Educational Outcomes, Goals, and Objectives for Postgraduate Year Two (PGY2) Pharmacy Informatics Residency Programs

Overview of PGY2 Pharmacy Informatics Residencies

The PGY2 residency in pharmacy informatics draws upon the clinical foundation of entering residents, including general competencies for managing medication-use systems and the support of optimal medication therapy outcomes. The residency trains individuals who can lead the evolution of organizations' medication-use systems by applying pharmacy informatics principles, standards, and best practices. Graduates are adept in the language and concepts of information technology (IT), equipping them to function in the interdisciplinary environment of informatics project teams.

PGY2 pharmacy informatics residency graduates are prepared to enter practice positions in a variety of environments. They are equipped to be the single pharmacy department source of informatics knowledge, skills, and abilities needed to serve small hospitals' technology and automation system needs. In the case of large health systems, graduates are prepared to assume roles in sub-specialties of pharmacy informatics. The broad scope of PGY2 pharmacy informatics training also enables graduates to participate in governmental health care informatics initiatives or to design innovative technology and informatics solutions within healthcare, including the software industry.

The residency inculcates the capacity to identify where technology and automation systems can work to improve the medication-use system. Graduates are prepared to be leaders who will take the initiative to advocate the pharmacy informatics perspective and command respect for their technical skills. Graduates exit with the capacity to contribute pharmacy leadership to the project life cycle of significant pharmacy information technology or automation initiatives. Such projects include the creation of clinical decision support programming; ensuring the accuracy of medication order intent; guiding clinicians to appropriate medication use; and selection, acquisition, implementation, and evaluation of technology and automation systems that support pharmacy operations.

Explanation of the Contents of This Document:

The educational outcomes, goals, and objectives below are to be used in conjunction with the PGY2 accreditation standard for second year specialized residencies in pharmacy informatics. Users of this document will want to refer to the accompanying glossary to assure a shared understanding of terms.

Each of the document's objectives has been classified according to educational taxonomy (cognitive, affective, or psychomotor) and level of learning. An explanation of the taxonomies is available elsewhere.[1]

The educational outcomes, goals, and objectives are divided into those that are required and those that are elective. The required outcomes, including all of the goals and objectives falling under them, must be included in the design of all programs. The elective outcomes are provided for those programs that wish to add to the required outcomes. Programs selecting an elective outcome are not required to include all of the goals and objectives falling under that outcome. In addition to the potential elective outcomes contained in this document, programs are free to create their own elective outcomes with associated goals and objectives. Each of the goals falling under the program's selection of program outcomes (required and elective) must be evaluated at least once during the resident's year.

Educational Outcomes (*Outcome*): Educational outcomes are statements of broad categories of the residency graduates' capabilities.

Educational Goals (Goal): Educational goals listed under each educational outcome are broad sweeping statements of abilities.

Educational Objectives (OBJ): Resident achievement of educational goals is determined by assessment of the resident's ability to perform the associated educational objectives below each educational goal.

Instructional Objectives *(IO)*: Instructional objectives are the result of a learning analysis of each of the educational objectives. They are offered as a resource for preceptors encountering difficulty in helping residents achieve a particular educational objective. The instructional objectives falling below the educational objectives suggest knowledge and skills required for successful performance of the educational objective that the resident may not possess upon entering the residency year. Instructional objectives are teaching tools only. They are not required in any way nor are they meant to be evaluated.

[1] Nimmo, CM. Developing training materials and programs: creating educational objectives and assessing their attainment. In: Nimmo CM, Guerrero R, Greene SA, Taylor JT, eds. Staff development for pharmacy practice. Bethesda, MD: ASHP; 2000.

Required Educational Outcomes, Goals, and Objectives for Postgraduate Year Two (PGY2) Pharmacy Informatics Residencies

Outcome R1: Evaluate opportunities for improving patient outcomes through the application of pharmacy informatics principles, standards, and best practices.

Goal R1.1 Demonstrate understanding of basic pharmacy informatics principles, standards, and best practices.

OBJ R1.1.1 (Comprehension) Explain the application of human factors engineering analysis to the design of safe technology and automation systems.

- *IO State the definition of human factors engineering.*
- *IO List the essential contributions of the disciplines that provide the basis for human factors engineering (e.g., anthropometrics, cognitive psychology, physiology of the senses).*
- *IO Compare and contrast the progressive use of human factors engineering in aviation and consumer software with its use in health care.*
- *IO Explain the human-machine conceptual model.*
- *IO Explain how databases of human-machine interaction have been developed (e.g., lab and field research) and used (e.g., design guidelines for engineers).*
- *IO Explain the concept of "lazy automation."*
- *IO Explain one cognitive psychology theory for each of the following: working memory; vigilance-attention, signal detection, and decision-making.*
- *IO Explain the term "situational awareness" including its explanation of human behavior in performance of automated tasks.*
- *IO Explain the term "learned intuition" and how it helps explain the need for human factors engineering, the prevalence of surprising errors with new systems, and why people do not see the vulnerabilities created with "work-arounds."*
- *IO Explain the theory of anthropometrics and biomechanics of workplace standing and sitting areas.*
- *IO Explain the principles of macro ergonomics, the science which looks at design and efficiency at the work group and organizational level.*
- *IO Explain basic guidelines for controls and displays on small or hand-held devices.*
- *IO Explain the role of cognitive biases and recognition-primed decision making that happens when physicians prepare medication orders.*
- *IO Explain how the human-machine conceptual model would apply to a variety of medication-use system tools and devices (e.g., computer, IV pump).*
- *IO Explain how the principles of human-computer interaction (HCI) affect the use of medication-use system software/hardware (e.g., menu design, button labeling, mode errors).*

