



PAEA End of Curriculum™ Exam

FACULTY GUIDE 2019

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Preface

Dear Members,

We are excited to introduce you to the new PAEA End of Curriculum™ exam. This 300-question exam was developed over four years by a team of PA educators and national exam experts. In fact, faculty from 80 unique programs contributed their time, expertise, and unique perspectives to help us launch the first version of the End of Curriculum exam.

As you may know, the PAEA End of Curriculum exam, delivered in the final four months of the PA program, is an objective, standardized evaluation of a PA student's medical knowledge as one component of their readiness for graduation.


Moreover, the exam is designed to complement other assessment tools in programs' summative evaluations. It should be noted that the End of Curriculum exam is not intended to assess interpersonal skills, clinical and technical skills, professionalism, and clinical reasoning. Additionally, some programs may have specific areas of medical knowledge unique to their outcomes and mission that may require assessment beyond the End of Curriculum exam. It's also critical that programs understand that the exam is not intended to correlate with or predict student performance on the Physician Assistant National Certifying Exam (PANCE).

This faculty guide offers context to the End of Curriculum exam's development, including how its blueprint, guiding principles, content area list, exam items, and core tasks and objectives were created, and the scientific review that occurred upon completion. Furthermore, it touches on the exam's overall construct validity.

We know that summative assessment near the end of a student's education is critical for PA program faculty to determine a student's readiness for graduation. While the End of Curriculum exam focuses on the assessment of medical knowledge, we reiterate that it remains one component of a PA student's readiness for graduation.

We hope you find this guide helpful and appreciate your continued participation in PAEA. Should you have additional questions, feel free to contact me directly at oziegler@PAEAonline.org.

Sincerely,



Olivia Ziegler, Chief Assessment Officer

Contributors

PAEA would like to acknowledge the countless hours of over 100 individual faculty members from 80 unique programs who were instrumental in the development and launch of the PAEA End of Curriculum Version 1 exam. In particular, we would like to thank Denise Rizzolo, PhD, PA-C; Kim Cavanagh, DHSc, PA-C; and Betsy D. Ekey, MPAS, PA-C for their contributions to the faculty guide.

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Contact Us

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SECTION 1

End of Curriculum™ Exam

STATEMENT OF PURPOSE

The PAEA End of Curriculum exam is an objective, standardized evaluation of a PA student's medical knowledge as one component of their readiness for graduation.

This 300-question exam was built using a blueprint and content area list developed by PA educators and national exam experts, and is intended to be delivered in the final four months of the PA program. All exam items are peer-reviewed and statistically validated for accuracy and consistency. Exams are delivered through a secure, password-protected website that utilizes a lockdown browser to maintain content validity.

BACKGROUND

The Test Item Bank Advisory (TIBA) Committee was formed in 2011 to explore the potential offering of additional exam products by PAEA. The Committee was comprised of 10 members including representatives of the PAEA Board of Directors, program directors, program faculty, and clinical coordinators. The TIBA recommended maintaining PACKRAT®, a self-assessment tool for student and curricular evaluation, and developing two new examination programs: End of Rotation™ examinations and a new comprehensive examination—which would later become the End of Curriculum™ exam. The TIBA determined that End of Rotation exam development should be prioritized as it was the most pressing need for members, and Version 1 of the End of Rotation exams was released in January of 2013. Development of a new comprehensive exam began in earnest in 2016. Staff and volunteer leadership worked together to develop a framework for the comprehensive exam, starting with renaming it the PAEA End of Curriculum exam. The name was selected as it more clearly designates the purpose of the examination.

The End of Curriculum exam development process has been thoughtful and rigorous, and done in accordance with the *Standards for Educational and Psychological Testing*,¹ established by the American Psychological Association, the American Educational Research Association, and the National Council on Measurement in Education. A diverse group of PA program faculty from across the country were directly involved in the creation of the following exam components: blueprint and content area lists; writing and peer review of all exam items; development of performance and policy level descriptors; and exam standard setting. Additionally, 80 programs participated in one or more ways to launch the first version. This level of participation is critical to the exam's quality.

