

Job Analysis

Nuclear Pharmacy (BCNP)

September 2023



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Table of Contents

Executive Summary.....	3
Introduction	4
1. Definition of Tasks and Knowledge.....	5
2. Survey Administration and Analysis.....	10
3. Finalization of Exam Content Outline	17
Appendix A – Subject Matter Experts	18
Appendix B – Orientation Presentation	20
Appendix C – Survey Text.....	25
Appendix D – Exam Content Outline	38

Executive Summary

The Board of Pharmacy Specialties (BPS) performed a job analysis, a multi-method approach into defining a job role or competency area in terms of the relevant tasks and associated knowledge areas, in 2023 to develop the content outline and other specifications for the specialty certification examination for pharmacists who specialize in nuclear pharmacy. In accordance with relevant professional and accreditation standards, the study consisted of three major phases:

1. Definition of tasks and knowledge areas
2. Development, administration, and analysis of a survey
3. Finalization of the exam content outline

This report provides evidence for the exam content outline developed and its applicability to the nuclear pharmacy specialty practice area. The outcome of this study was the creation of an examination blueprint that will be used to construct the nuclear pharmacy specialty certification examination such that it aligns with the competencies identified and in equal proportions across all forms (versions) of the examination.

Examination Content Domains and Subdomains		
1	Radionuclides and Radiopharmaceuticals	47%
1A	Procurement and Storage	20%
1B	Handling of Radioactive Materials	27%
2	Patient Management	24%
2A	Patient Care	12%
2B	Diagnostic and Therapeutic Interventions	12%
3	Professional Practice	29%
3A	Patient, Occupational, and Public Safety	14%
3B	Practice Management	15%

Introduction

The Board of Pharmacy Specialties (BPS) performed a job analysis in 2023 to develop the content outline and other specifications for the specialty certification examination for pharmacists who specialize in nuclear pharmacy.

A job analysis¹, sometimes called a role delineation study or practice analysis in healthcare certification settings, is a multi-method approach to defining a job role or competency area in terms of the relevant tasks or work activities and the associated competencies (operationalized as knowledge, skills, and abilities) and/or other attributes. Indeed, job analysis can also be thought of as referring to a family of related approaches to establishing the foundations of content validity² for an assessment³, in this case applied to the assessment of competencies associated with a specialty area in the licensed practice of pharmacy. A job analysis is considered a multi-method approach because it incorporates both qualitative and quantitative evidence in support of the definition the practice area in question. The job analysis consisted of three major phases:

1. Definition of tasks and knowledge areas, organized in a content outline format and completed by an assembled panel of qualified pharmacists who are currently engaged in nuclear pharmacy
2. Development, administration, and analysis of a survey to other qualified pharmacists who are currently engaged in nuclear pharmacy, requesting their ratings either endorsing the inclusion or exclusion of each task and knowledge area identified by the committee
3. Finalization of the exam content outline, completed by the assembled panel and with consideration given to the survey results to help determine the retention, discard, or editing of knowledge and task lists, as well as the relative weights assigned to each content area

The study described in this report was conducted according to the Standards for Educational & Psychological Testing⁴ and applicable accreditation standards (NCCA⁵ and ISO/IEC 17024⁶). The subsequent sections describe the methods, results, and outcomes of the study, complemented by appendices which describe the qualifications and professional characteristics of the subject matter experts who contributed to this study, the actual text of the survey administered, and the final exam content outline produced by this study.

¹ Sackett, P.R., Lacz, R.M. (2003). Job and Work Analysis. Handbook of Psychology.

² Cronbach, L.J., Meehl, P.E. (1955). Construct Validity in Psychological Tests. Psychological Bulletin, 52(4), 281-302.

³ Kane, M.T. (2013). Validating the Interpretations and Uses of Test Scores. Journal of Educational Measurement, 50(1), 1-73.

⁴ American Educational Research Association, the American Psychological Association, National Council on Measurement in Education. (2014). Standards for Educational & Psychological Testing.

⁵ National Commission for Certifying Agencies. (2014). Standards for the Accreditation of Certification Programs.

⁶ International Organization for Standardization, International Electrotechnical Commission. (2012). Conformity Assessment: General Requirements for Bodies Operating Certification of Persons.

1. Definition of Tasks and Knowledge

BPS assembled a panel that consisted of 17 subject-matter experts in nuclear pharmacy, who were representative of the diversity of professional characteristics within the specialty with respect to practice setting, patient populations served, years of experience, and geographic dispersion within the United States. See Appendix A for the qualifications and professional characteristics of the job analysis panel and interviewees.

The panel met via teleconference on three occasions to develop, define, and update the tasks performed and knowledge required to practice as a specialist in nuclear pharmacy. The dates of the meetings were 12 July, 25 July, and 26 July 2023.

On the first session, the panelists were oriented to the objectives of the study and the meeting, and then were presented a draft examination content outline and list of associated tasks that drew from the outgoing examination content outline and the interview notes. See Appendix B for the presentation used to orient the job analysis panelists.

The panel developed 19 task statements that describe the work activities performed by a nuclear pharmacist.

