U.S. FOOD & DRUG ADMINISTRATION

Center for Drug Evaluation and Research

Office of Translational Sciences

2025 Annual Report

Contents

From the Director

Welcome to the 2025 Annual Report of the Office of Translational Sciences (OTS). Despite the many challenges we faced over the past year, I am proud to showcase the dedication, resilience, and impactful work of our office.

OTS is powered by a multidisciplinary team of collaborative and experienced professionals who advance our mission and vision through four suboffices and the Immediate Office. Together, we continued to deliver on our core responsibilities, which include:

- Promoting scientific collaboration and innovation in drug regulatory review across the Center for Drug Evaluation and Research (CDER).
- Assuring the validity of clinical trial design and analysis in regulatory decision-making.
- Developing and applying quantitative and statistical approaches to support regulatory review.
- Overseeing bioavailability, bioequivalence, and nonclinical inspections to help ensure that safe and effective new and generic drugs are available.
- Aligning CDER's research with the Center's strategic goals.
- Facilitating the establishment of technology transfer agreements to strengthen collaboration with the broader scientific community.
- Maintaining knowledge management databases to enhance the regulatory review process.

Throughout the year, we continued to explore emerging technologies and implement those that meet the evolving needs of our staff. We also communicated our progress and outcomes through publications, forums, and other collaborative platforms—keeping the scientific community and stakeholders informed, even amid operational and scientific hurdles.

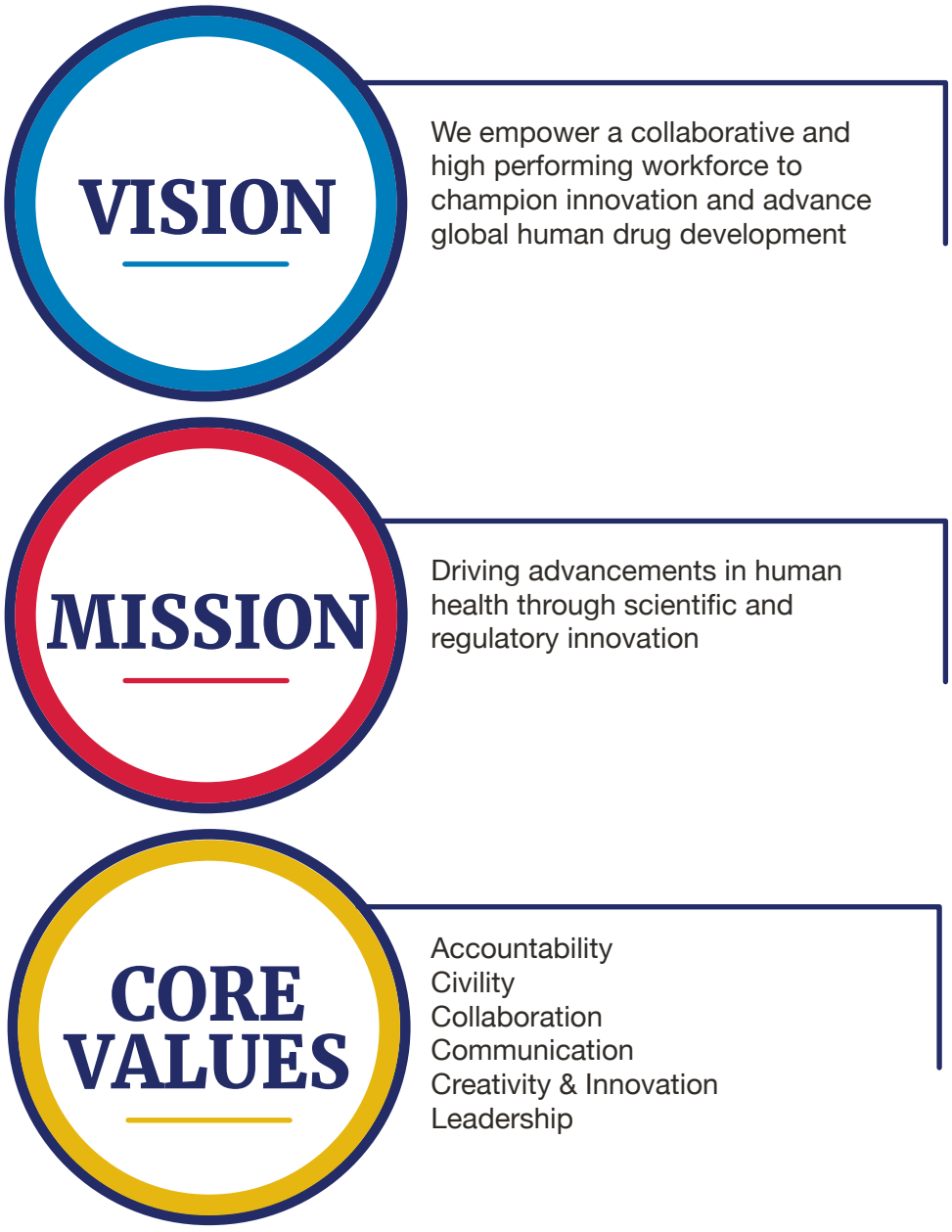
This report highlights the office's significant accomplishments during 2025. These achievements reflect our unwavering commitment to advancing human health through scientific and regulatory innovation.