IO *Explain how "lazy automation" affects the design and operation of pharmacy software and robots.*

IO *Give examples of signs that situational awareness is a growing problem with increased automation of the medication-use system.*

IO *Explain the key attributes of effective warnings to be employed in the medication-use process.*

IO *Explain research findings on the limitations of using warnings, including warning labels and alarms, in the medication-use process.*

IO *Explain research literature that demonstrates that physical interlocks and other physical design changes are often vastly superior to the use of warnings in the medication-use process.*

IO *Explain opportunities in the design of a safe medication-use system in which the tools of macro ergonomics can contribute value.*

IO *Explain how basic guidelines for controls and displays on small or hand-held devices should influence tools of this nature used in the medication-use process (e.g., barcode devices, syringe pumps).*

IO *State sources of human factors engineering research and guidance for design for older adults and people with functional impairments (e.g., Trace Center at University of Wisconsin).*

IO *List typical questions used as probes when conducting a human factors analysis of typical medication-use system functions (e.g., time to use major functions, error types).*

IO *Explain the characteristics of a systematic application of human factors engineering principles (i.e., heuristic evaluation) to an analysis of typical medication-use system functions.*

IO *Explain the process of usability testing in field and in controlled lab settings.*

IO *Explain the limitations of applying human resource engineering tools to an analysis of medication-use system functions without significant formal training or assistance by a human factors engineering professional.*

OBJ R1.1.2 (Comprehension) Explain the principles upon which the practice of pharmacy informatics is based.

IO *Explain the ASHP Statement on the Pharmacist's Role in Medical Informatics.*

IO *Explain the difference between pharmacy informatics and informatics for other health care professions.*

OBJ R1.1.3 (Comprehension) Explain the sources, content, and application of standards governing the use of data, information, and knowledge in health care.

IO *State the major standards-setting bodies for health care informatics.*

IO *Explain the importance of standards for formatting data (e.g., HL7).*

OBJ R1.1.4 (Comprehension) Explain the sources and application of best practices in pharmacy informatics.

IO *State the organizations that develop best practices for health care informatics.*

OBJ R1.1.5 (Comprehension) Explain how testing and change control impact the quality of data and knowledge resources.

IO *Explain the concept of change control as it applies to the maintainability and reliability of technology and automation systems.*

IO *Explain the phases of testing for technology and automation systems.*

IO *Explain the purposes of testing methodologies for technology and automation systems.*

IO *Explain the need for a controlled testing environment.*

Goal R1.2 Evaluate opportunities for improving patient outcomes by improving the safety and quality of the medication-use system through the application of informatics principles, standards, and best practices.

OBJ R1.2.1 (Application) Exercise skill in mapping and analysis of the flow of data within technology and automation systems.

IO *Explain the concept of flow of data within technology and automation systems.*

IO *Explain findings in the current literature for dataflow challenges in healthcare informatics*.

OBJ R1.2.2 (Analysis) When presented with a process map related to the flow of data within technology and automation systems, identify opportunities for improving safety, quality, and productivity.

OBJ R1.2.3 (Application) Exercise skill in mapping of workflow processes related to technology and automation systems.

IO *Explain workflow as it relates to technology and automation systems.*

OBJ R1.2.4 (Analysis) When presented with a process map related to workflow processes of technology and automation systems, identify opportunities for improving safety, quality, and productivity.

OBJ R1.2.5 (Application) Exercise skill in diagramming clinical decision-making processes.

IO *Explain the level of specificity that is required when diagramming clinical decision-making for technical audiences.*

OBJ R1.2.6 (Analysis) When presented with a clinical decision-making diagram, identify opportunities for improving safety, quality, and efficiency.

Goal R1.3 Evaluate opportunities for improving operational efficiencies in order to better serve patient and health professional needs through the application of informatics principles, standards, and best practices.

OBJ R1.3.1 (Analysis) Skillfully use direct observation and interview techniques to identify opportunities to improve medication-use processes.

IO *Explain the process of direct observation of the human/technology interface for the purpose of analysis.*

IO *Explain the process of interview for the purpose of understanding the human/technology interface.*

Outcome R2: Foster effective decision support for members of interdisciplinary health care teams.

Goal R2.1 Evaluate the validity of information and knowledge in the organization's technology and automation systems.

OBJ R2.1.1 (Comprehension) Explain the importance of assuring the validity of the data, information, and knowledge in the organization's technology and automation systems.

IO Explain common sources of health care organization data, information, and knowledge.

OBJ R2.1.2 (Evaluation) Identify opportunities for improvement in the selection of sources of data, information, and knowledge so as to enhance the validity of the database.

IO Explain methods for evaluating validity of data, information, and knowledge put into technology and automation systems.

IO Explain the application of continuous quality/performance improvement methods to information products and outputs.

Goal R2.2 Assure that all patient-specific, medication-specific, and evidence-based pharmacotherapy information required to support effective medication-related decisions is readily available in a useful format to members of interdisciplinary, patient-centered teams.

OBJ 2.2.1 (Synthesis) Effectively present the benefits of functionally integrated evidence-based and other knowledge resources, patient information systems, and medication information systems.

IO Explain the components of an integrated patient, medication, and evidence-based resources information system and how the components must be linked to each other to be defined as integrated (as opposed to cobbled).