1	Evaluate patient clinical status, disease state, history, and other pertinent patient characteristics
2	Collaborate with the patient, caregiver, and interprofessional healthcare team in the development of patient care plans
3	Optimize the administration of radiopharmaceuticals to patients
4	Monitor and evaluate patient progress to healthcare outcomes, and recommend any appropriate modifications
5	Provide education, counseling, and/or support to patients, caregivers, members of the public, pharmacists, pharmacy learners, and other healthcare professionals
6	Lead or participate in healthcare quality improvement, safety, and public health initiatives
7	Evaluate, establish, and/or align policies and procedures according to standards of practice, regulatory requirements, and evidence-based medicine
8	Develop and/or utilize drug-selection strategies to improve cost effectiveness, resource utilization, and risk mitigation
9	Utilize health information technology to optimize patient care
10	Engage in nuclear pharmacy professional development, such as healthcare committee involvement, scholarly activities, and continuing education
11	Evaluate clinical literature and its applicability to nuclear pharmacy and nuclear medicine practice

12	Define material specifications such as quantity, quality, concentration, availability, calibration, expiration, and manufacturer
13	Evaluate materials for shipping condition, storage condition, labeling, and acceptability of use
14	Evaluate prescriptions and/or orders for radiopharmaceuticals, devices, and adjunct pharmaceuticals
15	Select products, components, supplies, and equipment needed to prepare, compound, and dispense prescription orders
16	Handle sterile and non-sterile pharmaceuticals using radiation safety and/or environmental control techniques
17	Perform radiopharmaceutical end-product release testing
18	Perform quality assurance procedures for nuclear pharmacy personnel, instrumentation, equipment, and environment
19	Document and respond to adverse drug events, recalls, defects, clinical issues, and supply issues

The panel identified three content domains that describe the key high-level components of nuclear pharmacy. Across the three content domains, the panel identified seven content sub-domains and developed 30 knowledge areas that describe specific job knowledge associated with the practice of nuclear pharmacy. In some cases, the panelists wrote examples in parenthesis, which are meant to be non-exhaustive, to help better illustrate the intended scope of the knowledge area listed.

1	Radionuclides and Radiopharmaceuticals
1A	Procurement and Storage
1A1	Radionuclide Production and Radiopharmaceutical Manufacturing
1A2	Materials Specifications and Assessment
1A3	Physical and Chemical Properties of Radionuclides and Radiopharmaceuticals
1A4	Receipt, Labeling, Storage, and Shipping of Radiopharmaceuticals and Devices
1A5	Inventory Management
1B	Handling of Radioactive Materials
1B1	Preparation of Radiopharmaceuticals
1B2	Compounding of Radiopharmaceuticals
1B3	Radioactive Devices
1B4	Radionuclide Generators
1B5	Radiopharmaceutical Release Testing
1B6	Disposal of Radioactive and Other Materials
2	Patient Management
2A	Patient Care Planning
2A1	Clinical Assessment and Diagnosis (e.g., clinical presentation, disease state, MUE, SDoH)
2A2	Pharmacodynamics and Pharmacokinetics (e.g., altered biodistribution)
2A3	Goals of Diagnostics and Therapy
2A4	Interprofessional Care Coordination

2A5	Patient and Caregiver Education and Counseling
2B	Diagnostic and Therapeutic Interventions
2B1	Routes of Administration
2B2	Radiopharmaceuticals and Devices used in Diagnostics
2B3	Radiopharmaceuticals and Devices used in Treatment
2B4	Pharmaceutical Adjuncts
2C	Outcomes and Monitoring
2C1	Clinical Status Monitoring
2C2	Radiopharmaceutical-Drug Interactions
2C3	Adverse Drug Events
3	Professional Practice
3A	Patient, Occupational, and Public Safety
3A1	Practice Standards, Regulations, and Guidelines (e.g., USP, NRC, ACR, FDA, DOT)
3A2	Occupational Safety Requirements, Regulations, and Guidelines (e.g., NRC, EPA, OSHA, BOP)
3A3	Radiation Protection
3B	Practice Management
3B1	Equipment (e.g., PEC, heating device, remote handling device)
3B2	Instrumentation (e.g., dose calibrator, survey meter, multichannel analyzer)
3B3	Statistical Analysis
3B4	Quality Management and Process Improvement

The panel also helped create a definition of the nuclear pharmacist, the target population for the BCNP credential, and a statement describing the purpose of the BCNP credentialing program.

The BPS Board-Certified Nuclear Pharmacist (BCNP) program is a credential for pharmacists who specialize in the procurement, preparation, compounding, dispensing, repackaging, and distribution of radiopharmaceuticals.

The purpose of the BCNP program is to validate that the pharmacist has the advanced knowledge, skills, and experience necessary to optimize the safety and efficacy of patient care and public health outcomes through the use of radiopharmaceuticals for research, diagnosis, therapy, and monitoring.

The panel also refined a list of demographic questions to be provided to survey respondents which would help better understand the professional characteristics of the respondent sample, which is described in more detail in the next section.

Lastly, the panel engaged in a linkage analysis, which is an exercise to identify the inter-relationships among the knowledge areas and tasks. Each panelist was asked to individually develop a linkage matrix in which tasks are listed as columns and knowledge areas as rows, and an x-mark indicating that the knowledge area is required for performance of the task. Individual matrices were aggregated such that any proposed linkage (x-mark) by more than half of the panelists was counted in the final (consensus) linkage matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1																			
1A																			
1A1					x			x		x		x	x		x				x
1A2							x	x		x		x	x		x				
1A3					x					x		x	x		x		x		
1A4					x		x	x				x	x		x				
1A5								x				x	x						x
1B																			
1B1			x				x	x		x		x			x	x			
1B2							x	x		x		x			x	x			
1B3							x	x		x		x			x	x			
1B4							x	x		x		x			x	x			
1B5							x			x		x			x	x	x	x	
1B6					x		x								x	x			
2																			
2A																			
2A1	x	x	x	x	x				x		x								
2A2	x	x	x	x	x					x									
2A3	x	x	x	x	x		x	x	x		x								
2A4	x	x	x	x	x				x										
2A5	x	x		x	x				x										
2B																			
2B1	x	x	x				x			x				x					
2B2	x	x	x	x	x		x	x		x	x			x					
2B3	x	x	x	x	x		x	x		x	x			x					
2B4	x	x	x	x	x		x	x		x	x			x					
2C																			
2C1	x	x		x	x														
2C2	x	x	x	x	x					x				x					x
2C3	x	x		x	x					x									x
3																			
3A																			
3A1			x		x	x	x			x						x			
3A2					x	x	x			x						x			
3A3	x	x	x		x	x	x			x						x			
3B																			
3B1							x								x	x	x	x	
3B2							x								x	x	x	x	
3B3							x			x	x								
3B4				x	x	x	x		x	x									x