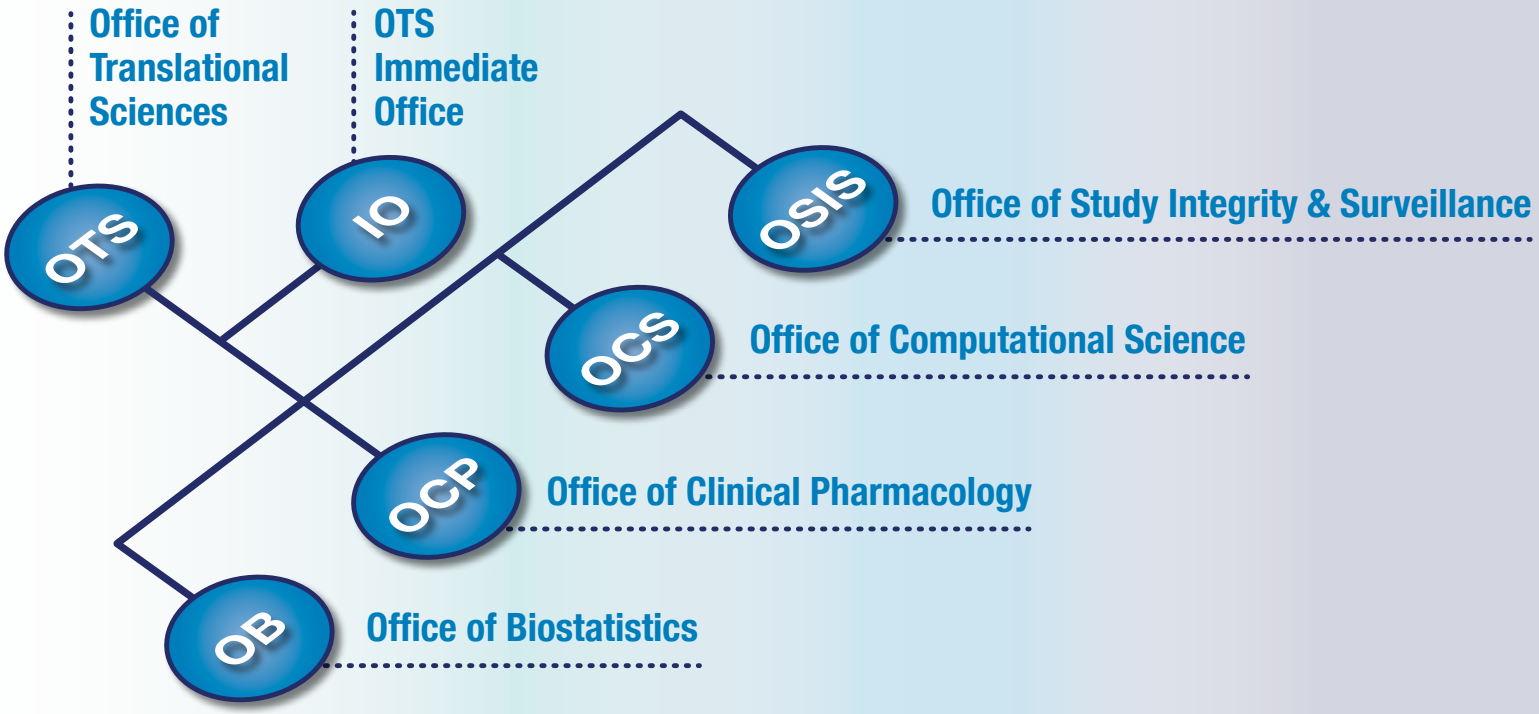
ShaAvhrée Buckman-Garner
MD, PhD
Director

Core Functions of OTS

The Office of Translational Sciences (OTS) supports the mission of the U.S. Food and Drug Administration (FDA) through multiple efforts that directly contribute to drug evaluation and advance medical product science throughout the product life cycle. We perform core regulatory review efforts and applied regulatory research, facilitate scientific collaborations, and manage intramural and extramural research programs. We engage directly with government and nongovernment entities to develop methods, approaches, tools, and standards to streamline drug development. In addition, OTS helps other offices in the Center for Drug Evaluation and Research (CDER) develop collaborations with non-FDA researchers to stimulate innovation in the development, manufacture, and safe use of drugs.

OTS is guided by its vision, mission, and core values:





OTS Organizational Chart

The **Office of Biostatistics (OB)** promotes innovative, science-based, quantitative decision-making throughout the drug development life cycle. OB supports CDER's mission by providing statistical leadership, expertise, and advice to ensure that safe and effective drugs are available to the American people.

The **Office of Clinical Pharmacology (OCP)** advances the development of innovative new medicines by applying state-of-the-art regulatory science and clinical pharmacology principles. OCP promotes therapeutic optimization and individualization through best practices in research, policy development, and drug evaluation throughout the product life cycle.1

The **Office of Computational Science (OCS**) delivers innovative, reliable solutions to improve and strengthen the scientific review process by integrating data, tools, and training.

The **Office of Study Integrity and Surveillance (OSIS)** ensures that data supporting regulatory decisions are reliable by conducting and directing inspections of bioavailability/bioequivalence and nonclinical good laboratory practice studies submitted to FDA.