IO Explain the potential for error when using "stand-alone" systems or when a system is not fully integrated with the organization's primary information system.

IO Explain why the IOM Report and other major patient safety advocates endorse the use of computerized prescriber order entry (CPOE) systems.

IO Explain why, if a CPOE system that incorporates the pharmacy's information system is not operational, a pharmacy computerized order entry system should be in place.

IO: Evaluate different approaches to patient care involving different informatics data content.

OBJ 2.2.2 (Synthesis) Define requirements for evidence-based and other knowledge resources, patient information systems, and medication information systems to support effective evidence-based medication-related patient-care decisions by interdisciplinary, patient-centered teams, in collaboration with information technology professionals and pertinent health-care providers.

IO Explain the principles of decision support as they apply to health-care providers making direct patient-care decisions and their effect on medication safety.

IO Explain how the principles of decision support may be applied to accurately determine integrated patient, medication, and evidence-based resources information system needs that will support safe medication-use decision-making by interdisciplinary, patient-centered teams.

- *IO Explain the importance of availability of inpatient and outpatient laboratory values to members of interdisciplinary, patient-centered teams.*
- *IO Explain the importance of a direct link between a computer system used for medication order entry and the laboratory system so that it automatically alerts members of interdisciplinary, patient-centered teams to the need for potential medication therapy changes.*
- *IO Explain the importance of including information about the patient's co-morbid conditions (hypertension, diabetes, renal or liver impairment, pregnancy, lactation, etc.) in the integrated patient, medication, and evidence-based resources information system.*
- *IO Explain the importance of including in the integrated patient, medication, and evidence-based resources information system allergies and a current and complete medication history, including prescription and over-the-counter medications, vitamins, herbal products, and illicit drugs/substances.*
  - *IO Explain the importance of establishing the validity of a documented patient allergy.*
- *IO Explain the contribution of an integrated patient, medication, and evidence-based resources information system that guides prescribers in the use of formulary medications and established protocols/clinical pathways.*
  - *IO Explain the role of prompts and alerts in decision support and limits on their effectiveness.*
    - *IO Explain the importance of a computer system dose range check with warnings about overdoses and underdoses for all medications.*
    - *IO Explain the importance of alerts built into the computer software to remind health-care providers about problematic medication names, packaging, or labeling.*
- *IO Explain the value of bar coding in verifying medication and patient identity and in documenting medication administration.*
- *IO Explain the importance of designing an integrated patient, medication, and evidence-based resources information system that minimizes the possibility of incorrect data entry.*
  - *IO Explain the importance of accurate recording of patient allergies and ADR information.*
  - *IO Explain strategies for the input of data that minimizes the potential for incorrect data entry.*
- *IO Explain the importance of designing an integrated patient, medication, and evidence-based resources information system that assures that data is input in the proper sequence.*

IO *Explain the importance of designing a system that requires the patient's allergies be entered before any medication orders for that patient can be entered.*

IO *Explain the importance of designing a system that requires the patient's weight and/or body surface area be entered before any medication orders for the patient can be entered.*

IO *Explain the importance of designing a system that produces clear and distinctive labels free of dangerous abbreviations and nonessential information.*

IO *Explain the principles of human/machine interface and how these principles should be considered in the design of screens for an integrated patient, medication, and evidence-based resources information system.*

IO *Explain the importance of arranging computer mnemonics to prevent look-alike medication names from appearing on the same computer screen.*

IO *Explain the importance of clear visibility of patients' allergy information at the point of administration.*

IO *Compare and contrast the benefits and risks of currently available computerized patient, medication, and evidence-based resources information systems.*

Outcome R3: Ensure accuracy of documentation and communication of medication orders by utilizing a standard messaging vehicle, standard vocabularies, and clinically validated data.

Goal R3.1 Assure the accurate and efficient flow of data between the organization's technology and automation systems.

OBJ R3.1.1 (Synthesis) Collaborate with information technology professionals in the programming of interfaces to facilitate accurate and efficient flow of information between the technology and automation systems utilized in the organization's medication-use system.

IO *Explain the differences between an interfaced and an integrated technology or automation system.*

IO *Explain the pros and cons of various methods for interfacing technology and/or automation systems.*

Goal R3.2 Support efforts to assure the interoperability of technology and automation systems that interface with those of outside organizations.

OBJ R3.2.1 (Synthesis) In cooperation with internal and external resources, collaborate with pertinent organizations in the development of interfaces to facilitate accurate and efficient interchange of information stored in technology and automation systems.

IO *Explain current initiatives in the area of interoperability.*

IO *Explain the benefits of external reporting to public health entities.*

IO *Explain the benefits and issues related to e-prescribing in the ambulatory care environment.*

Goal R3.3 Guard the confidentiality and security of health data stored in the health care organization's database.

OBJ R3.3.1 (Comprehension) Explain the organization's and regulatory policies for security of patient information.

OBJ R3.3.2 (Comprehension) Explain ethical considerations related to management of protected health information.

OBJ R3.3.3 (Synthesis) Collaborate with information technology and other professionals to assure that the organization's technology and automation systems comply with applicable organizational and regulatory requirements.

IO Explain the content and function of the NABP-developed Verified Internet Pharmacy Practices Sites (VIPPS) program.

IO Explain the impact of the Health Insurance Portability and Accountability Act (HIPAA) on the standardization of electronic data and interchange.

Goal R3.4 Assure the implementation of documented, formal testing procedures for data and transactional verification and/or validation.