2. Survey Administration and Analysis

A survey was created for the purpose of soliciting ratings of endorsement from the larger practitioner population. Survey results are used to validate the appropriateness of the knowledge areas and tasks developed by the panelists and to inform content weighting decisions. The survey was developed with the following components:

- Description of the purpose of the survey
- Definition of the target population identified by the specialty practice area
- Respondent ratings of endorsement for the task statements
- Respondent ratings of endorsement for the knowledge areas
- Demographic questions that assess survey respondents' professional qualifications
- Open field for any additional comments

The ratings of endorsement from the survey respondents were solicited using two scales: Importance and Frequency. Each scale consists of a prompt for task statement, prompt for knowledge areas, and numerical responses with an associated text anchor (description).

Importance	How important is this task to nuclear pharmacy practice?
	How important is this knowledge area to nuclear pharmacy practice?
0	not at all / not applicable
1	of very little importance
2	somewhat important
3	moderately important
4	very important
5	critically important
Frequency	How frequently is this task performed in nuclear pharmacy practice?
	How frequently is this knowledge used in nuclear pharmacy practice?
0	not at all / not applicable
1	very rarely
2	rarely
3	occasionally
4	often
5	very often

The survey was pilot tested with a sample that consisted of the job analysis panelists, the specialty examination council, and BPS staff persons. The pilot test was conducted during the dates of 1-8 August 2023. Pilot testers did not identify any necessary changes. See Appendix C for a copy of the final survey text.

The survey was open and available from 15 August 2023 to 12 September 2023. All pharmacists who hold the BCNP credential were directly invited via email to complete the online survey. The survey was

also disseminated by the Society of Nuclear Medicine and Molecular Imaging (SNMMI) and the American Pharmacists Association (APhA) Nuclear Pharmacy Special Interest Group (SIG).

The survey yielded 34 usable responses. Responses were not used if the survey was not completed or if the respondent indicated spending less than 50% of their pharmacy practice in nuclear pharmacy.

Responses to Demographic Questions		
Percentage of Time in Nuclear Pharmacy Practice	Mean = 90.29 SD = 19.26	<i>n</i>
20 – 50		5
51 – 75		0
76 – 99		6
100		23
Post-Graduate Pharmacy Residency Programs		<i>n</i>
PGY1 Pharmacy		1
PGY1 Managed Care Pharmacy		0
PGY1 Community-Based Pharmacy		1
PGY2 Ambulatory Care Pharmacy		0
PGY2 Cardiology Pharmacy		0
PGY2 Clinical Pharmacogenomics		0
PGY2 Community-Based Pharmacy Administration and Leadership		1
PGY2 Corporate Pharmacy Administration and Leadership		0
PGY2 Critical Care Pharmacy		0
PGY2 Emergency Medicine Pharmacy		1
PGY2 Geriatric Pharmacy		1
PGY2 Health System Pharmacy Administration and Leadership		0
PGY2 Infectious Diseases Pharmacy		0
PGY2 Internal Medicine Pharmacy		0
PGY2 Investigational Drugs and Research		0
PGY2 Medication Use Safety and Policy		0
PGY2 Neurology		0
PGY2 Nuclear Medicine Pharmacy		1
PGY2 Oncology Pharmacy		0
PGY2 Palliative Care / Pain Management Pharmacy		0
PGY2 Pediatric Pharmacy		0
PGY2 Pharmacotherapy		0
PGY2 Pharmacy Informatics		0
PGY2 Population Health Management and Data Analytics Pharmacy		0
PGY2 Psychiatric Pharmacy		0
PGY2 Solid Organ Transplant Pharmacy		0
PGY2 Specialty Pharmacy Administration and Leadership		0
BPS Certifications		<i>n</i>
BCACP - Ambulatory Care		0

BCCCP - Critical Care	0	
BCCP - Cardiology	0	
BCEMP - Emergency Medicine	0	
BCGP - Geriatric	0	
BCIDP - Infectious Diseases	0	
BCNP - Nuclear	24	
BCNSP - Nutrition Support	0	
BCOP - Oncology	0	
BCPP - Psychiatric	0	
BCPPS - Pediatric	0	
BCPS - Pharmacotherapy	0	
BCSCP - Compounded Sterile Preparations	1	
BCTXP - Solid Organ Transplantation	0	
Years of Experience in Pharmacy Practice	Mean = 22.26 SD = 14.41	n %
0-5	4	11.8%
6-10	5	14.7%
11-15	5	14.7%
16-20	5	14.7%
20+	15	44.1%
Years of Experience in Nuclear Pharmacy Practice	Mean = 21.06 SD = 13.02	n %
0-5	4	11.8%
6-10	6	17.7%
11-15	4	11.8%
16-20	5	14.7%
20+	15	44.1%
Primary Practice Setting		n %
Academic Institution / Educational Institution	2	5.9%
Academic Medical Center or Hospital	11	32.4%
Centralized Nuclear Pharmacy - Commercial Network	10	29.4%
Centralized Nuclear Pharmacy - Independent Pharmacy	4	11.8%
Community Hospital	1	2.9%
Governmental Healthcare Facility / Veterans Affairs Hospital	3	8.8%
Pharmaceutical Industry	1	2.9%
Other	2	5.9%
Location of Primary Practice		n %
United States	21	91.2%
AL	1	2.9%
FL	2	5.9%
GA	2	5.9%
IA	1	2.9%
IL	2	5.9%