The **Immediate Office (IO)** coordinates support for CDER and the suboffices in OTS. This support includes, but is not limited to, business transformation strategy; data analytics and technology assistance; guidance, policy, and communications; health information technology; knowledge management; strategic partnerships and technology transfer; science and research oversight; scientific collaborations; and professional development.

[1] To learn more about OCP, please visit its website: https://www.fda.gov/about-fda/cder-offices-and-divisions/office-clinical-pharmacology.

OTS Senior Leadership

ShaAvhrée Buckman-Garner
MD, PhD
Director

Mitra Ahadpour
MD, DABAM
Principal Deputy Director

Chekesha Clingman-Henry
PhD, MBA
Deputy Director for Science

Mark Levenson[2]
PhD
Acting Director, OB

Rebecca Chiu
PhD
Acting Deputy Director, OB

Issam Zineh
PharmD, MPH, FCCP
Director, OCP

Shiew-Mei Huang[3]
PhD
Deputy Director, OCP

ShaAvhrée Buckman-Garner
MD, PhD
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Sean Kassim
PhD
Director, OSIS

Brian Folian
JD, MS
Deputy Director, OSIS

Mary Doi
MD, MS
Associate Director for Knowledge Management

Elizabeth Ford
RN
Associate Director for Regulatory Affairs

Kylie Haskins
PhD
Associate Director for Communications

Nisha Bruce
Special Assistant for Strategic Innovation

[2] Dr. Levenson became the OB Director in January 2026.
[3] Dr. Huang retired from her position on December 31, 2025.

Drug Regulatory Review

The Office of Translational Sciences (OTS) supports drug regulatory review as part of a multidisciplinary team approach. The office completed over 10,000 regulatory reviews of drugs across four application types: Investigational New Drug Applications, New Drug Applications, Biologics License Applications, and Abbreviated New Drug Applications. These comprehensive reviews encompassed the evaluation of new molecular entities, new safety information, and the expansion of indicated uses for drugs already marketed in the United States. Approved treatment options included new clinical indications, patient populations, and dosing regimens.

- Conducted drug regulatory reviews through a multidisciplinary team, contributing to the approval of 46 new drugs for use by patients. These reviews addressed issues of dose selection and optimization, therapeutic individualization, and benefit-risk balance. Examples follow:
  - Reviewed multiple applications for rare disease drug approvals, including dordaviprone as the first systemic therapy for K27M-mutant diffuse midline glioma, nitisinone for the reduction of urine homogentisic acid in adult patients with alkaptonuria, and sepiapterin for the treatment of hyperphenylalaninemia in adults and pediatric patients (1 month of age and older) with sepiapterin-responsive phenylketonuria.
  - Facilitated the expanded indication for three amyloid-beta positron emission tomography imaging drugs.
  - Evaluated semaglutide for cardiovascular death, heart attack, and stroke in adults with cardiovascular disease and who have obesity or are overweight.
  - Supported the first approval for non-cystic fibrosis bronchiectasis with brensocatib.
  - Presented at numerous advisory committees, including in discussions on opioid post-marketing safety studies and treatment for post-traumatic stress disorder.
- Coordinated with review staff in the Center for Drug Evaluation and Research (CDER) Office of Pharmaceutical Quality to develop, validate, and deliver training to reviewers on the use of a tool for implementing the Carcinogenic Potency Categorization Approach model to determine acceptable intake limits for nitrosamine impurities. This tool allows Office of Pharmaceutical Quality staff to directly conduct these assessments without the need for an internal expert consultation, thereby enhancing review efficiency while conducting these safety assessments. The tool supported over 100 reviews in 2025.

- Received 21 initial meeting requests through the first four submission cycles in the Advancing Real-World Evidence Program. Of the 21 requests sponsors made during the first four submission cycles, the U.S. Food and Drug Administration (FDA) accepted four, with one sponsor completing their participation in the program. Participation in this program allowed for enhanced communication and application of the principles put forth in the FDA guidance related to real-world data and real-world evidence. The program focuses on studies that directly support labeling for effectiveness or meet post-approval requirements.
- Led the FDA Complex Innovative Trial Design Meeting Program. The program supports the goal of facilitating and advancing the use of complex adaptive, Bayesian, and other novel clinical trial designs. The program fulfills a performance goal under the Prescription Drug User Fee Act (PDUFA) for fiscal years 2023 to 2027 (PDUFA VII). In 2025, the program published a case study that examines an innovative Phase 3 alopecia areata trial design using external and synthetic control data. The case study details FDA's discussion of the design's advantages in patient treatment access and trial efficiency and considerations regarding valid inference, operating characteristics, and safety characterization.
- Led the FDA Model-Informed Drug Development Paired Meeting Program. The program advances and integrates the development and application of exposure-based, biological, and statistical models derived from preclinical and clinical data sources in drug development and regulatory review. The program integrates data from pharmacology, disease biology, and patient characteristics to address critical questions in drug development. The program fulfills a performance goal under PDUVA VII. In 2025, the program granted 9 meeting requests and conducted 7 meetings with sponsors.
- Led the CDER Quantitative Medicine Center of Excellence. The center facilitates and coordinates continuous evolution and consistent application of quantitative medicine approaches for drug development and regulatory decision-making across CDER. In 2025, the Quantitative Medicine Center of Excellence achieved the following key milestones: 1) completed and received CDER Director's endorsement of the strategic plan; 2) provided on-demand quantitative medicine support to the Translational Science Team on 1 investigational new drug application and 1 new drug application submissions; and 3) released a Progress and Priorities Update report describing CDER's efforts to lay a strong operational and scientific foundation and create conditions for sustained meaningful impact.
- Led the Critical Path Innovation Meeting (CPIM) Program. The program provides a mechanism for FDA and its external stakeholders to discuss novel approaches to advancing drug development in a non-binding, non-regulatory forum. The program managed eight meetings. The meetings addressed critical therapeutic areas including rare disease natural history studies, long COVID patient-reported outcomes, pediatric inflammatory bowel disease (IBD) development, developmental epileptic encephalopathies, machine learning pharmacokinetic modeling, STXBP1-related disorders, clinical trial readiness for ultra-rare disease, and a novel artificial intelligence (AI) tool for clinical trial enrichment. Notably, for the pediatric IBD meeting, the CPIM mechanism was utilized in a novel way that involved major drug developers engaging in a collective dialogue with FDA about the unique challenges associated with pediatric IBD drug development—and what relevant stakeholders can do to address those challenges.