OBJ R3.4.1 (Analysis) When given a specific technology or automation system, identify existing test plans, cases, and environments for data and transactional verification and/or validation.

IO Explain what is meant by verification in the context of technology and automation systems.

IO Explain what is meant by validation in the context of technology and automation systems.

IO Explain the required elements of a test plan.

IO Explain the elements and purposes of a test case.

IO Explain the requirements of an appropriate test environment.

OBJ R3.4.2 (Synthesis) When needed, create a testing plan for data and transactional verification and/or validation.

OBJ R3.4.3 (Application) Participate in testing of data and transactional verification and/or validation according to an established plan.

IO Explain how to produce documentation for proof of testing and issue identification.

IO Explain how to review and prioritize issue resolution.

OBJ R3.4.4 (Application) Participate in an assessment of the adequacy and completion of a testing plan for verification and/or validation.

IO Explain a systematic process for assessing the adequacy and completion of a testing plan for verification and/or validation.

IO Explain criteria for judging that a testing plan for verification and/or validation is adequate and complete.

Outcome R4: Promote the safe and effective utilization of technology and automation systems for pharmacy operations.

Goal R4.1 Demonstrate a working knowledge of available technology and automation systems for prescribing medications.

OBJ R4.1.1 (Comprehension) State sources of information for available technology and automation systems for prescribing medications.

OBJ R4.1.2 (Comprehension) Explain critical factors for assessing the functions, benefits, and constraints relative to safety and effectiveness of available technology and automation systems for prescribing medications.

IO Explain current literature (e.g., JCAHO and ISMP) with regard to patient safety related to technology and automation systems for prescribing medications.

Goal R4.2 Demonstrate a working knowledge of currently available automated technology for order processing.

OBJ R4.2.1 (Comprehension) State sources of information for available technology and automation systems for order processing.

OBJ R4.2.2 (Comprehension) Explain critical factors for assessing the functions, benefits, and constraints relative to safety and effectiveness of available technology and automation systems for order processing.

IO Explain current literature (e.g., JCAHO and ISMP) with regard to patient safety related to technology and automation systems for order processing.

Goal R4.3 Demonstrate a working knowledge of currently available automated devices for the safe and efficient distribution and dispensing of medications.

OBJ R4.3.1 (Comprehension) State sources of information for available technology and automation systems for the distribution and dispensing of medications.

OBJ R4.3.2 (Comprehension) Explain critical factors for assessing the functions, benefits, and constraints relative to safety and effectiveness of available technology and automation systems for the distribution and dispensing of medications.

IO Explain current literature (e.g., JCAHO and ISMP) with regard to patient safety related to technology and automation systems for the distributing and dispensing medications.

Goal R4.4 Demonstrate a working knowledge of currently available technology or automation for the safe and efficient administration of medications.

OBJ R4.4.1 (Comprehension) State sources of information for available technology and automation systems for administering medications.

OBJ R4.4.2 (Comprehension) Explain critical factors for assessing the functions, benefits, and constraints relative to safety and effectiveness of available technology and automation systems for administering medications.

IO Explain current literature (e.g., JCAHO and ISMP) with regard to patient safety related to technology and automation systems for administering medications.

IO Explain the benefits of and challenges to the positive identification of the medication and the patient during medication administration.

IO Explain the five rights of medication administration.

IO Explain the function of point-of-care decision support systems.

Goal R4.5 Demonstrate a working knowledge of currently available automated technology for documenting medication administration.

OBJ R4.5.1 (Comprehension) State sources of information for available technology and automation systems for documenting medication administration.

OBJ R4.5.2 (Comprehension) Explain critical factors for assessing the functions, benefits, and constraints relative to safety and effectiveness of available

technology and automation systems for documenting medication administration.

IO *Explain current literature (e.g., JCAHO and ISMP) with regard to patient safety related to technology and automation systems for documenting medication administration.*

Goal R4.6 Demonstrate a working knowledge of currently available electronic surveillance systems for effects monitoring.

OBJ R4.6.1 (Comprehension) State sources of information for available technology and automation systems for effects monitoring.

OBJ R4.6.2 (Comprehension) Explain critical factors for assessing the functions, benefits, and constraints relative to safety and effectiveness of available technology and automation systems for effects monitoring.

IO *Explain current literature (e.g., JCAHO and ISMP) with regard to patient safety related to technology and automation systems for effects monitoring.*

IO *Explain the relevance of synchronous versus asynchronous decision support.*

IO *Explain patient-specific versus population-specific surveillance.*

IO *Explain the impact of surveillance systems on clinical pharmacy practice.*

IO *Explain the components of a surveillance system.*

Goal R4.7 Demonstrate a working knowledge of currently available pharmacy inventory management systems.

OBJ R4.7.1 (Comprehension) State sources of information for available technology and automation systems for pharmacy inventory management.

OBJ R4.7.2 (Comprehension) Explain critical factors for assessing the functions, benefits, and constraints relative to safety and effectiveness of available technology and automation systems for pharmacy inventory management.

Goal R4.8 Demonstrate a working knowledge of emerging technology and automation systems that assist with the medication-use system.

OBJ R4.8.1 (Comprehension) State sources of information on emerging technology and automation systems for the tasks of the medication-use system.

Goal R4.9 Contribute to resolution of identified operational problems.

OBJ R4.9.1 (Synthesis) Contribute the pharmacy informatics perspective to teams solving operational problems in the medication-use system.

Outcome R5: Execute a project life cycle for a significant pharmacy information technology or automation initiative.

