• Evaluating the cost-effectiveness of new treatment strategies and care-delivery models for the treatment of common chronic diseases (Drs. Choudhry, Najafzadeh, and Avorn)

• Performing safety assessments of diabetes medications using a distributed-data network drawing on U.S. and European data sources (Drs. Seeger and Schneeweiss)

• Using natural language processing to adjust for confounding in studies based on electronic medical records (Dr. Schneeweiss)

• Developing a program in computational pharmacoepidemiology to explore advanced, high-performance algorithms for confounding control and other challenges in non-randomized research (Dr. Schneeweiss)

• Defining the relationship between the Orphan Drug Act and the development, approval, and cost of drugs for rare diseases (Drs. Kesselheim, Sarpatwari, and Avorn)

• Applying advanced quantitative methods to problems in risk-assessment and cost-effectiveness analysis, including propensity scores, multivariable co-morbidity scores, and instrumental variable techniques (Drs. Glynn and Schneeweiss)

• Comparing the risks of specific antipsychotic medications in hospitalized patients (Drs. Bateman and Huybrechts)

• Exploring the use of a scanning-based approach to identify the etiologically relevant time window for drug exposure during pregnancy and the risk of negative outcomes (Drs. Huybrechts and Kulldorff)

• International comparison of the use of and adherence to antipsychotic medications in patients with schizophrenia (Drs. Patorno and Huybrechts)

• International comparison of the use of clozapine (Drs. Huybrechts and Patorno)

• Expanding the activities of the National Resource Center for Academic Detailing to work with multiple healthcare organizations to improve healthcare quality and clinical outcomes (Drs. Fischer, Avorn, and Choudhry)

• Refining an intensive high-dimensional propensity-score methodology to address confounding in very large pooled population-based datasets of medication use and outcomes (Drs. Schneeweiss, Franklin, and Gagne)
- Developing and evaluating improvements to marginal structural model methodology to adjust for time-varying confounding in comparative effectiveness research (Drs. Franklin, Glynn, and Schneeweiss)

- Undertaking formal, prospective analyses of the clinical and economic impact of large-scale policy changes on medication use and clinical outcomes (Drs. Kesselheim, Fischer, Sarpawari, and Avorn)

- Implementing and evaluating population-wide controlled trials to improve the use of medications by physicians and patients and the effect of such interventions on clinical outcomes, cost, and productivity (Drs. Choudhry, Avorn, Lauffenburger, and Fischer)

- Quantifying the relationship between medication adherence, health outcomes, and spending (Drs. Choudhry and Glynn)

- Comparing methods for automated confounder selection in comparative effectiveness and safety studies in secondary healthcare databases (Drs. Franklin, Glynn, and Schneeweiss)

- Working with large employers and health insurers to help rationalize their medication benefit plans to enhance access to preventive medications in high-risk patients, and then measuring changes in rates of key clinical outcomes such as myocardial infarction (Dr. Choudhry)

- Analyzing the effects of computer-guided prescribing on physicians’ drug choices and patient outcomes in the outpatient setting (Dr. Fischer)

- Assessing the cost-effectiveness, comparative effectiveness, perceptions, and utilization of follow-on biologics (Drs. Sarpawari, Kesselheim, Gagne, and Avorn)

- Linking randomized clinical trials and claims data for enhancing the generation of evidence on patient-centered outcomes (Drs. Najafzadeh, Gagne, and Schneeweiss)

- Using microsimulations for facilitating between-study comparisons in the presence of heterogeneity of treatment effects (Drs. Najafzadeh and Gagne)

- Assessing the extent and variation of price increases for brand-name and generic drugs (Drs. Kesselheim and Sarpawari)

- Evaluating cardiovascular risk of treatment with biologic or non-biologic disease-modifying agents in patients with inflammatory bowel disease (Drs. Desai and S. Kim)

- Developing a framework for understanding treatment effectiveness in older adults for new drugs shortly after market entry (Drs. Wang, Franklin, S. Kim, Glynn, and Schneeweiss)