  Previously held CPIMs achieved the following outcomes in 2025:

- The Hyperphagia Questionnaire for Clinical Trials Total Score, discussed during a 2018 CPIM, served as the primary efficacy endpoint in the clinical study that supported the approval in 2025 of Vykat XR, the first drug to treat hyperphagia in adult and pediatric patients with Prader-Willi Syndrome.
- A Qualification Plan for a composite biomarker panel that was used as a surrogate endpoint for allograft loss in kidney transplant patients was accepted in the FDA Biomarker Qualification Program in 2025. The Qualification Plan was discussed during a 2019 CPIM. The composite biomarker panel will allow clinicians to better identify and manage patients at higher risk of allograft loss within the first year after their transplants.

New Approach Methods

Aligned with FDA's Roadmap for Reducing Animal Testing, OTS evaluated new approach methods (NAMs) and advanced regulatory science research to improve drug safety and provide more effective models, while reducing animal testing. Before any NAM is used to assess safety, it is critical to establish the validity and reliability of the method. As these NAMs undergo development, validation, refinement, and adoption, they present an opportunity to do the following: reduce the number of animals used in testing; refine the methods still requiring animals, so they are less stressful to the animals; and replace animal testing whenever possible. OTS advanced NAMs through the following initiatives:

- Used microphysiological systems and human-induced, pluripotent stem cell-derived cardiomyocytes to study multiple organ systems and functions (including models for the heart, liver, lungs, neurological system, and lactation). This research supported multiple aspects of regulatory review. Findings from the heart,[4] lung, and neurological studies are published in peer-reviewed journals.
- Assessed the use of juvenile animal studies and showed that they directly resulted in a warning in the pediatric use section of the prescribing information in only 8.1% of products. The study results suggest that while juvenile animal studies are an important contribution to pediatric preclinical safety assessment, the exploration of NAMs may provide additional insight into pediatric developmental safety.
- Published a table containing contexts of use where CDER would be open to streamlined, nonclinical programs. The table was developed by the CDER NAMs Coordinating Committee, which functions to guide and support the development, validation, and adoption of innovative, human-relevant scientific approaches that reduce or replace animal testing. OTS was a key partner in establishing the committee, the goals of which are to promote collaboration, streamline implementation, and ensure regulatory alignment to advance ethical and effective research practices.
- Coordinated CDER's engagement in the public-private partnership Pistoria Alliance In Vitro NAMs Standardization Project. The project aims to accelerate adoption of in vitro NAMs by working to standardize the measurement of assay performance, ensure consistent reporting of assay results, and harmonize the provenance of assay metadata.
- Established a Research Collaboration Agreement to evaluate alternative human placenta barrier models for drug transport activity, which will allow for more accurate labeling of drugs that may be taken during pregnancy.

[4] Also see: Geiger, RM, Serna III, C, Bhardwaj, B, Feaster, TK, and Blinova, K, 2025, Towards human cardiac new approach methodologies (NAMs) to evaluate the combination of repolarization prolonging and shortening drugs: a pilot study, Front Drug Discov, 5:1679626, doi: 10.3389/fddsv.2025.1679626.

Addressing Substance Use

OTS continues to help address the public health crisis associated with the use of substances with abuse potential by advancing evidence-based treatments through regulatory science research and collaboration.

- Led the Acute Pain Pathways Study with the Yale University-Mayo Clinic Center for Excellence in Regulatory Science and Innovation (CERSI). The study leveraged digital technologies and provided insight into patients' real-world experiences managing pain and opioid disposal practices.

  The study collected real-world data from 1,708 opioid-naïve patients in 12 states who initiated opioid therapy. Participants were recruited from multiple care settings, including emergency, primary care, surgery, and dental practices. The study tracked the pharmacological and nonpharmacological approaches patients used to manage pain and examined the bidirectional relationship between mental health status and pain management outcomes. Among patients who used non-pharmacological approaches to manage their pain, several reported benefits from using mindfulness techniques and distraction methods that included video games. The study evaluated multiple medical conditions. Notably, patients experiencing low back pain demonstrated the highest rate of progression from acute pain to chronic pain. Use of prescription opioids for managing acute pain was characterized by low-dose, short-duration regimens that conferred no statistically significant analgesic benefit compared to non-opioid pharmaceutical therapies. Approximately two-thirds of the patients in the study reported being in possession of leftover opioid medication.

