

PEDIATRIC TRANSLATIONAL RESEARCH CORE

The proposed pediatric competencies address gaps in the current understanding of pediatric health and illnesses and the need for research discovery.

Core Thematic Areas	Competencies
I. CLINICAL AND TRANSLATIONAL RESEARCH QUESTIONS	1. Describe how a translational research hypothesis might be modified to be testable in a pediatric population. (e.g., pediatric rare diseases, small numbers of patients; see also II. Study Design)
II. STUDY DESIGN	<ol style="list-style-type: none"> 1. Describe study design modifications and methods appropriate for small sample sizes. 2. Describe study design modifications or controls that would be appropriate for a vulnerable population. 3. Describe special considerations for biospecimen collection from children (e.g., age-appropriate sampling techniques, quantity/volume of specimen, subject assent/ informed consent).
III. BIOMEDICAL INFORMATICS	<ol style="list-style-type: none"> 1. Identify unique or describe age-appropriate modifications to data fields for the conduct of studies involving children. 2. Describe how quality control/quality assurance standards for data entry might be modified for studies involving children (e.g., height/weight data fields appropriate for a 3 year old).
IV. RESPONSIBLE CONDUCT OF RESEARCH	1. Summarize the US regulatory and historical framework to the conduct of clinical research involving children and how it differs from adults (e.g., section 407 and minimal risk; age appropriate ascent procedures).
V. TRANSLATIONAL TEAMWORK	1. Describe special considerations in assembling and managing a multidisciplinary team to conduct longitudinal, lifespan studies (e.g., transitioning of child to adult care).

SPECIAL CONSIDERATIONS FOR T1 RESEARCH

With the understanding that the career paths of individuals embarking on T1 research careers will be very diverse, some special considerations can be offered for the how the general core competencies of T1 investigators may differ from those detailed in Areas I-XIV.

Core Thematic Areas	Competencies
I. CLINICAL AND TRANSLATIONAL RESEARCH QUESTIONS	1. Understanding mechanistic approaches to disease and disease processes within their area of expertise. Specific examples of such competencies include physiology, pathophysiology, the genetics of human disease, and pharmacology
II. STUDY DESIGN	1. Understanding the methodologies in which clinical and basic science findings are initially evaluated in terms of their relevance to human disease. This area would also encompass familiarity with animal models and the technical tools used for the phenotyping and analysis of those models (imaging, gene expression, proteomics, metabolomics, etc.).
III. BIOMEDICAL INFORMATICS	1. Understanding the more distal steps in the translation process. These include many of the competencies listed in Areas I-XIV. Areas of particular relevance to T1 investigators include being familiar with technology transfer and other matters connected with working with the private sector, and understanding the steps leading to the ultimate application of research