IN	2	5.9%
KY	1	2.9%
MA	1	2.9%
MD	1	2.9%
MO	1	2.9%
NC	1	2.9%
NY	2	5.9%
OH	5	14.7%
OR	1	2.9%
SC	1	2.9%
TN	2	5.9%
TX	1	2.9%
UT	1	2.9%
VA	1	2.9%
WA	1	2.9%
WI	1	2.9%
Outside of the United States	3	8.8%
Germany	1	2.9%
Iran	1	2.9%
Pakistan	1	2.9%
Time Spent in Professional Role	<i>n</i> (>50%)	Average %
Direct Patient Care	0	1.7%
Radiopharmaceutical Handling and Dispensing: Diagnostics	5	32.4%
Radiopharmaceutical Handling and Dispensing: Therapeutics	0	9.9%
Manufacturing	0	4.5%
Administration / Management / Regulatory	6	30.8%
Teaching / Precepting	0	9.0%
Research / Scholarship	0	6.6%
Medical Science Liaison / Sales	0	0.0%
Other	0	5.1%
Does your primary practice facility have a cyclotron or other particle accelerator?	<i>n</i>	%
Yes	13	38.2%
No	21	61.8%

Mean Ratings for Task Statements		Importance	Frequency
1	Evaluate patient clinical status, disease state, history, and other pertinent patient characteristics	2.5	1.9
2	Collaborate with the patient, caregiver, and interprofessional healthcare team in the development of patient care plans	2.5	2.1
3	Optimize the administration of radiopharmaceuticals to patients	3.4	2.6
4	Monitor and evaluate patient progress to healthcare outcomes, and recommend any appropriate modifications	2.2	1.4
5	Provide education, counseling, and/or support to patients, caregivers, members of the public, pharmacists, pharmacy learners, and other healthcare professionals	3.3	2.9
6	Lead or participate in healthcare quality improvement, safety, and public health initiatives	3.2	2.5
7	Evaluate, establish, and/or align policies and procedures according to standards of practice, regulatory requirements, and evidence-based medicine	4.1	3.7
8	Develop and/or utilize drug-selection strategies to improve cost effectiveness, resource utilization, and risk mitigation	3.0	2.7
9	Utilize health information technology to optimize patient care	2.3	2.1
10	Engage in nuclear pharmacy professional development, such as healthcare committee involvement, scholarly activities, and continuing education	3.6	3.3
11	Evaluate clinical literature and its applicability to nuclear pharmacy and nuclear medicine practice	3.3	3.0
12	Define material specifications such as quantity, quality, concentration, availability, calibration, expiration, and manufacturer	4.4	4.2
13	Evaluate materials for shipping condition, storage condition, labeling, and acceptability of use	4.3	4.4
14	Evaluate prescriptions and/or orders for radiopharmaceuticals, devices, and adjunct pharmaceuticals	3.9	4.1
15	Select products, components, supplies, and equipment needed to prepare, compound, and dispense prescription orders	4.5	4.7
16	Handle sterile and non-sterile pharmaceuticals using radiation safety and/or environmental control techniques	4.8	4.8
17	Perform radiopharmaceutical end-product release testing	4.8	4.7
18	Perform quality assurance procedures for nuclear pharmacy personnel, instrumentation, equipment, and environment	4.7	4.5
19	Document and respond to adverse drug events, recalls, defects, clinical issues, and supply issues	4.2	3.1

Mean Ratings for Knowledge Statements		Importance	Frequency
1	Radionuclides and Radiopharmaceuticals		
1A	Procurement and Storage		
1A1	Radionuclide Production and Radiopharmaceutical Manufacturing	4.1	4.1
1A2	Materials Specifications and Assessment	4.0	3.9
1A3	Physical and Chemical Properties of Radionuclides and Radiopharmaceuticals	4.1	3.8
1A4	Receipt, Labeling, Storage, and Shipping of Radiopharmaceuticals and Devices	4.4	4.6
1A5	Inventory Management	4.3	4.7
1B	Handling of Radioactive Materials		
1B1	Preparation of Radiopharmaceuticals	4.9	4.9
1B2	Compounding of Radiopharmaceuticals	4.7	4.3
1B3	Radioactive Devices	3.6	3.0
1B4	Radionuclide Generators	4.5	4.6
1B5	Radiopharmaceutical Release Testing	4.6	4.8
1B6	Disposal of Radioactive and Other Materials	4.4	4.4
2	Patient Management		
2A	Patient Care Planning		
2A1	Clinical Assessment and Diagnosis (e.g., clinical presentation, disease state, MUE, SDoH)	2.3	1.6
2A2	Pharmacodynamics and Pharmacokinetics (e.g., altered biodistribution)	3.4	2.3
2A3	Goals of Diagnostics and Therapy	3.2	2.4
2A4	Interprofessional Care Coordination	3.1	2.5
2A5	Patient and Caregiver Education and Counseling	2.9	1.9
2B	Diagnostic and Therapeutic Interventions		
2B1	Routes of Administration	4.0	3.1
2B2	Radiopharmaceuticals and Devices used in Diagnostics	4.1	3.8
2B3	Radiopharmaceuticals and Devices used in Treatment	4.1	3.5
2B4	Pharmaceutical Adjuncts	3.7	3.3
2C	Outcomes and Monitoring		
2C1	Clinical Status Monitoring	2.2	1.4
2C2	Radiopharmaceutical-Drug Interactions	3.9	2.6
2C3	Adverse Drug Events	4.1	2.4
3	Professional Practice		
3A	Patient, Occupational, and Public Safety		
3A1	Practice Standards, Regulations, and Guidelines (e.g., USP, NRC, ACR, FDA, DOT)	4.6	4.6
3A2	Occupational Safety Requirements, Regulations, and Guidelines (e.g., NRC, EPA, OSHA, BOP)	4.4	4.3
3A3	Radiation Protection	4.8	4.6
3B	Practice Management		

3B1	Equipment (e.g., PEC, heating device, remote handling device)	4.6	4.6
3B2	Instrumentation (e.g., dose calibrator, survey meter, multichannel analyzer)	4.7	4.6
3B3	Statistical Analysis	2.8	2.6
3B4	Quality Management and Process Improvement	4.0	3.7

An exploratory factor analysis⁷ using maximum likelihood extraction and varimax rotation⁸ was performed on the importance ratings provided for the knowledge areas. One factor emerged, with an eigenvalue of 9.3, as the primary factor explaining 31.1% of the variability in importance ratings. All subsequent factors had eigenvalues of 4.1 or less and each explained less than 13.5% of the variability in importance ratings. This provides additional evidence for the consistency of the knowledge areas developed and their applicability to the intended measurement construct.