- Conducted research on the pharmacologic properties of different naloxone formulations, reversal strategies in polysubstance opioid overdose, and the application of systems pharmacology modeling to inform on reversal strategies and opioid antagonist product development. In the study on pharmacologic properties of different naloxone formulations, researchers evaluated the impact of clearance and absorption rates to reverse respiratory depression induced by an opioid overdose. The study findings included the following:
  - To reverse respiratory depression, fast-absorbing opioid antagonists are better than their slow-absorbing equivalent.
  - For preventing renarcotization caused by a long opioid exposure, a slow-clearing antagonist may be more useful.

- Used a computational model that predicts the amount of time nitazenes are bound to the mu opioid receptor in the human body to evaluate the

effectiveness of naloxone against emerging nitazenes. Nitazenes are a group of novel synthetic opioids reported to be up to 40 times more potent than fentanyl and have been linked to an increase in overdose cases.

- Published research on cannabidiol (CBD) and liver safety. The use of these CBD products can lead to liver enzyme level elevations in healthy adults. The study evaluated potential harm on the liver from taking CBD in doses representing those found in currently available but unregulated consumer products.
- Supported qualification of a surrogate endpoint (first discussed at a CPIM in 2018) for use in developing new treatments for alcohol use disorder (AUD). This qualification of a "two-level reduction in risk drinking level of alcohol consumption"[5] addresses a critical need given that 28.9 million Americans had AUD in 2023. The qualification of this surrogate endpoint provides a tool that may enhance the feasibility of clinical trials for AUD and the development of more effective treatments for the disease, thereby addressing the significant unmet medical need in this population.

[5] U.S. Food and Drug Administration (FDA), 2025, FDA qualifies drug development tool to facilitate clinical trial research on alcohol use disorder, FDA website, accessed October 23, 2025, https://www.fda.gov/drugs/drug-safety-and-availability/fda-qualifies-drug-development-tool-facilitate-clinical-trial-research-alcohol-use-disorder.

Inspections

Decision-making in the drug regulatory review process requires FDA to have assurance in the quality and integrity of data it receives in support of new product approvals and marketing applications. To ensure the reliability of these data, OTS leads comprehensive, study-directed, and surveillance inspections of clinical and nonclinical sites that conduct pharmacokinetic, bioavailability (BA), bioequivalence (BE), Good Laboratory Practice, and Animal Rule studies in support of human drug applications.

Site Evaluations (Inspections and Remote Regulatory Assessments)

- Expanded the use of Remote Regulatory Assessments (RRAs), including the implementation of the first ever mandatory RRA (under the authority of 704(a)(4) of the Federal Food, Drug, and Cosmetic Act) for the BE and BA bioanalytical compliance program.
- Assessed over 500 sites to determine the need for inspection to support over 700 drug marketing applications.
- Performed over 200 site evaluations, which included inspections and RRAs for BA, BE (analytical, clinical, and clinical endpoint), and Good Laboratory Practice. The number of site evaluations related to Good Laboratory Practice increased 25% from 2024.
- Led FDA's efforts to identify and evaluate unique data integrity issues at bioanalytical laboratories, supporting FDA's mandate to ensure that quality drug products are available to the American public.

Inspection Tools

- Developed and implemented the Establishment Record Intake Portal for use during site evaluations. Site evaluators have access to the portal, and external stakeholders can directly and securely upload or transfer inspection and RRA files to FDA.
- Led and implemented the Inspection and Compliance Consolidation/Improvement Initiative, which establishes a strategic framework to embrace electronic solutions that have applicability throughout FDA. The initiative aims to reduce redundancy, optimize resource utilization, and improve operational efficiency across FDA.
- Developed new electronic dashboards to view and act on data related to bioresearch monitoring. The dashboards allow site evaluators to instantly track inspection and RRA metrics and activities while conducting site evaluations.

Science and Research

Regulatory science involves the development of new tools, standards, and approaches to assess the safety, efficacy, quality, and performance of FDA-regulated products. CDER's regulatory science activities aim to enhance the development of new drugs while ensuring that the drugs are safe and effective when used as intended. To facilitate CDER's efforts in this area, OTS performs a variety of tasks that include promoting scientific collaboration and innovation in drug regulatory review and facilitating the establishment of technology transfer agreements that are valuable to collaborations with the broader scientific community.