- Evaluating transparency and reproducibility of database studies (Drs. Wang and Schneeweiss)

- Barriers to generic substitution among special populations (Drs. Luo and Fischer)

- Additive versus multiplicative survival models in investigation of heterogeneity (Drs. Wang and Franklin)

- Evaluation of interactions in vaccine schedules (Drs. Wang and Kulldorff)

- Investigating the feasibility and robustness of point of care evidence based on electronic health records (Drs. Wang and Schneeweiss)

- Evaluating the reproducibility, replicability and robustness of adherence studies conducted in large healthcare databases (Dr. Wang)

- Specific reporting requirements for reproducible healthcare database analyses (Drs. Wang and Schneeweiss)
<table>
<thead>
<tr>
<th>FACULTY ROSTER</th>
<th>SELECT MAJOR FACULTY ACCOMPLISHMENTS</th>
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</thead>
<tbody>
<tr>
<td><strong>Professor</strong></td>
<td><strong>Jerry Avorn, M.D.</strong></td>
</tr>
<tr>
<td>Jerry Avorn, M.D.</td>
<td>Member, Regulatory Sciences Advisory Group, HMS</td>
</tr>
<tr>
<td>Niteesh K. Choudhry, M.D., Ph.D.</td>
<td>“Most Highly Cited Researchers” (top 1% of cited papers in epidemiology and medicine), Thomson Reuters</td>
</tr>
<tr>
<td>Robert H. Glynn, Ph.D., Sc.D.</td>
<td>Plenary speaker, International Society for Pharmacoeconomics and Outcomes Research</td>
</tr>
<tr>
<td>Martin Kulldorff, Ph.D.</td>
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<tr>
<td>Sebastian Schneeweiss, M.D., Sc.D.</td>
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<tr>
<td>Daniel H. Solomon, M.D.</td>
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<tr>
<td><strong>Associate Professor</strong></td>
<td><strong>Brian Bateman, M.D.</strong></td>
</tr>
<tr>
<td>Michael Fischer, M.D.</td>
<td>Member, Clinical Trials Study Section, NHLBI</td>
</tr>
<tr>
<td>Aaron S. Kesselheim, M.D., J.D.</td>
<td>Associate Editor, Anesthesiology</td>
</tr>
<tr>
<td><strong>Assistant Professor</strong></td>
<td><strong>Niteesh Choudhry, M.D., Ph.D.</strong></td>
</tr>
<tr>
<td>Brian Bateman, M.D.</td>
<td>Member, Advisory Committee, Anesthetic and Analgesic Drug Products, FDA</td>
</tr>
<tr>
<td>Jessica Franklin, Ph.D.</td>
<td>Member, Maternal Quality Improvement Program (MQIP) Advisory Committee, American College of Obstetrics and Gynecology and American Society of Anesthesiology</td>
</tr>
<tr>
<td>Krista Huybrechts, Ph.D.</td>
<td></td>
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<tr>
<td>Dae H. Kim, M.D., Sc.D.</td>
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<tr>
<td>Seoyoung C. Kim, M.D., Sc.D.</td>
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<tr>
<td>John Seeger, Pharm.D., Dr.P.H.</td>
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<tr>
<td>Shirley Wang, Ph.D.</td>
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<tr>
<td><strong>Instructor</strong></td>
<td><strong>Ameet Sarpatwari, J.D., Ph.D.</strong></td>
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<tr>
<td>Rishi J. Desai, Ph.D.</td>
<td></td>
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<tr>
<td>Julie C. Lauffenburger, Pharm.D., Ph.D.</td>
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<tr>
<td>Mehdi Najafzadeh, Ph.D.</td>
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<tr>
<td>Elisabetta Patorno, M.D., Dr.P.H.</td>
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<tr>
<td>Ameet Sarpatwari, J.D., Ph.D.</td>
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</tr>
</tbody>
</table>
### Select Major Faculty Accomplishments (continued)