There are two equated forms available. If a student fails on his or her first attempt and the PA program would like the student to retake the End of Curriculum exam, they may do so only once and no earlier than 60 days after their initial administration. This ensures that the student and program have adequate time to develop and implement an individualized remediation plan.

SECTION 2

Exam Development & Construction Methods

CONSTRUCT VALIDITY

Exam development board members, assessment staff, and psychometricians used the following resources to guide the creation of exam content and construct exam forms: exam blueprint, guiding principles, content area list, and core tasks and objectives.

PAEA undertook a multi-stage process to develop and ratify these documents to ensure construct validity. A special workgroup, that included a subset of members from the previous PAEA Assessment Council as well as two psychometricians, performed an extensive literature review and sampled a number of documents to ensure exam resources closely aligned with a common curriculum across PA programs. It is important to understand that the exam will not cover the curriculum of every PA program. Its stated intent is to serve as an objective and standardized evaluation of a student's medical knowledge as one component of their readiness for graduation. It is the responsibility of an individual PA program to ensure that the content is appropriately mapped to the local program's stated mission, goals, and outcomes. The exam should be utilized in conjunction with other evaluation tools to meet the ARC-PA's 4th Edition C3.04 or the ARC-PA's 5th Edition B4.01 accreditation requirements.

PAEA will conduct periodic review of all resources to validate that exam content is up to date with current evidence-based practices.

BLUEPRINT

The exam blueprint ([Appendix A](#)), by design, is multi-dimensional and organized by task area, content area, and four proposed entrustable professional activities (EPAs).



End of Curriculum™ Exam Blueprint

PROPOSED ENTRUSTABLE PROFESSIONAL ACTIVITIES	Gather essential and accurate information about patients through history-taking, physical examination, and the use of laboratory data, imaging, and other methods			Develop and implement patient management plans		Provide preventive health care services and education	Locate, critically evaluate, integrate, & appropriately apply scientific evidence to patient care	Totals	
	End of Curriculum 250-Question Exam	History & Physical	Diagnostic Studies	Diagnosis	Clinical Intervention	Clinical Therapeutics	Health Maintenance		Scientific Concepts
	(18%)	(10%)	(22%)	(12%)	(18%)	(10%)	(10%)	(100%)	
Cardiology	(16%)	7	4	9	5	7	4	4	40
Pulmonology	(12%)	5	3	7	4	5	3	3	30
Gastrointestinal/nutritional	(10%)	5	3	6	3	4	2	2	25
Orthopedics/rheumatology	(10%)	5	3	6	3	4	2	2	25
Head, ears, eyes, nose, oral cavity, and throat (HEENOT)	(8%)	4	2	4	2	4	2	2	20
Obstetrics/gynecology	(8%)	4	2	4	2	4	2	2	20
Endocrinology	(6%)	3	2	3	2	3	1	1	15
Neurology	(6%)	3	2	3	2	3	1	1	15
Psychiatry/behavioral medicine	(6%)	3	2	3	2	3	1	1	15
Urology/renal	(6%)	3	2	3	2	3	1	1	15
Dermatology	(4%)	2	1	2	1	2	1	1	10
Hematology	(4%)	2	1	2	1	2	1	1	10
Infectious diseases	(4%)	2	1	2	1	2	1	1	10
Totals:	(100%)	48	28	54	30	46	22	22	250

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Setting	Percent
Outpatient	60%
Inpatient	20%
Emergency department	10%
Perioperative	10%

Life course	Percent
Pediatric (birth to age 17)	20%
Adult	60%
Geriatric (older person with considerable impairment or frailty. ¹)	20%

Bloom's Taxonomy ²	Percent
Analyze & evaluate	40%
Understand & apply	50%
Remember	10%

Entrustable Professional Activities (EPAs)

Unique to this exam, PAEA chose to include four of the Association’s proposed EPAs²—demonstrating which EPAs can be assessed with this exam. EPAs were added to the blueprint by the workgroup that developed the blueprint in 2016. The workgroup considered all available possibilities, including mapping to the [PAEA Core Competencies for New PA Graduates](#)³ (which were not yet public but available to the workgroup). Ultimately, EPAs were chosen because they are brief, action-oriented, and without qualifiers and thus can be aligned with the End of Curriculum task areas; for example, the EPA “Provide preventative health care services and education” is aligned with the task area “Health Maintenance.” Programs also have the option to map the blueprint to competencies. This can be easily done through the EPAs. In fact, each EPA can be aligned with multiple competencies. For example, the EPA “Develop and implement patient management plans” can be mapped to the following competencies: “Patient-Centered Practice Knowledge”; “Health Literacy”; and “Communication.”