Advancing Regulatory Decision-Making

- Advanced statistical methodologies in drug evaluation through research and publications. The methodologies address multiple topics including:
  - Novel trial designs for rare diseases using global tests. This work proposes a novel clinical trial design to address challenges of rare disease trials, which are often underpowered due to small participant numbers and struggle with heterogeneous clinical manifestations that make single primary endpoints impractical.
  - Optimizing clinical trials in diabetes drug development and continuous glucose monitoring. This research included an evaluation of study data submitted to FDA in new drug applications. Researchers found that "reduced sample sizes can be used without interfering with the validity of efficacy results for adult type 2 diabetes drug trials."[6] Additional work provided considerations for using continuous glucose monitoring in diabetes trials, with recommendations for adequate documentation for the presence of patient- and device-related events (e.g., sensor changes, non-wear time) to address causes of missing data for continuous glucose monitoring.
  - Perspectives on approvals in oncology. The article presents key parts of the regulatory review process in FDA's review and approval of polatuzumab vedotin-piiq (in combination with a rituximab product, cyclophosphamide, doxorubicin, and prednisone) to treat some types of large, B-cell lymphomas.

[6] Cambon, AC, Travis, J, Sun, L, Idokogi, J, and A Kettermann, 2024, Optimizing Sample Size Determinations for Phase 3 Clinical Trials in Type 2 Diabetes, Pharmaceutical Statistics: 24(2):e2446, https://doi.org/10.1002/pst.2446.

- Recommendations on futility monitoring. The article discusses public health and ethical reasons for conducting futility monitoring in clinical trials. Futility monitoring provides an "assessment of the results of an ongoing [clinical] trial to determine if the trial is unlikely to meet its objectives,"[7] thereby allowing researchers to stop a trial to protect subjects and save resources.
- Bayesian statistical methods. The office published work on the use of Bayesian statistical methods to support regulatory approvals, including work on intravenous belimumab for children with systemic lupus erythematosus and Bayesian borrowing methods for pediatric type II diabetes trials.
- Implementation of the estimand framework. The office provided perspectives on the implementation of the E9(R1) Addendum[8] with strategies for handling intercurrent events and applying estimand frameworks to post-market safety studies.

- Conducted over 81 research projects on topics related to clinical pharmacology.

Scientific Collaboration and Technology Transfer

- Continued to support CDER's use of two extramural funding mechanisms: the Broad Agency Announcement (BAA) program and CERSI grants. The BAA program spurs development and innovation in the field of regulatory science. CERSI grants promote innovation in regulatory science predominantly by supporting cutting-edge scientific research that address high-priority regulatory science needs identified within FDA's Regulatory Science Framework.
- Collaborated with researchers on CERSI grants to develop statistical methods for handling missing data arising from endpoints derived from digital health technologies. These partnerships aim to improve understanding of data from wearable devices, create methods for identifying and handling non-wear periods, and develop an open-source simulation tool and code to implement the methods.
- Facilitated the collaboration between CDER and the Critical Path Institute to advance drug development tools that can enhance the safety and efficacy of drugs and help facilitate regulatory processes. This included the qualification of drug-induced liver injury (DILI) biomarker. FDA qualified serum glutamate dehydrogenase (GLDH) as a safety biomarker (in conjunction with alanine aminotransferase and other standard liver injury markers in clinical trials) for use in clinical trials to assess DILI, particularly in participants with elevated serum transaminases due to muscle injury. GLDH differentiates liver injury due to drugs from liver injury due to muscle damage. Patients with Duchenne muscular dystrophy can have elevated alanine aminotransferase due to muscle degeneration, which can confound a DILI signal. In these situations, GLDH can provide additional information to help make a DILI determination.
- Collaborated with the National Center for Toxicological Research on several efforts to explore AI and machine learning in drug safety assessment and regulatory science. The focus of the collaboration was to develop predictive models for hepatotoxicity, carcinogenicity, and mutagenicity and to understand the computational resources required for these advanced AI techniques.
- Coordinated CDER's engagement in the following public-private partnerships:

[7] Higgins, KM, Zalkikar J, Zhang, J, Wang, Y, Chiu, R, Soukup, M, Chen, Y-F, and G Levin, 2025, The Whys, Whens, and Hows of Futility Monitoring, Statistics in Medicine, 44:10–12, https://doi.org/10.1002/sim.70117.

[8] International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use, 2021, E9(R1) Statistical Principles for Clinical Trials: Addendum: Estimands and Sensitivity Analysis in Clinical Trials Guidance for Industry, U.S. Food and Drug Administration website, accessed November 20, 2025, https://www.fda.gov/regulatory-information/search-fda-guidance-documents/e9r1-statistical-principles-clinical-trials-addendum-estimands-and-sensitivity-analysis-clinical.

- Unifying Framework for Patient-Centered Clinical Study (UNIFIED). The study aims to develop a harmonized, global approach for integrating patient-centered clinical study endpoints that surpass traditional measures.
- Decentralized Trials and Research Alliance. The alliance accelerates adoption of innovative clinical trial methods, including decentralized elements, by collaborating with a community of global stakeholders.
- Myositis International Health and Research Collaborative Alliance. The alliance focuses on advancing research and treatment development for myositis-related diseases. The alliance is a science, education, and advocacy organization of international multidisciplinary, multispecialty experts (including patients).
- National Hepatitis B Consortium. The consortium aims to strengthen patient-centered comparative clinical effectiveness research in hepatitis B. The consortium is partnering with a wide range of stakeholders, including patients, caregivers, community partners, hepatologists, primary care providers, public health professionals, scientists, and clinical trial developers.