COMPETENCIES FOR ACADEMIA-INDUSTRY DRUG DEVELOPMENT

Core Thematic Areas	Competencies
I. DEVELOPING NEW DRUGS	<ol style="list-style-type: none"> 1. Describe the traditional process of drug discovery and development, including target identification and validation, lead molecule identification and optimization. 2. Describe the role of pre-clinical testing in drug and device development. 3. Define the four phases of clinical drug testing
II. MANAGING REGULATORY ISSUES IN DRUG DEVELOPMENT	<ol style="list-style-type: none"> 1. Describe the differences between regulations and guidance regarding drug development and approval. 2. Discuss the objectives of a pre-IND meeting. 3. Describe the elements of an IND and IND annual report 4. Identify situations in which an investigator would be required to file an IND. 5. Outline the steps an investigator would take to submit an IND. 6. Discuss the objectives of an end of phase 2 meeting. 7. Describe the basic drug approval process. 8. Discuss elements of inspection readiness for regulatory audit and how to interact with auditors/inspectors
III. RECRUITING INVESTIGATORS	<ol style="list-style-type: none"> 1. Describe how industry identifies potential investigators. 2. Describe how investigators seek to participate in multicenter clinical trials. 3. Discuss strategies by which investigators may seek funding for investigator-initiated studies from industry.
IV. DESIGNING CLINICAL TRIAL PROTOCOLS	<ol style="list-style-type: none"> 1. Describe scientific as well as practical factors that may impact study design. 2. Discuss essential elements of a protocol. 3. Discuss the concepts of internal and external validity and how protocol design may impact the validity of the study. 4. Discuss issues surrounding the inclusion/exclusion of women of childbearing and non-childbearing potential in clinical trials. 5. Discuss issues surrounding the use of human tissues and banking of samples. 6. Discuss data analysis, prespecification of analysis plan, primary versus secondary endpoints, intent-to-treat and per-
V. MANAGING IRB ISSUES AND DATA SAFETY MONITORING	<ol style="list-style-type: none"> 1. Outline the essential elements of informed consent. 2. Describe strategies that can be used to recruit research volunteers and the IRB regulations concerning such practices, including volunteer compensation. 3. Discuss the role of Data Safety Monitoring Boards. 4. Outline strategies for reporting medical adverse events. 5. Define a “serious adverse event” (SAE) and discuss associated SAE reporting procedures. 6. Define an “unanticipated problem” (UP) and its reporting requirements. 7. Discuss the differences between a UP that is related to a clinical adverse event and a UP that is unrelated. 8. Define non-compliance and its reporting requirements.
VI. PREPARING BUDGET AND NEGOTIATING CONTRACTS	<ol style="list-style-type: none"> 1. Describe factors to consider when developing a budget for a clinical trial. 2. Outline the steps in successfully negotiating a contract. 3. Describe factors that need to be considered by the investigator, institution and sponsor, including intellectual property considerations, ownership of research data and publication rights.

COMPETENCIES FOR ACADEMIA-INDUSTRY DRUG DEVELOPMENT

Core Thematic Areas	Competencies
VII. EXECUTING CLINICAL TRIAL	<ol style="list-style-type: none"> 1. Describe an investigator's brochure. 2. Describe the process of initiating an industry sponsored clinical trial: pre-study visit and study site initiation packet. 3. Outline the concept of Good Clinical Practice (GCP) as specifically described in the ICH Harmonized Tripartite Guideline. <ul style="list-style-type: none"> -Describe study site monitoring by a Sponsor with respect to human subjects protection, trial conduct compliance with protocol and regulatory requirements and verification of trial data. 4. Discuss data storage and confidentiality. 5. Discuss FDA title 21CFR11 on electronic records and signatures, the use of computerized systems in clinical investigations and audit trails. 6. Discuss equivalent practices for paper documentation. 7. Describe the functionalities of an electronic data capture system (aka RDC or e-CRF.)
VIII. MANAGING CONFLICT OF INTEREST	<ol style="list-style-type: none"> 1. Define conflict of interest and discuss financial and non-financial examples. 2. Discuss situations in which an investigator or institution has a conflict of interest in an industry sponsored research study. 3. Discuss FDA requirements for financial disclosure by clinical investigators.
IX. DEVELOPING NEW AREAS OF COLLABORATION	<ol style="list-style-type: none"> 1. Outline the potential role of pharmacogenomics in clinical research. 2. Describe the pros and cons for assessing phenotype vs genotype in clinical trials. 3. Use pharmacogenomics to identify mechanisms of drug toxicity. 4. Describe strategies to identify appropriate biomarkers. 5. Describe the role and potential limitations of using biomarkers and surrogate endpoints in clinical trials.