In 2016, the PAEA Presidents Commission proposed 15 EPAs for PA education.² The End of Curriculum blueprint only includes four because not all EPAs can be assessed through a multiple choice exam and not all of the 15 EPAs are aligned with the exam’s purpose of assessing medical knowledge. Significant thought was given as to which EPAs could be partially demonstrated in a knowledge based multiple choice exam and mapped to the End of Curriculum exam. It is our hope that PA programs will use this as a starting point to map all of the components of their program’s summative evaluation to EPAs.

Content Areas

This content area list covers 13 organ systems, each divided into disease processes associated with the organs and tissues within each system, along with the percentage of the exam content included in the exam for each area. We recognize that topics on the content area list ([Appendix B](#)) are considered only a sample of what might be covered in PA education, and the list is not intended to be all inclusive. It is focused on content that PA expert educators felt was important. Content areas are organized to include topics in broad categories and do not necessarily indicate a greater importance or emphasis on that area in the exam.

To learn more, visit: <https://paeaonline.org/wp-content/uploads/2018/05/eoc-topiclist-20180524.pdf>

Core Tasks and Objectives

Core Tasks and Objectives ([Appendix C](#)) are assessed by all of the PAEA examinations (PACKRAT, End of Rotation, and End of Curriculum) and should be provided to students in conjunction with the individual examination blueprints and content area lists. This will aid students in their preparation for the exams. We recognize that each program will have additional objectives that correspond to their individual curricula and encourage programs to provide a consolidated list of objectives to students. [Appendix D](#) provides a worksheet example of how your program might map PAEA core tasks and objectives to program-specific outcomes.

To learn more, visit: <https://paeaonline.org/assessment/core-tasks-and-objectives/>

Guiding Principles

Several cross-cutting criteria guided the development of the End of Curriculum exam. The goal of cross-cutting criteria is to ensure that the exam, to the extent a multiple choice exam can, evaluates a wide breadth of medical knowledge critical to a PA student's readiness for graduation.

Items written for this exam expressly consider the broad diversity of patients that PAs will be called upon to treat, focusing on patient care setting (Inpatient, Emergency Department, Perioperative, and Outpatient settings) and life-span (Pediatric, Adult, and Geriatric Patients). Additional consideration was given to diversity including, but not limited to, race, ethnicity, nationality, gender identity, sexual orientation, socioeconomic status, cultural identity, religion, and functional diversity.

This exam employs the principles of Bloom's Taxonomy to demonstrate that examinees who pass the exam have demonstrated a thorough mastery of content. This exam was developed with targets for a consolidated Bloom's Taxonomy breakdown (Remember, Understand and Apply, and Analyze and Evaluate).

ITEM FORMAT

The End of Curriculum exam uses a "one best answer" format. It consists of a scenario or vignette (known as a stem), a question (known as a lead-in), and a list of potential solutions. The list of solutions consists of one correct or best answer (known as the key) and incorrect or inferior alternatives (known as distractors).

Each item on the End of Curriculum exam includes a clinical vignette, with varying degrees of complexity. Vignettes are a good measure for assessing higher-order thinking skills and provide a better approximation of real-life practice.⁴

The following vignette is a sample item consistent with those on the End of Curriculum exam:

A 19-year-old woman comes to the office for evaluation of throbbing headaches of increasing frequency, from once a month to three times a month over the past year. She has associated photophobia, nausea, and vomiting. She sees floating spots prior to each headache. The patient has tried ibuprofen (Motrin) without relief. Temperature is 36.7°C (98.0°F), pulse rate is 68/min and regular, respirations are 14/min and unlabored, and blood pressure is 122/68 mmHg. Funduscopic exam reveals no papilledema. There are no focal neurologic deficits. ← ITEM STEM