- Advanced regulatory science through previously established public-private partnerships:
  - Setting International Standards in Analysing Patient-Reported Outcomes and Quality of Life Endpoints in Cancer Clinical Trials – Innovative Medicines Initiative Consortium (SISAQOL-IMI). OTS and the FDA Oncology Center of Excellence actively engaged with and provided regulatory perspectives to the SISAQOL-IMI consortium. The international multidisciplinary consortium successfully launched recommendations on patient-reported outcomes, which were published in a peer-reviewed journal. The SISAQOL-IMI website includes an interactive table and guidebook with definitions and recommendations organized by clinical trial objective. In addition to the recommendations, SISAQOL-IMI produced checklists to support patient advocates and health care professionals reviewing cancer clinical trial protocols and results that include patient-reported outcome measures.
  - American Statistical Association's Biopharmaceutical Real World Evidence Scientific Working Group. OTS helped develop standards and best practices for the application of real-world evidence in regulatory contexts.
- Executed 17 technology transfer agreements that are facilitating research in high-priority, mission-critical areas such as substance use, advanced manufacturing, and rare diseases. Some of these agreements were to:
  - Assess real-world administration of naloxone by health care professionals to determine the efficacy and safety of increased doses of the drug to treat presumed opioid overdose.
  - Conduct a clinical study to characterize the abuse potential of botanical Kratom.
  - Develop a continuous biopharmaceutical manufacturing process that may allow for higher yields and lower costs compared to current batch manufacturing.
  - Provide FDA with access to a data sharing and analytics platform designed to accelerate therapy development for rare diseases.
- Conducted research projects under 18 technology transfer agreements.

Advancing Tools, Technologies, and Innovation

OTS actively searches for ways to advance the utilization of data, tools, and technologies that yield innovations to enhance the processes within regulatory review and regulatory science research.

- Modernized regulatory submission practices through several key initiatives:
  - Developed comprehensive guidance on statistical and technical considerations for submitting more efficient and standardized submissions.
  - Continued to evaluate and develop innovative analytical tools and programs with internal and external stakeholders to assist with statistical analysis and computing to improve the efficiency and quality of reviews for regulatory submissions.
- Achieved efficiencies in performing regulatory review activities and managing staff workloads by implementing tools, including those using AI, automating data visualization and exploration, and automating the access to existing tools and services to make quality, validated data easily available to staff.
- Improved tools that assess data quality, enabling early detection of potential quality issues that could impact or delay the regulatory review. The office also provided support to CDER in leveraging innovative technology and scientific tools for analyses, research, modeling, and simulations—all of which also enabled staff to quickly test concepts, build prototypes, and demonstrate scalability. Some examples of AI-related achievements include the following:
  - Developed and deployed AI-assisted solutions with user-friendly interfaces to facilitate regulatory reviews (Investigational New Drug Application, New Drug Application, and Biologics License Application). These solutions have been used in over 100 regulatory submissions to maintain scientific rigor while accelerating review timelines. FDA AI tools are designed to assist in informing decisions, not to make them. These tools/solutions are specifically designed to support human expertise or assist with informing decisions, and output is reviewed by qualified individuals with relevant domain expertise.
  - Developed innovative AI methodologies and workflows to identify risk factors for drug adverse events, facilitating proactive identification of high-risk patients and improving patient safety.

- Implemented an automated Immunogenicity Specimen assessment tool and 351(k) Pharmacokinetic Similarity Analysis tool to streamline biologics and biosimilar application reviews. These tools directly support 12 ongoing Biologics License Applications and 13 ongoing 351(k) applications in fiscal year 2025 (i.e., 10/1/2025 to 9/30/2026), significantly reducing manual data processing time and accelerating regulatory review for critical therapeutic products.

- Developed an interactive reviewer platform that generates graphical summaries of renal impairment study results. This platform enhances the quality and efficiency of regulatory decision-making by standardizing data visualization, reducing inconsistencies in data interpretation, and decreasing review preparation time.
  - Established AI-driven rapid landscape analysis capabilities for comprehensive scanning of regulatory documents to extract mission-critical information and identify patterns across submissions. This capability leveraged Elsa's large language models and supported important CDER initiatives including the weekly scanning of submissions with AI components or NAMs, thereby reducing manual document review time and enabling systematic identification of regulatory trends and precedents.
- Explored how to leverage innovative technologies, particularly AI and machine learning, to support data analysis for safety assessments. The effort explores new tools to improve efficiency in drug evaluation and safety monitoring, including the use of predictive AI to provide early safety reports on molecular entities.

Health Information Technology

- Led the Code Map Services Project in collaboration with the National Institutes of Health and the Assistant Secretary for Technology Policy/Office of the National Coordinator for Health Information Technology. The project has been ongoing since 2023 and focuses on the following:
  - Advancing data sharing, aggregation, and analysis by developing a solution that enables consistent and accurate data transformation, thereby facilitating new discoveries to improve patient and population health.
  - Registering mappings among several common data models (Observational Medical Outcomes Partnership [OMOP], Sentinel, PCORNet, i2b2/ACT, and TriNetX) and data standards (HL7® FHIR® US Core and CDISC SDTM).
- Harmonized data elements between FHIR US Core and CDISC SDTM to identify and address gaps between health care and clinical research standards.
- Collaborated with oncologists in the CDER Office of New Drugs to develop a breast cancer-focused clinical question of interest. Two participating Health Information Exchanges—Indiana and CyncHealth Nebraska—analyzed the corresponding electronic health record datasets.
- Completed the integration of electronic health record data in the I-SPY 2.2 Breast Cancer Trial. The integration enabled the automated capture of laboratory result data across nine sites (University of California, San Francisco, Stanford, University of California San Diego, University of Minnesota, University of Pennsylvania, University of Colorado, University of Alabama at Birmingham, and Emory University). This effort was part of the OneSource Project that OTS leads with the University of California, San Francisco. The project leverages electronic health records as the electronic source in the I-SPY 2.2 Breast Cancer Trial.