Goal R5.1 Contribute to planning for acquisition and implementation of significant technology or automation initiatives involving the pharmacy department.

OBJ R5.1.1 (Comprehension) Explain the informatics stages in a technology or automation project life cycle.

OBJ R5.1.2 (Synthesis) Contribute to the development of an informatics project plan for a technology or automation system.

IO *Explain the elements of a project plan for technology and automation systems including the purpose of each step.*

IO *When presented with a completed informatics project plan, explain its highlights including the statement of resources, Gantt charts, and linked project steps.*

OBJ R5.1.3 (Synthesis) Participate in writing a request for proposal (RFP) for a technology or automation system.

IO *Discuss circumstances when an RFP should be utilized.*

IO *Explain the categories of information included in an RFP.*

IO *Explain how to format an RFP.*

IO *Explain the importance of writing clear directions for vendor responses.*

OBJ R5.1.4 (Synthesis) Contribute to the development of a plan for the evaluation of a technology or automation system.

IO *Explain the components of a plan for the evaluation of a technology or automation system.*

IO *Explain how to develop metrics for evaluation of a technology or automation system.*

OBJ R5.1.5 (Evaluation) Participate in the assessment of responses to an RFP for a technology or automation system.

IO *Explain the importance of designing an objective strategy for evaluating responses to an RFP.*

IO *Explain the use of enterprise ranking for judging value to patient care.*

IO *Explain the use of key values for ranking vendors.*

OBJ R5.1.6 (Synthesis) Contribute to the development of a plan for implementation of a technology or automation system.

IO *Explain options for implementation strategies including the benefits and constraints involved.*

IO *Explain the components of a plan for the implementation of a technology or automation system.*

OBJ R5.1.7 (Synthesis) Contribute to the development of a plan for testing of a technology or automation system.

IO *Explain the concept of technology or automation testing.*

IO *Explain the components of a testing plan for a technology or automation system.*

IO *Explain the concept of interface testing.*

IO *Explain the concept of testing for the validity of data.*

IO *Explain the concept of unit testing.*

IO *Explain the concept of integration testing.*

IO *Explain the concept of functional testing.*

IO *Explain the concept of testing for clinical validity.*

IO *Explain the concept of regression testing.*

IO *Explain the concept of usability testing.*

IO *Explain the value of release notes for technology or automation upgrades*

IO *Explain the necessity of balancing decisions for what to include in the testing plan relative to available resources.*

OBJ R5.1.8 (Synthesis) Contribute to the development of a plan for the maintenance of technology or automation systems.

IO *Explain the components of a plan for the maintenance of a technology or automation system.*

OBJ R5.1.9 (Synthesis) Formulate or make improvements to a test plan that assures the on-going currency of the organization's patient, medication, and evidence-based resources information system.

IO *(Comprehension) Explain the importance of loading clinical content updates of medication information from vendors at least quarterly and conducting quality assurance checks on the updates.*

IO *(Comprehension) Explain the importance of assuring that formulary additions are promptly entered into the existing information system.*

IO *(Comprehension) Explain the importance of routine tests of the computer system to assure that maximum and minimum dose alerts are present for all medications.*

Goal R5.2 Participate in the implementation of a technology or automation system.

OBJ R5.2.1 (Synthesis) Participate in the installation, including supplemental build-outs, of a technology or automation system.

IO *Explain the meaning of the term "supplemental build out."*

OBJ R5.2.2 (Synthesis) Participate in testing of a technology or automation system.

OBJ R5.2.3 (Synthesis) Participate in the training of staff for use of a technology or automation system.

OBJ R5.2.4 (Synthesis) Participate in the maintenance of a technology or automation system according to an established plan.

Goal R5.3 Participate in contingency planning.

OBJ R5.3.1 (Analysis) Using skill with risk analysis procedures, identify parameters for a contingency plan.

IO *Explain how to conduct a risk analysis.*

IO *Explain different types of risk involved with technology and automation systems.*

OBJ R5.3.2 (Analysis) Identify stakeholders affected by difficulties with the functioning of the targeted technology or automation system.

IO *Explain how data flow and workflow process diagrams can contribute to the identification of stakeholders.*

OBJ R5.3.3 (Synthesis) Contribute to the development of a contingency plan for the targeted technology or automation system.

IO *Explain the components of a contingency plan.*

IO *Explain the importance of including workarounds and interim bridge solutions during downtime in contingency planning.*

Goal R5.4 Report the findings of a technology or automation system project.

OBJ R5.4.1 (Synthesis) Make an effective presentation to an appropriate audience of the outcomes of the implementation of a technology or automation system project.

Outcome R6: Function as a leader in the field of pharmacy informatics.

Goal R6.1 Demonstrate the personal skills and abilities of a pharmacy informatics leader.

OBJ R6.1.1 (Characterization) Demonstrate commitment to optimizing the use of informatics to improve patient outcomes by a pattern of persistence in achieving pharmacy informatics goals.

OBJ R6.1.2 (Comprehension) Explain effective strategies for establishing openly communicative, collaborative working relationships between pharmacy and the information technology staff of an organization.

IO: Explain the value of good peer relationships in the achievement of informatics projects.

IO: Explain the health system's information systems organization and the links / matrix with pharmacy informatics professionals.

IO: Explain differences in the approach to the resolution of information flow problems between clinicians and information technology professionals.

OBJ R6.1.3 (Synthesis) Use knowledge of organizational dynamics to effectively achieve pharmacy informatics goals.