<table>
<thead>
<tr>
<th>Michael Fischer, M.D.</th>
<th>Aaron S. Kesselheim, M.D., J.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Director, National Resource Center for Academic Detailing</td>
<td>• Research Leadership Award, BWH</td>
</tr>
<tr>
<td>• Member, Editorial Board, <em>Journal of General Internal Medicine</em></td>
<td>• Young Mentor Award, HMS</td>
</tr>
<tr>
<td>• Member, Healthcare System and Value Research Study Section, AHRQ</td>
<td>• Selected to the National Academy of Medicine Committee on Pain Management and Regulatory Strategies to Address Prescription Opioid Abuse</td>
</tr>
<tr>
<td>Jessica Franklin, Ph.D.</td>
<td>• Selected to the FDA Peripheral and Central Nervous System Advisory Committee</td>
</tr>
<tr>
<td>• Member, Editorial Board, <em>Journal of Computational and Graphical Statistics</em></td>
<td>• Visiting Associate Professor of Medicine, Yale Law School</td>
</tr>
<tr>
<td>• Member, Program Committee, Health Policy Statistics Section, Joint Statistical Meetings</td>
<td>• Visiting Scholar, Center for Drug Safety and Effectiveness, Bloomberg School of Public Health, Johns Hopkins University</td>
</tr>
<tr>
<td>Joshua J. Gagne, Pharm.D., Sc.D.</td>
<td>• Grand Rounds, Division of Cardiovascular Medicine, BWH</td>
</tr>
<tr>
<td>• Co-Lead, Methods Core of the FDA’s Sentinel System</td>
<td>• Grand Rounds, Survivorship Outcomes and Risk Seminar Series, Memorial Sloan Kettering Cancer Center</td>
</tr>
<tr>
<td>• Chair, Education Committee, International Society for Pharmacoepidemiology</td>
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<tr>
<td>• Recipient, Teaching Commendation, HSPH</td>
<td></td>
</tr>
<tr>
<td>• Recipient, Chair’s Research Award, DOM, BWH</td>
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<tr>
<td>Robert J. Glynn, Ph.D., Sc.D.</td>
<td></td>
</tr>
<tr>
<td>• Highly Cited Researcher, <em>Thomson Reuters</em></td>
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<tr>
<td>• Member, Arthritis and Musculoskeletal and Skin Diseases Clinical Trials Review Committee Study Section</td>
<td></td>
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<tr>
<td>• Member, Partners HealthCare IRB Panel A</td>
<td></td>
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<tr>
<td>Krista Huybrechts, Ph.D.</td>
<td></td>
</tr>
<tr>
<td>• Member, Scientific Program Committee, 32nd International Conference on Pharmacoepidemiology &amp; Therapeutic Risk Management</td>
<td></td>
</tr>
<tr>
<td>• Inducted, Fellow of the International Society for Pharmacoepidemiology</td>
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<tr>
<td>Dae H. Kim, M.D., Sc.D.</td>
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<tr>
<td>• Recipient, Beeson Career Development Award, NIA</td>
<td></td>
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<tr>
<td>• Recipient, Best Poster Award, 2016 American Geriatrics Society Annual Meeting</td>
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<tr>
<td>• Recipient, Chair’s Research Award, DOM, BWH</td>
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<tr>
<td>Seoyoung C. Kim, M.D., Sc.D.</td>
<td></td>
</tr>
<tr>
<td>• Associate Editor, <em>Arthritis Care &amp; Research</em></td>
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<tr>
<td>• Arthritis Advisory Committee, FDA</td>
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<tr>
<td>• Member, Classification and Response Criteria Committee, American College of Rheumatology</td>
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<tr>
<td>• Clinical Research Junior Faculty Representative, Research Oversight Committee, Brigham Research Institute, BWH</td>
<td></td>
</tr>
<tr>
<td>• Recipient, Early Career Mentoring Award, DOM, BWH</td>
<td></td>
</tr>
</tbody>
</table>
### SELECT MAJOR FACULTY ACCOMPLISHMENTS (continued)