Which of the following is the most appropriate for acute management of the patient's headaches? ← LEAD-IN

DISTRACTORS →

- A. Mirtazapine (Remeron)
- B. Propranolol (Inderal)
- C. Sertraline (Zoloft)
- D. Sumatriptan (Imitrex) ← KEY**
- E. Verapamil (Calan)

Note the structure of the stem and potential options. All of the items on our exams are coded to the blueprint and topic list; the coding for this specific item is as follows:

Content Area:	Neurology
Task Area:	Clinical Therapeutics
EPA:	Develop and implement patient management plans
Diagnosis:	Migraine headache
Setting:	Outpatient
Life Course:	Adult
Bloom's Taxonomy:	Analyze and Evaluate

ITEM GENERATION AND PILOT TESTING

Over a two-year period, 800 items were written to construct the first two exam forms for publication in January 2020. There are 300 items on two forms: 250 on each form are operational (or scored), 50 are pre-test (or unscored). This practice enables PAEA to build a validated test bank.

The End of Curriculum exam went through two blocks of pilot testing to gather performance data and exam statistics on the items. The first pilot test occurred between October 2018 and February 2019. PAEA specifically targeted programs with students in the last four months of their program, graduating between December 2018 and May 2019. Five blocks of 100 items each were constructed for administration. Students were randomly assigned one block of 100 items in a secure setting proctored by program faculty or staff. A total of 1,004 students from 24 programs participated in this first block pilot test.

This initiative was followed by a limited release exam between August and October 2019. The limited release was developed using 300 items including scored items (statistics derived from data gathered from the block pilot test), and new pre-test items. Much like the first pilot test, we targeted programs with students in the last four months of their program, graduating between September 2019 and January 2020. Programs agreed to require the full class participation and administration in a secure proctored setting on campus. A total of 784 students from 20 programs participated in the limited release. During the limited release the Safe Exam browser was utilized.

Ultimately, a diverse group of programs, from all regions of the U.S. and with a well-represented student sample, participated in our pilot testing. Programs were both well-established and newly developed, public and private, with large and small class sizes. This ensured an accurate representative sample of PA students and programs.

ITEM ANALYSIS AND KEY VALIDATION

We perform ongoing analyses of operational and pre-test items to ensure that they are meeting expectations. After we retrieve data on pre-test and operational items, we perform classical analyses on the following:

- Percentage of students selecting each multiple-choice option
- Overall p-value for each item
- Point-biserial correlation for key (rkey)
- Point-biserial for distractor response options (rdist)

Consistent with best practices outlined in joint technical standards (American Educational Research Association, American Psychological Association, National Council on Measurement in Education),¹ PAEA uses the results of an item analysis to identify items in need of further content review and key validation by subject matter experts. Given that End of Curriculum exam items are all multiple choice, a p-value lower than chance may be indicative of an item not functioning as desired. Conversely, if an item proves to be overly easy, it may warrant flagging for additional review. The point-biserial correlation, r , is a measure of item discrimination. It can be calculated for the keyed option (rkey) as well as each incorrect distractor (rdist). Items with large and positive rkey and all rdist near or below zero are behaving as expected. If an rdist is positive, especially if rdist is larger than rkey, the item may be miskeyed. PAEA uses four flagging criteria to identify items for review:

- $p < .2$
- $rkey < 0.1$
- $rkey < rdist$ for at least one distractor
- $p < 0.9$ and at least one $rdist > 0.0$

Items flagged during the development of Version 1 of the End of Curriculum exam were reviewed on two separate occasions in advance of publication. One review was conducted by subject matter experts during an annual Exam Development Summit in March 2019. A second review was held during the PAEA Education Forum in October 2019. Prepared materials for the key validation meetings include a display of each item to be reviewed and a collection of relevant statistical information for each item. Subject matter experts reviewed each flagged item and decided whether to keep the item as is (“accept”), mark the item as “rewrite,” or delete the item (“reject”). A psychometrician recorded the decision for each item and assisted with the interpretation of statistical information. This process will continue yearly after the exam is published.