COMPETENCIES FOR MEDICAL DEVICE INNOVATION AND TECHNOLOGY TRANSFER

Core Thematic Areas	Competencies
I. IDENTIFYING AND CHARACTERIZING CLINICAL NEEDS FOR DEVICES	<ol style="list-style-type: none"> 1. Describe the process of clinical observation (ethnography of clinical needs finding). 2. Translate a clinical observation into a clear statement of need (specifying the absolute and relative requirements for a solution). 3. Be able to filter and prioritize clinical needs based on clinical impact, demographics, and general market and regulatory considerations.
II. DEVELOPING IDEAS AND SELECTING CONCEPTS	<ol style="list-style-type: none"> 1. Actively participate in team-based brainstorming. 2. Describe the process of generating multiple solution concepts for each need. 3. Organize the output of brainstorming process. 4. Develop practical experience in filtering concepts based on the needs specifications. 5. Formulate detailed clinical, market, regulatory, reimbursement and intellectual property considerations.
III. DEVELOPING FAMILIARITY WITH INTELLECTUAL PROPERTY	<ol style="list-style-type: none"> 1. Describe the basic system of provisional, utility and methods patents in the United States as applied to medical technologies. 2. Be able to write applications for provisional patents. 3. Describe the role of patent counsel: when and how to seek expert help. 4. Describe the need for patent filing outside the U.S.
IV. ACQUIRING KNOWLEDGE OF REGULATORY PROCESS	<ol style="list-style-type: none"> 1. Describe the structure and function of the Center for Devices and Radiological Health (CDRH) within the context of FDA. 2. Describe the three-tier device classification structure. 3. Describe Exempt, 510(k) and PMA pathways, including the basics of the application process and timelines. 4. Describe the basic requirements for exempt and non-exempt investigations of a device, including factors used to determine whether a study is significant or non-significant risk. 5. Describe the requirements for Medical Device Reporting for various entities. 6. Be able to communicate with regulatory consultant: when and how to obtain help. 7. Describe the basics of regulatory systems outside the U.S., particularly in Europe, Japan, India and China.
V. MANAGING REIMBURSEMENT	<ol style="list-style-type: none"> 1. Describe the U.S. system of payment for medical technologies, including CMS systems for coding and reimbursement. 2. Describe in depth large private payer systems and how they relate to Medicare. 3. Describe the implications of health care reform, including comparative effectiveness research on the future reimbursement for new technologies. 4. Describe the role of a reimbursement consultant: when and how to obtain help.
VI. CARRYING OUT PRECLINICAL AND CLINICAL TESTING	<ol style="list-style-type: none"> 1. Describe preclinical testing requirements for medical technologies (bench and animal testing, including general APLAC requirements and ethical treatment of animals). 2. Enumerate the stages of clinical trials (e.g., First-In Human, Pilot, Pivotal). 3. Design an appropriate clinical trial for a given technology (e.g., registry versus randomized, controlled trial). 4. Identify and describe ethical issues of that are common in device development and testing, including conflict of interest.
VII. USING QUALITY SYSTEMS	<ol style="list-style-type: none"> 1. Describe quality systems regulations as they apply to medical technology prototyping, development and testing. 2. Be able to access expertise in quality control system creation and documentation.
VIII. MANAGING UNIVERSITY TECHNOLOGY TRANSFER	<ol style="list-style-type: none"> 1. Describe the role of university technology transfer offices (TTO) in identifying and executing licensing opportunities. 2. Describe the core issues of conflict of interest in technology invention and testing. 3. Comply with specific policies for the individual university's TTO.
IX. NAVIGATING TECHNOLOGY DEVELOPMENT PATHWAYS (BUSINESS MODELS)	<ol style="list-style-type: none"> 1. Describe the different types of business models for medical technologies (e.g., disposable equipment, capital equipment, etc). 2. Apply different pathways for technology transfer (licensing a product to an existing company versus starting up a new company).
X. FUNDING FOR TECHNOLOGY DEVELOPMENT	<ol style="list-style-type: none"> 1. Describe the different pathways for funding technology development (federal or corporate grant; SBIR/STTR; licensing; research contract; venture capital funding). 2. Write an application for the different funding pathways (grant application; licensing plan; business plan).