⁷ Thompson, B. (2004). Exploratory and confirmatory factor analysis: Understanding concepts and applications. American Psychological Association: Washington DC.

⁸ Kaiser, H. (1958). The varimax criterion for analytic rotation in factor analysis. Psychometrika, 23(3).

3. Finalization of Exam Content Outline

The job analysis panel reconvened on 20 September 2023 via teleconference to review the results of the survey and to finalize the exam content outline. The panelists first reviewed the results of the survey demographic questions and deemed the respondent sample to be representative of the target population, which are pharmacists specializing in nuclear pharmacy.

The panelists considered the task statements, especially those with importance ratings less than 3.0 (Task 1, 2, 4, and 9). The panel noted that these tasks with lower importance ratings, associated with patient care, are not necessarily performed across all practice setting but an increased emphasis in the near future is reasonably expected. Task 4 (Monitor and evaluate patient progress to healthcare outcomes, and recommend any appropriate modifications) was eliminated and Task 1 was modified to include the concept of patient progress so that it now reads: Evaluate patient clinical status, disease state, history, patient progress, and other pertinent patient characteristics. Task 9 was revised to include the mention of systems and workflows in addition to technology so that it now reads: Utilize health information technology, systems, and workflows to optimize patient care. All other task statements were retained without edits.

The panelists considered the knowledge statements, especially those with importance ratings less than 3.0 (2A1, 2A5, 2C1, 3B3). The panel agreed to change the name of 2A from “Patient Care Planning” to “Patient Care” and move the contents of 2C (Outcomes and Monitoring) into that category. 2C2 and 2C3 were re-numbered to 2A6 and 2A7, respectively. The panel eliminated 2C1 (Clinical Status Monitoring) and modified the text of 2A1 to include the concept of monitoring and remove the mention of diagnosis so that 2A1 now reads: Clinical Assessment and Monitoring. 3B3 was modified to make mention of research method so that it now reads: Statistical Analysis and Research Methods. All other elements of the exam content outline were retained without edits.

Lastly, the panelists were tasked with determining the content weighting, the proportion of examination content to be distributed to each content domain and sub-domain. The sum of the mean criticality ratings for the knowledge areas in each domain was tabulated and compared against the sum of the mean criticality ratings for all knowledge areas, which in turn yields the draft content percentage weight to be allocated to each content area. Save for addressing rounding errors, the panel made no other changes in determining the final weight. See Appendix D for the final Examination Content Outline.

	Content Domains and Subdomains of ECO	Draft Weight	Final Weight
1	Radionuclides and Radiopharmaceuticals	46.9%	47%
1A	Procurement and Storage	20.2%	20%
1B	Handling of Radioactive Materials	26.6%	27%
2	Patient Management	24.2%	24%
2A	Patient Care	11.9%	12%
2B	Diagnostic and Therapeutic Interventions	12.3%	12%
3	Professional Practice	28.9%	29%
3A	Patient, Occupational, and Public Safety	14.2%	14%

Appendix A – Subject Matter Experts

Name	Credentials	Post-Licensure Experience	Job Title	Employer/Affiliation	Location
David Barnes	RPh	36 Years	Business Unit Director	RLS USA, Inc	FL
Andrew Brown	PharmD, BCNP, ANP	18 Years	Quality Assurance Manager	Cardinal Health Nuclear & Precision Health Solutions	OH
Jeffrey Alan Clanton	RPh, MS, BCNP	48 Years	Independent Radiopharmacy Consultant	Self-Employed	TN
Ronald J. Crowe	RPh, BCNP	33 Years	PET Radiopharmacy Manager	Emory University School of Medicine	GA
Arnaldo Delvalle	PharmD, BCNP	8 Years	Nuclear Pharmacist	RLS USA, Inc	FL
Melissa Foster	PharmD, BCNP	20 Years	Pharmacy Manager	Cardinal Health Nuclear & Precision Health Solutions	TN
Wendy Galbraith	PharmD, BCNP, FAPhA	33 Years	Interim Nuclear Pharmacy Manager	University of Oklahoma	OK
Leana Gebo	PharmD, BCNP	16 Years	Pharmacy Manager	Cardinal Health Nuclear & Precision Health Solutions	MD
Richard L. Green	BSP Pharm, RPh, BCNP, FAPhA	35 Years	Director of Radiopharmacy Practice	Cardinal Health Nuclear & Precision Health Solutions	TN

Paul M. Knapp	RPh, MBA, BCNP	28 Years	Sr. Program Manager, Clinical Support	Cardinal Health Nuclear & Precision Health Solutions	OH
Lisa L. Koss	BS Pharm, BCNP	33 Years	Manager Relief Pharmacist	Jubilant Radiopharma	OH
Dao Le	PharmD, BCNP, FAPhA	21 Years	Regional Medical Director, RLT	Novartis	TX
Nicolo Mastascusa	PharmD, BCNP	15 Years	Chief Nuclear Pharmacist	University of Iowa Hospitals & Clinics	IA
Steve Mattmuller	MS, RPh, BCNP	43 years	Chief Nuclear Pharmacist	Kettering Medical Center Dept of Nuclear Medicine/PET	OH
Eric Smith	PharmD, BCNP, FAPhA	19 years	Senior Targeted Alpha Therapy Expert	Bayer Pharmaceuticals	NC
Christopher Stanton	PharmD, BCNP	13 Years	Pharmacy Manager	Jubilant Radiopharma	NY