STANDARD SETTING

Standard setting is a critical component of nationally standardized educational testing. The process defines *categorical scores* that correspond to policy level descriptors. Standard setting of the End of Curriculum exam will help programs by indicating whether a student has limited, satisfactory, or advanced medical knowledge.

Determining these categorical scores, or the scores that fit into each performance level, is made through a formal standard setting process. At PAEA, the initial process was completed by a workgroup

consisting of PA educators in a variety of roles and inclusive of the variety of PA programs. Care was taken to ensure that the workgroup included well-qualified educators and was a sufficiently large, representative sample of our membership.

The initial standard setting meeting was held in Chicago, Illinois, in November 2019. Over a three-day work session, 21 of the 25 invited PA educators met to determine the appropriate categorical scores. To set standards, the team leveraged the Bookmark Method, which was selected over ID Matching and Angoff methods. Here are the reasons why the Bookmark Method was selected:

1. The Bookmark Method is well-known and used in a majority of state assessment programs.
2. Bookmark combines psychometric information on item difficulty with expert judgments from work group members.
3. Bookmark focuses discussion on those items that are closest to the scores between each of the three categories, e.g., between limited medical knowledge and satisfactory medical knowledge, and between satisfactory medical knowledge and advanced medical knowledge.

The Bookmark Method earned its namesake because, traditionally, all workgroup members received a paper booklet with one item on each page. Those items were presented in order from easiest to hardest. Setting the bookmark meant, quite literally, placing a bookmark at the point in the booklet where workgroup members believed a student with limited medical knowledge would no longer answer questions correctly. Once all workgroup members place their bookmarks, debate, discussion, and convergence can occur. PAEA's process was completed with an electronic application mimicking the traditional Bookmark experience.

The PAEA standard-setting workgroup agreed upon two bookmarks and all scores were placed into each of the three performance categories. A report was then presented to the PAEA Board of Directors and approved in Austin, Texas, in December 2019. The Standard Setting process will be repeated approximately every 3–5 years.

PROJECT PLANNING AND QUALITY

Developing a high-quality, national standardized exam, with multiple equivalent exam forms is a significant endeavor. Multiple individuals and processes are involved. And a well-documented system of exam development is necessary to ensure quality. At PAEA, we utilize project management and quality assurance processes to ensure production goals are met and the quality of the End of Curriculum exam is maintained through a systematic approach.

SECTION 3

Scoring & Analytical Reports

STATEMENT OF PURPOSE

The PAEA End of Curriculum exam is an objective, standardized evaluation of a student’s medical knowledge as one component of their readiness for graduation. It is important that programs have a clear understanding of the characteristics, meaning, intended interpretation, and also the limitations of the End of Curriculum scoring and analytical reports. Scores should only be used to interpret a student’s medical knowledge as one component of their readiness for graduation.

Programs are cautioned against interpreting the scoring and analytical reports outside of the statement of purpose. Specifically, PAEA explicitly discourages programs from utilizing the End of Curriculum exam as a stand-alone summative evaluation. A single multiple choice exam is not capable of addressing and measuring the full scope of graduation readiness. Pointing to the ARC-PA-defined summative evaluation components, the exam should be used in conjunction with other program assessment tools, as research suggests that multiple assessments increase the reliability that programs are truly measuring the skill or knowledge level they are intending to measure.⁵

PERFORMANCE AND POLICY LEVEL DESCRIPTORS

Performance levels are the “labels...classifying a test taker’s competency in a particular domain,”⁶ whereas performance level descriptors are the knowledge, skills, and abilities required of a student in each category.

Performance level descriptors differ slightly from policy level descriptors. Policy level descriptors are “policy definitions that determine how rigorous and challenging the standards will be for the assessments. They are not linked to content but are more general statements that assert an organization’s position on the desired level of performance or rigor intended at each level.”⁶ The following policy level descriptors were developed for the End of Curriculum exam and assist in identifying the categorical scores in the standard setting process.

	LIMITED MEDICAL KNOWLEDGE	SATISFACTORY MEDICAL KNOWLEDGE	ADVANCED MEDICAL KNOWLEDGE
POLICY LEVEL	The learner at the limited performance level demonstrates a partial understanding of general medical knowledge.	The learner at the satisfactory performance level demonstrates a sufficient understanding of general medical knowledge.	The learner at the advanced performance level demonstrates a comprehensive understanding of general medical knowledge.

