**Area of Concentration in Data Analytics (ARCO-DA)**

**Background**

Pharmacists are health care advocates and integral members of the health care team that provides patient care. Pharmacists specialize in pharmaceutical care, in which they maintain the responsibility of managing the safe and effective use of drug therapies intended to improve the well-being of patients and communities. Technology and data are becoming increasingly important to optimize pharmaceutical use and outcomes. Pharmacists are key contributors to pharmacoepidemiology analyses. Pharmacists often contribute to institutional quality improvement initiatives. Also, it is becoming more common in practice for pharmacists to be part of the data analytics team due to their background knowledge of the medications as well as their understanding of statistical methods necessary to analyze large data sets. Pharmacists use statistical tools to learn more about disease states, pharmacological aspects of drugs, and to provide others with high quality evidence-based recommendations from collecting data.

**Current Need**

The recent payment shift from volume to value has incentivized the implementation of interventions that optimize pharmaceutical use and outcomes. The increased quality, granularity, and accessibility to electronic patient data has created a unique opportunity to orient the implementation of these strategies towards patients who can benefit the most from them. For example, large data bases and advanced data analysis techniques can be used to direct pharmacists’ time towards those patients whose clinical outcomes can improve the most as a consequence of their interventions. In addition, predictive analytics can be used in predicting pharmaceutical outcomes, which will enable pharmacists to have a better understanding of the risks for specific medication-related problems that each patient faces. However, in order to take full advantage of these benefits, clinicians will likely require some understanding of predictive analytics. For this reason, it is important to include the basics of big data and predictive analytics in the PharmD training. Our ARCO-DA will address this need, by exposing PharmD students to early experiences in the use of data to optimize pharmaceutical operations, pharmaceutical use, and outcomes. This curriculum will empower students to develop a deep understanding of the pharmaceutical sciences, recognize and address drug therapy needs of patients, and advocate for pharmacist-expanded involvement in health care systems as technology and data become more valuable and more readily available to improve health care.

 **Purpose**

The purpose of the Area of Concentration in Data Analytics (ARCO-DA) in the School of Pharmacy is to allow students to learn and implement data analysis techniques while completing their PharmD degree. The ARCO-DA is designed to help students use data and technology to enhance pharmaceutical use, operations, and outcomes and drive better quality patient care. Students will become acquainted with big data sources, managing data, data analytic techniques from experience with statistical and analytics software to apply towards decision-making processes in the pharmacy field, including drug development, drug pricing and acquisition, and patient care outcomes.

**Experience and Skills Gained**

* *Data visualization*: Recognize the details and observations from the data to determine how to proceed with creating predictive models that is best represented from the data.
* *Data management*: Understand database design concepts, sources of data, and utilization of database software.
* *Decision Analysis and Optimization*: Develop a mathematical map of the entire decision structure and optimizing strategies to identify the most effective action to a variety of applications.
* *Statistical Concepts*: Application of statistical methods to analyze data utilized for solving problems and decision-making processes.
* *Statistical Modeling tools*: Understand and use statistical software programs such as Statistical Analysis System (SAS) for predictive modeling and data mining.

**Academic Requirements**

Students in the ARCO-DA must complete a total of 16 credit hours of coursework and rotations (i.e., 6 credits of approved elective courses and 10 credits from two APPE rotations aligned with the learning outcomes for the ARCO and approved by the ARCO oversight committee and director of experiential learning). Students must also complete an approved scholarly project under a faculty advisor.

**Coursework**

Students must complete coursework that has been approved by the ARCO-DA oversight group to fulfill the requirements. Students may select from the courses below and are to be completed after the first professional year. Additional courses a student wishes to pursue will be evaluated by the oversight group for approval. Students wishing to receive credit may enroll in Special Topics or conduct the project as a part of a P4 rotation.

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| Number | Course Title | Description |
| PHARM 5851 | Special Topics | Student has the opportunity to explore a pharmaceutical research or pharmaceutical care topic on an individual or small group basis with the oversight of a faculty member. Generally, the successful completion of a project is required. |
| PHARM 3045 | Advanced Statistical Methods | Course is designed to teach graduate students advanced statistical methods of data analysis. Where appropriate and consistent with the student's' educational background, theoretical foundations for statistical methods will be discussed. Students will obtain skills necessary to analyze complex data sets and to identify and apply methods appropriate for solving statistical problems presented during class sessions, in homework assignments, and in exams. At the end of the course, students will have skills to construct and test complex statistical models and will be able to understand statistical methods used in research articles and critique the methods selected. |
| PHARM 5830 | Discovering Scientific Inquiry | The primary purpose of the course is to adequately prepare learners to execute an outcomes research-based project during the P4 curriculum. As a required component of the pharmacotherapy scholars program, this course will enable P3 students in the spring semester to design a study, submit the required institutional review board documents, and strengthen their data analysis skills. |
| BIOST 2041 | Introduction to Statistical Methods 1 | Discusses techniques for the application of statistical theory to actual data. Topics include probability theory, estimation of parameters, and tests of hypothesis for both the discrete and continuous case.  |
| BIOST 2042 | Introduction to Statistical Methods 2 | More techniques are given for the application of statistics to actual data with emphasis on distribution-free and multivariate methods. Interpretation of results and concepts will be stressed.  |

**Experiential Learning**

In compliance with the requirements of the ARCO-DA, students must complete two APPE rotations that require the use of data. Students accepted into this ARCO will have meetings with faculty from the oversight group to discuss selection of APPE rotations. Students will choose from a list of APPE rotations that meet the requirements established by the ARCO-DA. Students may also choose to create proposal with the faculty oversight committee to add new APPE rotations that would be submitted to the director of experiential learning for quality assurance and approval.

**Project**

Under the supervision of a faculty advisor, each student will be required to complete a project related to the use of data analytics. Students will coordinate and consult with their faculty advisor for project ideas and a timeline of completion. Acceptable projects will include those that require a hands-on manipulation and analysis of a large database.

**Co-Coordinators**

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