Job Analysis



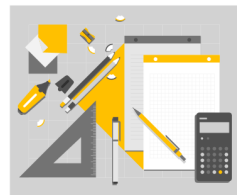
Job Analysis

A job analysis is often called a role delineation study or practice analysis in healthcare certification settings

The key points of inquiry in a Job Analysis are:

- ✓ **Definition of Target Population**
- ✓ **Tasks Performed**
- ✓ **Competencies Required**

The outcome is an exam content outline, which is used for creation of exams that reflect current practice and to identify to other stakeholders the scope of the exam



Multi-Method Approach

Both quantitative and qualitative methods are used in an RDS, which helps bolster the defensibility of the process and outcomes

Qualitative

- Interviews with Practitioners
- Focus Group with Practitioners

Quantitative

- Survey Administration and Analysis

Here is what the process looks like in sequence



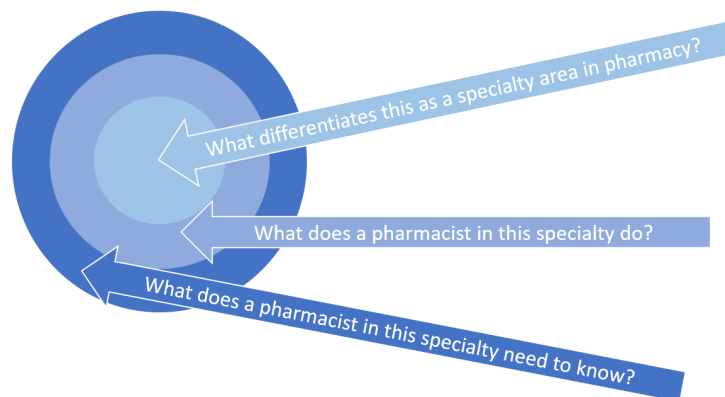
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Multiple Levels of Analysis

Consider how you would describe a job role to someone

All three levels help define the scope

But only the outer layer is the level at which an examinee is assessed



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Exam Content Outline

An ECO is a grouping of examination content areas in a hierarchical list

Exam Content Outline Structure and Components		(Somewhat Silly) Example	Domains
1	Content Domain	Chocolate	The Major Aspects of Practice Area
1A	Content Subdomain	History	
1A1	Knowledge Area	Mesoamerican Usage	Subdomains Meaningful Divisions within the Domain
1A2	Knowledge Area	European Adaptation	
1A3	Knowledge Area	Modern Production	
1B	Content Subdomain	Types	Knowledge Areas The Knowledge Assessed by Exam Items Each of these should be written such that they can be preceded by the phrase "Knowledge of"
1B1	Knowledge Area	Milk Chocolate	
1B2	Knowledge Area	Dark Chocolate	
1B3	Knowledge Area	White Chocolate	

Context Is Key



In addition to creation of an ECO, we will develop an inventory of [task statements](#).

- These tasks identify the objectives and responsibilities of the role.
- These tasks provide the context in which the knowledge is applied.
- Tasks need not be grouped into content domains.
- Tasks will not be used to classify exam items nor determine what is tested.

Linkage Analysis

A linkage matrix looks something like this

Purpose of the Linkage Matrix

- demonstrate which knowledge areas are required for each task
- demonstrate that the knowledge areas are indeed practice-based
- help identify gaps in either inventory
- help identify tasks or knowledge that are superfluous or out-of-scope

	1	2	3	4	5	6	7	8	9
1A1						x		x	
1A2					x				
1A3				x					x
1B1			x	x					
1B2			x				x		
1C1	x	x							
1C2		x					x		x

Helpful Hints

- An x-mark means that the specific knowledge is needed to perform that specific task.
- For example, knowledge of different types of chocolate is needed to *Develop Chocolate Recipes* but history of chocolate is not needed for that same task.

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Confidentiality



Although the outcomes of the Job Analysis will eventually be summarized in a public-facing document, please do not disclose information about our deliberations or work in progress



Any information other than that provided by BPS can give an unfair advantage or disadvantage to examinees, thereby threatening the validity of the exam



When asked about your involvement, simply direct prospective examinees and other stakeholders to official channels (BPS website) for information about the certification program

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Summary of Meeting Objectives

Review Exam Eligibility Requirements

Develop List of Task Statements

Develop Exam Content Outline

Conduct Linkage Analysis

Revise Tasks and ECO, as needed

Appendix C – Survey Text



BPS 2023 Nuclear Pharmacy (BCNP) Job Analysis Survey **Survey Introduction**

The Board of Pharmacy Specialties (BPS) is conducting a Job Analysis for the Board-Certified Nuclear Pharmacist (BCNP) certification program to develop an updated examination content outline, which serves as a blueprint for the certification exam and the scope for recertification and eligibility purposes.

As part of this Job Analysis, we request your participation in this survey to provide ratings and feedback for the tasks and knowledge areas identified as representing current pharmacy practice in nuclear pharmacy.

Survey respondents will be prompted to rate each task and knowledge area on its importance to nuclear pharmacy practice and its frequency of use.

Additionally, respondents will be asked a few demographic questions to better understand the respondent sample's professional qualifications - but no personally identifiable information will be solicited.

Responses will only be reviewed in aggregate and will not be used for any other purpose than the Job Analysis.

Your participation is expected to take 15 to 30 minutes in total.

Those who complete the survey are eligible for entry into a raffle for one of ten \$25 Amazon gift cards.

If you have any questions about this survey, please feel free to contact ja@aphanet.org.

Are you willing to participate in this survey and provide your responses to BPS?