SCALE SCORES AND FORM EQUATION

The End of Curriculum exam utilizes scale scores to report students' scores. Scale scores are scores that have been mathematically transformed from one set of numbers (i.e., the raw score) to another set of numbers (i.e., the scale score), in order to make them more easily comparable between different forms of the same exam. Doing so allows for a single performance report even though there are two forms of the exam—a process known as equating. The primary benefit to scale scores is that they allow all scores on all versions and forms of End of Curriculum to be comparable across years as they all use the same scale metric.

The scale for the End of Curriculum is 1200 to 1800. This scale was selected to avoid confusion with other common scoring systems used for the End of Rotation exams, PACKRAT, and the PANCE. The decision to have a scale of 600 points was based in part on reliability. If too few scale score points are used, then the reliability of the scale scores is decreased as scoring information is lost at the far ends of the scale. A 600-point scale demonstrates a normal distribution of scores over a bell-shaped curve.¹

PAEA will attempt to maintain a common scale over time and will conduct periodic checks of the stability of the scale on which we are reporting scores.

SCORE INTERPRETATION

The End of Curriculum exam uses categorical performance levels to indicate whether the student has limited, satisfactory, or advanced medical knowledge. Every student receives a scale score and a graphical representation of their score compared to the national average. Feedback is also provided by content and task areas, as well as by EPA, patient care setting, life course, and Bloom's Taxonomy level—all with national comparison data. This is a summative assessment so keyword feedback is not provided. All of this information is included in the program's composite and cohort performance reports, which include cohort means.

Interpret with Caution

For the PAEA End of Curriculum exam, categorical scores and policy level descriptors will be provided to programs. PAEA urges programs to interpret and use these categorical scores as well as national comparison data carefully and thoughtfully, as a variety of factors can influence individual and cohort-level performance. It is up to individual programs to decide if these categorical scores accurately represent a pass score within their individual programs and to determine the weight of the assessment that is most appropriate for their program.

In addition, data on sub-scores should be interpreted with caution as they may be associated with a small number of items with varying levels of difficulty. However, they do have value if used to assess a content section on multiple exams. For example, if sub-scales in hematology are consistently low across locally developed exams, PAEA End of Rotation exams, and the PAEA End of Curriculum exam, it may be worth reflecting on the program's curriculum to determine if hematology is covered in sufficient detail across the curriculum.

Data Triangulation

Data triangulation is a useful way to validate that a student has met a specific outcome relative to, and required by, your program. Triangulation takes multiple forms of assessment tools and ensures that the results match and/or are consistent with one another. While these forms of assessment are not exactly the same, a student who is ready to graduate should achieve consistent and similar scores across all three (or more) assessment tools.

Trends

For each End of Curriculum exam, scale scores can be compared between exam forms and across cohort years. We recommend that programs look at cohort data, examine cohort trends year over year, and compare them to the national exam data and national trends year over year.

SAMPLE REPORTS

It is important that programs have a clear understanding of the characteristics, meaning, intended interpretation, and the limitations of the End of Curriculum exam scoring and analytical reports. Sample reports can be found below.