<table>
<thead>
<tr>
<th>Martin Kulldorff, Ph.D.</th>
<th>Sebastian Schneeweiss, M.D., Sc.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Member, Scientific Advisory Board, ADVANCE – Accelerated Development of Vaccine Benefit-Risk Collaboration in Europe</td>
<td>• Member, Methodology Committee, Patient Centered Outcomes Research Institute</td>
</tr>
<tr>
<td>• Member, Promotions, Reappointments, and Appointments Committee, HMS</td>
<td>• Voting member, Drug Safety and Risk Management Advisory Committee, FDA</td>
</tr>
<tr>
<td>Julie Lauffenburger, Pharm.D., Ph.D.</td>
<td>• Member, National Death Index Advisory Board, CDC</td>
</tr>
<tr>
<td>• Presidential Scholarship Award for New Health Services Researchers, AcademyHealth</td>
<td>• Co-chair, Sentinel Program Methods Core, FDA</td>
</tr>
<tr>
<td>• Best Poster Award, International Society of Pharmacoepidemiology</td>
<td>• IMI GetReal Advisory Board, European Medicines Agency</td>
</tr>
<tr>
<td>Jing Luo, M.D.</td>
<td>John D. Seeger, Pharm.D., Dr.P.H.</td>
</tr>
<tr>
<td>• Keynote speaker, Harvard Health Policy Review, Spring Meeting</td>
<td>• President, International Society for Pharmacoepidemiology</td>
</tr>
<tr>
<td>Elisabetta Patorno, M.D., Dr.P.H.</td>
<td>Daniel Solomon, M.D.</td>
</tr>
<tr>
<td>• Associate course director, Effectiveness Research with Longitudinal Healthcare Databases. Summer School on Modern Methods on Biostatistics and Epidemiology, Italy</td>
<td>• Co-director, Center for Patient-centered Comparative Effectiveness Research, Brigham Research Institute, BWH</td>
</tr>
<tr>
<td>Ameet Sarpatwari, J.D., Ph.D.</td>
<td>• Member, Neurologic Aging and Musculoskeletal Epidemiology Study Section, NIH-CSR</td>
</tr>
<tr>
<td>• Consultant, National Academy for State Health Policy</td>
<td>• Chair, Conference on Comparative Effectiveness, American College of Rheumatology</td>
</tr>
<tr>
<td>• Instructor, Department of Health Policy and Management, HSPH</td>
<td>• Co-editor, <em>Arthritis &amp; Rheumatism</em></td>
</tr>
<tr>
<td>• Panelist, FDA conference on Risk Evaluation and Mitigation Strategies</td>
<td>Shirley Wang, Ph.D.</td>
</tr>
<tr>
<td>• Speaker, American College of Cardiology Organized Systems of Anticoagulation Care Summit</td>
<td>• Member, National Academy of Medicine Leadership Consortium for a Value &amp; Science-Driven Health System Workgroup, Methods Core, FDA Sentinel Program</td>
</tr>
<tr>
<td>• Speaker, Massachusetts Medical Society, Ethics Forum</td>
<td>• Recipient, Chair’s Research Award, DOM, BWH</td>
</tr>
<tr>
<td>• Grand Rounds, Emerson Hospital</td>
<td>• Recipient, Career Development Award, AHRQ</td>
</tr>
<tr>
<td>• Testimony before Massachusetts and Vermont General Assemblies</td>
<td>• Recipient, Stanley A. Edlavitch Award – Best Abstract, International Conference for Pharmacoepidemiology and Therapeutic Risk Management</td>
</tr>
<tr>
<td></td>
<td>• Recipient, Reuel A. Stallones Student Prize Paper, Society for Epidemiologic Research</td>
</tr>
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</table>