☐ Yes

☐ No

BPS 2023 Nuclear Pharmacy (BCNP) Job Analysis Survey

Task Statements

Please rate each task statement according to its importance to nuclear pharmacy practice and the frequency of its performance in nuclear pharmacy practice.

	Importance	Frequency
Evaluate patient clinical status, disease state, history, and other pertinent patient characteristics		
Collaborate with the patient, caregiver, and interprofessional healthcare team in the development of patient care plans		
Optimize the administration of radiopharmaceuticals to patients		
Monitor and evaluate patient progress to healthcare outcomes, and recommend any appropriate modifications		
Provide education, counseling, and/or support to patients, caregivers, members of the public, pharmacists, pharmacy learners, and other healthcare professionals		
Lead or participate in healthcare quality improvement, safety, and public health initiatives		

Evaluate, establish, and/or align policies and procedures according to standards of practice, regulatory requirements, and evidence-based medicine		
Develop and/or utilize drug-selection strategies to improve cost effectiveness, resource utilization, and risk mitigation		
Utilize health information technology to optimize patient care		
Engage in nuclear pharmacy professional development, such as healthcare committee involvement, scholarly activities, and continuing education		
Evaluate clinical literature and its applicability to nuclear pharmacy and nuclear medicine practice		
Define material specifications such as quantity, quality, concentration, availability, calibration, expiration, and manufacturer		
Evaluate materials for shipping condition, storage condition, labeling, and acceptability of use		
Evaluate prescriptions and/or orders for radiopharmaceuticals, devices, and adjunct pharmaceuticals		
Select products, components, supplies, and equipment needed to		

prepare, compound, and dispense prescription orders		
Handle sterile and non-sterile pharmaceuticals using radiation safety and/or environmental control techniques		
Perform radiopharmaceutical end-product release testing		
Perform quality assurance procedures for nuclear pharmacy personnel, instrumentation, equipment, and environment		
Document and respond to adverse drug events, recalls, defects, clinical issues, and supply issues		

What task associated with nuclear pharmacy is missing from this list, if any?

BPS 2023 Nuclear Pharmacy (BCNP) Job Analysis Survey

Knowledge Areas

Please rate each knowledge area in the Radionuclides and Radiopharmaceuticals: Procurement and Storage content domain according to its importance to nuclear pharmacy practice and the frequency of its use in nuclear pharmacy practice.

	Importance	Frequency
Radionuclide Production and Radiopharmaceutical Manufacturing		
Materials Specifications and Assessment		
Physical and Chemical Properties of Radionuclides and Radiopharmaceuticals		
Receipt, Labeling, Storage, and Shipping of Radiopharmaceuticals and Devices		
Inventory Management		

Please rate each knowledge area in the Radionuclides and Radiopharmaceuticals: Handling of Radioactive Materials content domain according to its importance to nuclear pharmacy practice and the frequency of its use in nuclear pharmacy practice.

	Importance	Frequency
Preparation of Radiopharmaceuticals		
Compounding of Radiopharmaceuticals		
Radioactive Devices		
Radionuclide Generators		
Radiopharmaceutical Release Testing		
Disposal of Radioactive and Other Materials		

Please rate each knowledge area in the Patient Management: Patient Care Planning content domain according to its importance to nuclear pharmacy practice and the frequency of its use in nuclear pharmacy practice.

	Importance	Frequency
Clinical Assessment and Diagnosis (e.g., clinical presentation, disease state, MUE, SDoH)		
Pharmacodynamics and Pharmacokinetics (e.g., altered biodistribution)		
Goals of Diagnostics and Therapy		
Interprofessional Care Coordination		
Patient and Caregiver Education and Counseling		

Please rate each knowledge area in the Patient Management: Diagnostic and Therapeutic Interventions content domain according to its importance to nuclear pharmacy practice and the frequency of its use in nuclear pharmacy practice.

	Importance	Frequency
Routes of Administration		
Radiopharmaceuticals and Devices used in Diagnostics		
Radiopharmaceuticals and Devices used in Treatment		
Pharmaceutical Adjuncts		

Please rate each knowledge area in the Patient Management: Outcomes and Monitoring content domain according to its importance to nuclear pharmacy practice and the frequency of its use in nuclear pharmacy practice.

	Importance	Frequency
Clinical Status Monitoring		
Radiopharmaceutical-Drug Interactions		
Adverse Drug Events		

Please rate each knowledge area in the Professional Practice: Patient, Occupational, and Public Safety content domain according to its importance to nuclear pharmacy practice and the frequency of its use in nuclear pharmacy practice.

	Importance	Frequency
Practice Standards, Regulations, and Guidelines (e.g., USP, NRC, ACR, FDA, DOT)		
Occupational Safety Requirements, Regulations, and Guidelines (e.g., NRC, EPA, OSHA)		
Radiation Protection		

Please rate each knowledge area in the **Professional Practice: Practice Management** content domain according to its importance to nuclear pharmacy practice and the frequency of its use in nuclear pharmacy practice.

	Importance	Frequency
Equipment (e.g., PEC, heating device, remote handling device)		
Instrumentation (e.g., dose calibrator, survey meter, multichannel analyzer)		
Statistical Analysis		
Quality Management and Process Improvement		

What knowledge area associated with nuclear pharmacy is missing from this list, if any?

BPS 2023 Nuclear Pharmacy (BCNP) Job Analysis Survey

Survey Respondent Demographics

What percentage of your professional practice is spent in nuclear pharmacy?

Which post-graduate pharmacy residency programs have you completed? Select all that apply and leave blank if none.