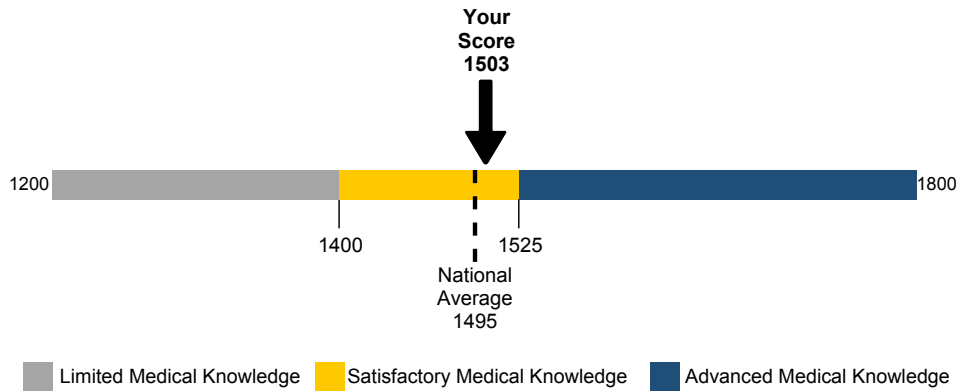
An important note for the End of Curriculum Version 1 Exam: Comparative all program data is based on a reference population. For End of Curriculum Version 1, the reference population is the examinees from the End of Curriculum exam 2019 limited release pilot test. This limited release pilot test consisted of 784 students (from 20 programs) in the final four months of their program who took the exam questions in full forms from August 26 to October 4, 2019. All programs with graduation dates in this window were invited to participate. When recruiting programs, PAEA sought diversity in geographic region, institution type (public/private), and class size, and inclusion of both new and established programs. In January 2021 starting with Version 2, the reference population will consist of the previous year's examinees.

Student Performance Report

The Student Report shows the test taker how they performed on the exam compared to national averages. The top of the report demonstrates where the student's score falls on the scale and within the performance levels, relative to the national average. Sub-scores help the test taker identify target areas of strengths and weaknesses relative to national average performance. It is a PDF file that students and faculty can download and review together.

End of Curriculum Exam Performance Report

Student Thirty
Exam Date: 12/30/2019



Feedback by Content Area and Task Area

Content Area	Content Blueprint	Your Performance	National Average
Cardiology	16%	1425	1499
Dermatology	4%	1479	1493
Endocrinology	6%	1583	1494
Gastrointestinal/Nutritional	10%	1575	1498
Head, ears, eyes, nose, oral cavity, and throat	8%	1434	1496
Hematology	4%	1433	1501
Infectious Diseases	4%	1575	1493
Neurology	6%	1475	1498
Obstetrics/Gynecology	8%	1454	1501
Orthopedics/Rheumatology	10%	1559	1496
Psychiatry/Behavioral Medicine	6%	1436	1494
Pulmonology	12%	1593	1496
Urology/Renal	6%	1615	1491
Task Area			
Clinical Intervention	12%	1459	1498
Clinical Therapeutics	18%	1472	1495
Diagnosis	22%	1507	1499
Diagnostic Studies	10%	1518	1493
Health Maintenance	10%	1578	1492
History and Physical	18%	1512	1498
Scientific Concepts	10%	1487	1497

Feedback by Entrustable Professional Activity

EPA	Content Blueprint	Your Performance	National Average
Gather essential and accurate information about patients through history-taking, physical examination, and the use of laboratory data, imaging, and other methods	50%	1513	1495
Develop and implement patient management plans	30%	1468	1495
Provide preventative health care services and education	10%	1578	1492
Locate, critically evaluate, integrate, & appropriately apply scientific evidence to patient care	10%	1487	1497

Feedback by Key Dimension Areas

Setting	Content Blueprint	Your Performance	National Average
Outpatient	60%	1496	1495
Inpatient	20%	1528	1494
Emergency Department	10%	1470	1496
Perioperative	10%	1571	1494

Life Course	Content Blueprint	Your Performance	National Average
Pediatric (birth to age 17)	20%	1451	1496
Adult	60%	1516	1495
Geriatric (older patient with impaired overall function)	20%	1519	1495

Bloom's Taxonomy	Content Blueprint	Your Performance	National Average
Analyze & Evaluate	40%	1508	1495
Understand & Apply	50%	1477	1495
Remember	10%	1558	1495

Student Score Report Disclaimer:

Your location in one of three performance categories is noted. The three performance categories are:

- Limited Medical Knowledge: The learner at the limited performance level demonstrates a partial understanding of general medical knowledge.
- Satisfactory Medical Knowledge: The learner at the satisfactory performance level demonstrates a sufficient understanding of general medical knowledge.
- Advanced Medical Knowledge: The learner at the advanced performance level demonstrates a comprehensive understanding of general medical knowledge.

The "National Average" is comparative data, based on average scores of a reference population of test takers in the relevant stage of their PA education. The National Average at the top of the score report and provided in the last column of the feedback sections are points of reference so you can compare your performance to your peers.