Outreach and Communication Efforts

OTS engages with its stakeholders and the public through outreach and communication efforts that include publications, forums, workshops, and other activities.

Guidance and Policy Documents, Guidance Snapshots, and Guidance Recap Podcasts

- Made significant contributions to the following two documents that provide recommendations by the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH). By harmonizing the regulatory requirements in regions around the world, ICH enhances global drug development and increases the availability of medications.
  - ICH draft guidance for industry *E20 Adaptive Designs for Clinical Trials* (September 2025). The draft guidance was prepared under the auspices of ICH. The document focuses on principles for the planning, conduct, analysis, and interpretation of clinical trials with an adaptive design that aim to confirm the efficacy and support the benefit-risk assessment of a treatment. The draft guidance, when finalized, will represent the current thinking of FDA on "E20 Adaptive Designs for Clinical Trials."
  - ICH E22 draft guideline on General Considerations for Patient Preference Studies. The draft guideline provides general principles for the use, design, conduct, analysis, and submission of patient preference studies. ICH published this guideline in November 2025.
- Published the following guidance snapshots and Guidance Recap Podcast episodes:
  - Guidance snapshot for the final guidance *Conducting Clinical Trials with Decentralized Elements* (September 2024).
  - Guidance snapshot, Guidance Recap Podcast episode, and podcast script for the final guidance *Patient-Focused Drug Development: Selecting, Developing, or Modifying Fit-for-Purpose Clinical Outcome Assessments* (October 2025).

Workshops, Meetings, Publications, and Regulatory Science Outreach

- Participated as speakers and panelists in multiple workshops and at scientific meetings across disease types and methodological areas. Some examples include the following:
  - Workshops with multiple internal and external partners and topics, including pediatric drug development, nitrosamine drug substance related impurities, and complex in vitro models.
  - Workshops to advance regulatory science and drug development:
    - Public workshop on novel oncology endpoint development. FDA and the American Association for Cancer Research Society for Immunotherapy of Cancer cosponsored the event.
    - Workshop on Regulatory Science in Hematology. FDA and the American Society of Hematology cosponsored the event.
    - Rare disease initiatives such as On the RISE: Controls in Rare Disease Clinical Trials and the Reagan-Udall Workshop on Primary Mitochondrial Diseases.
    - Patient-Focused Drug Development Workshop #2, which addressed methodological challenges in patient experience data.
- Co-organized the following key conferences, demonstrating and furthering the office's leadership in statistical innovation:
  - The inaugural STATBOLIC conference to advance statistical innovation for metabolic disorder treatments.
  - Drug Information Association Clinical Innovation and Biostatistics Summit.
  - American Statistical Association Biopharmaceutical Section Regulatory-Industry workshop.
- Contributed to Standardizing Laboratory Practices in Pharmacogenomics, a formal collaborative community advancing the optimization of standards, practices, and resources related to pharmacogenetic testing.
- Engaged with external stakeholders through the IQ Consortium, Clinical Trials Transformation Initiative, Critical Path Institute, Clinical Pharmacogenomics Implementation Consortium, American Association for Cancer Research, and International Society of Pharmacometrics.
- Published 92 peer-reviewed publications on a wide range of topics, such as model-informed drug development, AI and machine learning, opioids, oncology, rare disease, and biomarker science.
- Shared up-to-date clinical pharmacology topics to external stakeholders through 11 listserv communications to over 110,000 subscribers and through direct engagement with 8 professional organizations. Additionally, the office communicated the use of quantitative methods in review, research, and policy making to a distribution list with over 60,000 subscribers.
- Updated the drug development community about recent advances achieved through regulatory science research at CDER. OTS shared updates through a variety of communication formats, including two issues of a newsletter about advances in regulatory science.

Abbreviations

AI	Artificial Intelligence
AUD	Alcohol Use Disorder
BA	Bioavailability
BAA	Broad Agency Announcement
BE	Bioequivalence
CBD	Cannabidiol
CDER	Center for Drug Evaluation and Research
CERSI	Center for Excellence in Regulatory Science and Innovation
CPIM	Critical Path Innovation Meeting
DILI	Drug-Induced Liver Injury
FDA	U.S. Food and Drug Administration
GLDH	Serum Glutamate Dehydrogenase
IBD	Inflammatory Bowel Disease
ICH	International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use
IO	Immediate Office
NAMs	New Approach Methods
OB	Office of Biostatistics
OCP	Office of Clinical Pharmacology
OCS	Office of Study Integrity and Surveillance
OSIS	Office of Study Integrity and Surveillance
OTS	Office of Translational Sciences
PDUFA VII	Seventh Iteration of the Prescription Drug User Fee Act
RRA	Remote Regulatory Assessment

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