OBJ R6.1.4 (Application) Participate in the development of project budget estimates and financial projections for the acquisition, implementation, and maintenance of technology and automation systems.

IO Explain operational and capital budgeting.

IO Explain methods to estimate return on investment.

IO Explain the need for establishing contingencies in the budget estimation process.

IO Explain how to determine set points for acceptable return on investment.

OBJ R6.1.5 (Synthesis) Devise plans for the efficient and effective utilization of human and material resources relative to pharmacy informatics projects.

IO Explain the importance of placing value on the contribution of all individuals involved in a technology or automation system project.

IO Explain the value of effective project planning in managing human and material resources.

IO Explain the range of issues to consider when planning the utilization of human and material resources for technology and automation projects.

OBJ R6.1.6 (Synthesis) Engage in effective issue management and resolution when problems are encountered in pharmacy technology and automation systems.

IO Explain informatics principles for tracking issues.

IO Explain how the potential for an opportunity may arise when an issue escalates.

OBJ R6.1.7 (Synthesis) When presented with a non-standard informatics problem, apply lateral (out-of-box) thinking to its solution

Goal R6.2 Represent the pharmacy informatics perspective in interactions with the information technology staff, other health care staff, and/ or technology and automation vendors.

OBJ R6.2.1 (Analysis) Customize verbal and written communications to successfully match with the customary "language" and communication style of the intended audience.

IO *Explain the differences in language (e.g., jargon, acronyms) used to communicate among the various disciplines involved in technology and automation projects.*

IO *Explain the differences in communication patterns among the various disciplines involved in technology and automation projects.*

IO *Explain the unique characteristics of written communications in pharmacy informatics.*

OBJ R6.2.2 (Application) Use assertive skills to successfully represent pharmacy informatics concerns and positions to internal and external audiences.

Goal R6.3 Demonstrate the technical skills essential to the role of a pharmacy informaticist.

OBJ R6.3.1 (Synthesis) Use database skills to successfully create patient and medication information data sets.

IO *Explain the structure of various database management systems.*

IO *Explain the concept of data normalization.*

OBJ R6.3.2 (Analysis) Accurately determine the need for specific reports drawn from databases.

IO *Explain the types of needs that can met by reports generated from technology and automation systems.*

OBJ R6.3.3 (Synthesis) Use database skills to successfully construct reports.

IO *Explain how to develop a report requirement that is sufficiently detailed to support quality reports.*

IO *Evaluate the effectiveness and quality of the report request process within the pharmacy department.*

OBJ R6.3.4 (Comprehension) Explain common network standards and network architectures.

IO *Explain the term "network standards."*

IO *Explain the term "network architectures."*

IO *Explain the components of a network's architecture.*

OBJ R6.3.5 (Evaluation) Assess a technology or automation system's security and patient protections for conformance with accepted standards including access control, data security, data encryption, HIPAA privacy regulations, and ethical and legal issues.

IO *Explain accepted criteria for system security.*

IO *Explain current HIPPA regulations and the application of those regulations to pharmacy technology and automation systems.*

OBJ R6.3.6 (Comprehension) Explain the functions and purposes of common hardware components and configurations.

IO *Explain the impact of clinical mobile computing for the purpose of patient care.*

IO *Explain the current foundational hardware components used in technology and automation systems.*

OBJ R6.3.7 (Comprehension) Compare and contrast the advantages and disadvantages of various operating systems.

IO *Explain criteria for evaluating operating systems.*

IO *Identify current resources for information on operating systems.*

OBJ R6.3.8 (Comprehension) Explain the concept of data warehousing and its uses in clinical and operational decision-making.

IO *Explain the concept of dimensional modeling.*

IO *Explain how the design of the data warehouse facilitates decision making.*

IO *Explain the difference between transactional and analytic database design.*

IO *Explain the challenges that may be imposed when data is warehoused from different technology or automation systems.*

OBJ R6.3.9 (Comprehension) Explain the role of standards organizations in standards development for health care informatics.

IO *Identify the benefits and constraints of clinical data when multiple standards are in place for a single data field.*

OBJ R6.3.10 (Comprehension) Explain standards that apply to messaging within the health care environment

IO *Explain the challenges of communicating across the continuum of healthcare when there are different standards in medication usage.*

OBJ R6.3.11 (Comprehension) Explain standard vocabularies used in the health care informatics environment.

IO *Explain available vocabularies for common concepts in pharmacy.*

IO *Explain available vocabularies for ancillary departments.*

IO *Explain available vocabularies for informatics.*

Goal R6.4 Represent pharmacy informatics concerns in strategic planning for the implementation, use, and maintenance of technology and automation systems

OBJ R6.4.1 (Synthesis) Participate in constructing or updating strategic plans for technology and automation systems for the organization's medication-use process.

IO *Explain the issues and concerns that must be considered when doing strategic planning for the implementation, use, and maintenance of technology and automation used in an organization's medication-use process.*

Elective Educational Outcomes, Goals, and Objectives for Postgraduate Year Two (PGY2) Pharmacy Informatics Residencies

Outcome E1: Conduct pharmacy informatics research.

Goal E1.1 Design, execute, and report results of investigations of pharmacy informatics-related issues.

OBJ E1.1.1 (Analysis) Identify potential pharmacy informatics-related issues that need to be studied.

IO Explain common gaps with informatics systems.

OBJ E1.1.2 (Application) Use a systematic procedure for performing a comprehensive literature search.

OBJ E1.1.3 (Analysis) Draw appropriate conclusions based on a summary of a comprehensive literature search.