- ☐ PGY1 Pharmacy
- ☐ PGY1 Managed Care Pharmacy
- ☐ PGY1 Community-Based Pharmacy
- ☐ PGY2 Ambulatory Care Pharmacy
- ☐ PGY2 Cardiology Pharmacy
- ☐ PGY2 Clinical Pharmacogenomics
- ☐ PGY2 Community-Based Pharmacy Administration and Leadership
- ☐ PGY2 Corporate Pharmacy Administration and Leadership
- ☐ PGY2 Critical Care Pharmacy
- ☐ PGY2 Emergency Medicine Pharmacy
- ☐ PGY2 Geriatric Pharmacy
- ☐ PGY2 Health System Pharmacy Administration and Leadership
- ☐ PGY2 Infectious Diseases Pharmacy
- ☐ PGY2 Internal Medicine Pharmacy

- ☐ PGY2 Investigational Drugs and Research
- ☐ PGY2 Medication Use Safety and Policy
- ☐ PGY2 Neurology
- ☐ PGY2 Oncology Pharmacy
- ☐ PGY2 Palliative Care / Pain Management Pharmacy
- ☐ PGY2 Pediatric Pharmacy
- ☐ PGY2 Pharmacotherapy
- ☐ PGY2 Pharmacy Informatics
- ☐ PGY2 Population Health Management and Data Analytics Pharmacy
- ☐ PGY2 Psychiatric Pharmacy
- ☐ PGY2 Solid Organ Transplant Pharmacy
- ☐ PGY2 Specialty Pharmacy Administration and Leadership
- ☐ Other: please specify

Which BPS certifications do you currently hold? Select all that apply and leave blank if none.

- ☐ BCACP - Ambulatory Care
- ☐ BCCCP - Critical Care
- ☐ BCCP - Cardiology
- ☐ BCEMP - Emergency Medicine
- ☐ BCGP - Geriatric
- ☐ BCIDP - Infectious Diseases
- ☐ BCNP - Nuclear
- ☐ BCNSP- Nutrition Support
- ☐ BCOP - Oncology
- ☐ BCPP - Psychiatric
- ☐ BCPPS - Pediatric
- ☐ BCPS - Pharmacotherapy
- ☐ BCSCP - Compounded Sterile Preparations
- ☐ BCTXP - Solid Organ Transplantation

How many years of experience do you have as a pharmacist?

How many years of experience do you have in nuclear pharmacy?

What is your primary practice setting?

- ☐ Academic Institution / Educational Institution
- ☐ Academic Medical Center or Hospital
- ☐ Children’s Hospital
- ☐ Centralized Nuclear Pharmacy - Commercial Network
- ☐ Centralized Nuclear Pharmacy - Independent Pharmacy
- ☐ Community Hospital
- ☐ Pharmaceutical Industry
- ☐ Governmental Healthcare Facility / Veterans Affairs Hospital
- ☐ Other (please specify)

Where is your primary practice located?

State or Territory (if in United States)	-- select state --
Nation/Country	

What percentage of your time do you spend in each area?

Direct Patient Care	
Radiopharmaceutical Handling and Dispensing: Diagnostics	
Radiopharmaceutical Handling and Dispensing: Therapeutics	
Manufacturing	
Administration / Management / Regulatory	
Teaching / Precepting	
Research / Scholarship	
Medical Science Liaison / Sales	
Other	

Does your primary practice facility have a cyclotron or other particle accelerator?

☐ Yes

☐ No



BPS 2023 Nuclear Pharmacy (BCNP) Job Analysis Survey
Thank You

Please provide any feedback or comments about the survey here.

Those who complete the survey are eligible for entry into a raffle for one of ten \$25 Amazon gift cards. If you would like to be entered into the raffle, please enter your email address below. Your email address will be used for the sole purpose of sending your gift card if you win.

Thank you very much for your interest and participation!

Appendix D – Exam Content Outline

1	Radionuclides and Radiopharmaceuticals	47%
1A	Procurement and Storage	20%
1A1	Radionuclide Production and Radiopharmaceutical Manufacturing	
1A2	Materials Specifications and Assessment	
1A3	Physical and Chemical Properties of Radionuclides and Radiopharmaceuticals	
1A4	Receipt, Labeling, Storage, and Shipping of Radiopharmaceuticals and Devices	
1A5	Inventory Management	
1B	Handling of Radioactive Materials	27%
1B1	Preparation of Radiopharmaceuticals	
1B2	Compounding of Radiopharmaceuticals	
1B3	Radioactive Devices	
1B4	Radionuclide Generators	
1B5	Radiopharmaceutical Release Testing	
1B6	Disposal of Radioactive and Other Materials	
2	Patient Management	24%
2A	Patient Care	12%
2A1	Clinical Assessment and Monitoring (e.g., clinical presentation, disease state, MUE, SDoH)	
2A2	Pharmacodynamics and Pharmacokinetics (e.g., altered biodistribution)	
2A3	Goals of Diagnostics and Therapy	
2A4	Interprofessional Care Coordination	
2A5	Patient and Caregiver Education and Counseling	
2A6	Radiopharmaceutical-Drug Interactions	
2A7	Adverse Drug Events	
2B	Diagnostic and Therapeutic Interventions	12%
2B1	Routes of Administration	
2B2	Radiopharmaceuticals and Devices used in Diagnostics	
2B3	Radiopharmaceuticals and Devices used in Treatment	
2B4	Pharmaceutical Adjuncts	
3	Professional Practice	29%
3A	Patient, Occupational, and Public Safety	14%
3A1	Practice Standards, Regulations, and Guidelines (e.g., USP, NRC, ACR, FDA, DOT)	
3A2	Occupational Safety Requirements, Regulations, and Guidelines (e.g., NRC, EPA, OSHA, BOP)	
3A3	Radiation Protection	
3B	Practice Management	15%
3B1	Equipment (e.g., PEC, heating device, remote handling device)	
3B2	Instrumentation (e.g., dose calibrator, survey meter, multichannel analyzer)	
3B3	Statistical Analysis and Research Methods	
3B4	Quality Management and Process Improvement	