OBJ E1.1.4 (Synthesis) Generate a research question(s) to be answered by an investigation.

IO Explain the types of hypothesis that can be used in a research setting.

OBJ E1.1.5 (Synthesis) Develop specific aims and design study methods that will answer the question(s) identified.

IO Explain the types of metrics that can be used with informatics research.

IO Explain the use of quantitative versus qualitative research.

OBJ E1.1.6 (Application) Use a systematic procedure to collect and analyze data.

OBJ E1.1.7 (Evaluation) Draw valid conclusions through evaluation of the data.

OBJ E1.1.8 (Synthesis) Use effective communication skills to report orally and in writing the results and recommendations of an investigation into a pharmacy informatics-related issue.

Outcome E2: Demonstrate advanced skills in working with a specific technology or automation product.

Goal E2.1 Serve as an expert resource for the management of a specific technology or automation system.

OBJ E2.1.1 (Synthesis) Formulate effective explanations, geared for a variety of interested audiences, of the functions of the technology or automation system.

IO Explain the differences in communicating with a technical audience versus a non-technical audience.

IO Explain communication strategies with information technology vendors.

OBJ E2.1.2 (Application) Demonstrate the operation of the technology or automation system.

IO Explain the user view of the technology or automation system.

IO Explain the technical view of the technology or automation system.

OBJ E2.1.3 (Synthesis) When presented with a problem involving the day-to-day operation of the technology or automation system, accurately diagnose the source of the problem.

IO Explain the concept of root-cause analysis of problems specifically related to technology use.

OBJ E2.1.4 (Synthesis) Given a specific problem within the operation of the technology or automation system, recommend an effective solution to its operation.

OBJ E2.1.5 (Synthesis) Design effective ongoing training for users of the technology or automation system.

IO Explain training approaches for different audiences for the implementation of technology.

OBJ E2.1.6 (Application) Deliver effective and efficient training for users of the technology or automation system.

IO Explain teaching techniques to ensure that those being trained understand the training.

IO Explain the importance of hands-on training versus didactic training for users of technology.

Outcome E3: Demonstrate skills required to function in an academic setting.

Goal E3.1 Understand faculty roles and responsibilities.

OBJ E3.1.1 (Comprehension) Explain variations in the expectations of different colleges/schools of pharmacy for teaching, practice, research, and service.

IO Discuss how the different missions of public versus private colleges/schools of pharmacy can impact the role of faculty members.

IO Discuss maintaining a balance between teaching, practice, research and service.

IO Discuss the relationships between scholarly activity and teaching, practice, research and service.

OBJ E3.1.2 (Analysis) Explain the role and influence of faculty in the academic environment.

IO Explain the responsibilities of faculty in governance structure (e.g. the faculty senate, committee service).

IO *Describe the responsibilities of faculty (e.g. curriculum development and committee service) related to teaching, practice, research, and service roles.*

OBJ E3.1.3 (Comprehension) Describe the academic environment.

IO Describe how the decisions by university and college administration impact the faculty.

IO Discuss outside forces (e.g. change in the profession, funding source, accreditation requirements) that impact administrator and faculty roles.

OBJ E3.1.4 (Comprehension) Describe the types and ranks of faculty appointments.

IO Explain the various types of appointments (e.g. non-tenure, tenure-track, and tenured faculty).

IO Differentiate among the various ranks of faculty (e.g. instructor, assistant professor, associate professor, full professor).

IO Discuss the role and implications of part-time and adjunct faculty as schools continue to expand and faculty shortages occur.

OBJ E3.1.5 (Comprehension) Discuss the promotion and/or tenure process for each type of appointment.

IO *Identify the types of activities that are considered in the promotion process.*

IO *Identify the types of activities that are considered for tenure.*

OBJ E3.1.6 (Application) Identify resources available to help develop academic skills.

IO *Explain the role of academic-related professional organizations (e.g. AACP) in faculty professional development.*

IO *Identify resources to help develop teaching skills and a teaching philosophy.*

OBJ E3.1.7 (Comprehension) Explain the characteristics of a typical affiliation agreement between a college of pharmacy and a practice site (e.g., health system, hospital, clinic, retail pharmacy).

IO *Explain how the political environments of either a college or a health system may affect the other.*

Goal E3.2 Exercise teaching skills essential to pharmacy faculty.

OBJ E3.2.1 (Synthesis) Develop an instructional design for a class session, module, or course.

IO *Construct a student-centered syllabus.*

IO *Construct educational objectives for a class session, module, or course that is appropriate to the audience.*

IO *Identify appropriate instructional strategies for the class session, module, or course to achieve the objectives.*

IO *Consider assessment tools that measure student achievement of the educational objectives.*

OBJ E3.2.2 (Synthesis) Prepare and deliver didactic instruction on a topic relevant to the specialized area of pharmacy residency training.

IO *Identify educational technology that could be used for a class session, module, or course (e.g., streaming media, course management software, audience response systems).*

IO *Create instructional materials appropriate for the topic and audience.*

IO *Identify strategies to deal with difficult learners.*

IO *Given feedback from teaching evaluations (e.g. student and or peer), devise a plan to incorporate improvements in future instruction.*

OBJ E3.2.3 (Application) Develop and deliver cases for workshops and/or exercises for laboratory experiences.

IO *Identify the appropriate level of case-based teachings for small group instruction.*

IO *Identify appropriate exercises for laboratory experiences.*

IO *Provide appropriate and timely feedback to improve performance.*

OBJ E3.2.4 (Application) Serve as a preceptor or co-preceptor utilizing the four roles employed in practice-based teaching (direct instruction, modeling, coaching and facilitation).

IO *Assess the learner's skill level to determine the appropriate preceptor strategy for providing practice-based teaching.*

IO *Given performance-based criteria, identify ways to provide constructive feedback to learners.*

IO *Develop strategies to promote professional behavior.*

- *IO Identify strategies to deal with difficult learners in the practice setting.*
- *IO Given a diverse learner population, identify strategies to interact with all groups with equity and respect.*

OBJ E3.2.5 (Analysis) Develop a teaching experience for a practice setting (e.g., introductory or advanced pharmacy experience).

- *IO Create educational goals and objectives to be achieved.*
- *IO Develop activities that will allow achievement of identified educational goals and objectives.*
- *IO Identify how and when feedback should be provided.*
- *IO Identify other preceptors for the experience, if appropriate.*
- *IO Determine training that might be needed for the preceptors to deliver student education.*
- *IO Identify potential challenges of precepting and providing patient care services simultaneously.*

OBJ E3.2.6 (Synthesis) Design an assessment strategy that appropriately measures the specified educational objectives for the class session, module, course, or rotation.

- *IO Identify appropriate techniques for assessing learning outcomes in various educational settings [e.g., written examinations, oral examinations, practical examinations, Objective Structured Clinical Examination (OSCE)].*
- *IO Develop examination questions to assess the knowledge, skills, attitudes and behaviors that are appropriate to the learner's level and topic.*
- *IO Discuss the various methods for administering examination questions (e.g., computerized testing, paper testing).*

OBJ 3.2.7 (Evaluation) Create a teaching portfolio.

- *IO Define the concept of a teaching portfolio and describe its primary purpose*
- *IO Outline the steps in building a teaching portfolio.*
- *IO Develop a personal teaching philosophy to guide one's teaching efforts and facilitate student learning.*

OBJ E3.2.8 (Evaluation) Compare and contrast methods to prevent and respond to academic and profession dishonesty.

- *IO Evaluate physical and attitudinal methods to prevent academic dishonesty.*
- *IO Discuss methods of responding to incidents of academic dishonesty.*
- *IO Discuss the role of academic honor committees in cases of academic dishonesty.*
- *IO Identify examples and methods to address unprofessional behavior in learners.*

OBJ E3.2.9 (Comprehension) Explain the relevance of copyright laws to developing teaching materials.

- *IO Discuss copyright regulations as related to reproducing materials for teaching purposes.*
- *IO Discuss copyright regulations as related to linking and citing on-line materials.*

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The effective date for implementation of these educational outcomes, goals and objectives is commencing with the entering resident class of 2007.

Glossary

Interdisciplinary team -- a team composed of members from different professions and occupations with varied and specialized knowledge, skills, and methods. The team members integrate their observations, bodies of expertise, and spheres of decision making to coordinate, collaborate, and communicate with one another in order to optimize care for a patient or group of patients. (Institute of Medicine. Health professions education: a bridge to quality. Washington, DC: The National Academies Press; 2001.)

Leadership -- leadership practices include scanning, focusing, aligning/mobilizing, and inspiring.

Scanning:

- ✓ Identify client and stakeholder needs and priorities.
- ✓ Recognize trends, opportunities, and risks.
- ✓ Look for best practices.
- ✓ Identify staff capacities and constraints.
- ✓ Know yourself, your staff, and your organization – values, strengths, and weaknesses.

Focusing:

- ✓ Articulate the organizations' mission and strategy.
- ✓ Identify critical challenges.
- ✓ Link goals with the overall organizational strategy.
- ✓ Determine key priorities for action.
- ✓ Create a common picture of desired results.

Aligning/Mobilizing:

- ✓ Ensure congruence of values, mission, strategy, structure, systems and daily actions.
- ✓ Facilitate teamwork.
- ✓ Unite key stakeholders around an inspiring vision.
- ✓ Link goals with rewards and recognition.
- ✓ Enlist stakeholders to commit resources.

Inspiring:

- ✓ Match deeds to words.
- ✓ Demonstrate honest in interactions.
- ✓ Show trust and confidence in staff, acknowledge the contributions of others.
- ✓ Provide staff with challenges, feedback and support.
- ✓ Be a model of creativity, innovation, and learning.

(Management and Leadership Program. Leading and managing framework. Management Sciences for Health, Ballston, VA. 2004.)

Medical informatics -- the development and application of information technology systems to problems in health care, research, and education. (Institute of Medicine. Health professions education: a bridge to quality. Washington, DC: The National Academies Press; 2001.)

Medication-use system - medication use is a complex process that comprises the sub-processes of medication prescribing, order processing, dispensing, administration, and effects monitoring. The key elements that most often affect the medication use process…are…., patient information;

drug information, communication of drug information; drug labeling, packaging and nomenclature; drug storage, stock and standardization; drug device acquisition, use and monitoring; environmental factors; competency and staff education; patient education; and quality processes and risk management. (Institute of Safe Medication Practices web site accessed May 31, 2005 http://www.ismp.org/Pages/ismp_faq.html#Question%207.)

Quality improvement -- identify errors and hazards in care; understand and implement basic safety design principles, such as standardization and simplification; continually understand and measure quality of care in terms of structure, process, and outcomes in relation to patient and community needs; and design and test interventions to change processes and systems of care, with the objective of improving quality." (Institute of Medicine. Health professions education: a bridge to quality. Washington, DC: The National Academies Press; 2001.)