The listed percentages in the "Content Blueprint" column reflect the percentage of questions targeted for inclusion on each exam form; however, the actual content percentage on your test form may vary slightly from this target.

The number listed in the "Your Performance" column reflects your performance on the test questions in each area. Like the total score, your performance in each area ranges from 1200 to 1800.

Cohort Performance Report

The Cohort Performance Report shows program faculty how the cohort of test takers compare to national averages. Overall and sub-score cohort averages are compared to the national average. The report also shows the cohort distribution among the performance levels compared to the reference population distribution. It is an HTML report that is updated as exams are completed and can be printed or saved as a PDF.

PAEA Sample University Performance Report by Class End of Curriculum Exam (v1)

This report presents information on students and scores for the End of Curriculum examination. Specific information about your program is confidential and is not released to any other program.

	Number of Exams	Mean Score	Standard Deviation
All PROGRAMS			
Reference Population	784	1495	53
CLASS - Class of 2020			
Class Average	40	1490	88

	CLASS - Class of 2020 Percent	All PROGRAMS Percent
Performance Levels		
Limited Medical Knowledge (1200-1399)	15%	2.6%
Satisfactory Medical Knowledge (1400-1524)	60%	72.3%
Advanced Medical Knowledge (1525-1800)	25%	25.1%

	CLASS - Class of 2020 Average Score	All PROGRAMS Average Score
CONTENT CATEGORIES		
Cardiology	1479	1499
Dermatology	1498	1493
Endocrinology	1533	1494
Gastrointestinal/Nutritional	1493	1498
Head, ears, eyes, nose, oral cavity, and throat	1406	1496
Hematology	1498	1501
Infectious Diseases	1526	1493
Neurology	1455	1498
Obstetrics/Gynecology	1507	1501
Orthopedics/Rheumatology	1481	1496
Psychiatry/Behavioral Medicine	1535	1494
Pulmonology	1509	1496
Urology/Renal	1532	1491

TASKS		
Clinical Intervention	1456	1498
Clinical Therapeutics	1512	1495
Diagnosis	1462	1499
Diagnostic Studies	1493	1493
Health Maintenance	1517	1492
History and Physical	1489	1498
Scientific Concepts	1506	1497
Entrustable Professional Activity		
Gather essential and accurate information about patients through history-taking, physical examination, and the use of laboratory data, imaging, and other methods	1476	1495
Develop and implement patient management plans	1492	1495
Provide preventative health care services and education	1517	1492
Locate, critically evaluate, integrate, & appropriately apply scientific evidence to patient care	1506	1497
Key Dimension: Setting		
Outpatient	1490	1495
Inpatient	1498	1494
Emergency Department	1466	1496
Perioperative	1506	1494
Key Dimension: Life Course		
Pediatric (birth to age 17)	1478	1496
Adult	1495	1495
Geriatric (older patient with impaired overall function)	1483	1495
Key Dimension: Bloom's Taxonomy		
Analyze & Evaluate	1473	1495
Understand & Apply	1493	1495
Remember	1525	1495
Program Performance Report Disclaimer:		
<p>Comparative data contained in both the class average table at the top of the report and the "Content Area Feedback" sections are based on a reference population of test takers in the relevant stage of their PA education. The value listed in the "Class of 2020 Average Score" column reflects your cohort's performance on the test questions in each area. Like the total score, your program's performance ranges from 1200 to 1800.</p> <p>The "All PROGRAMS Average Score" column is comparative data. The score in this column is the average score of a reference population of test takers in the relevant stage of their PA education programs on items in each area of the End of Curriculum examination. The information provided in the last column is provided as a point of reference so you can compare your cohort's performance to national performance.</p> <p>For guidance on how to interpret the results, please visit EndofCurriculum.org.</p>		

Composite Report

The Composite Report compiles individual student scores into an Excel workbook that shows each student's overall and sub-score information, the date they took the exam, and whether the result has been released to the student. The Excel workbook includes a Keys tab, which indicates what each column stands for relative to the blueprint.

SECTION 4

Integration of the PAEA End of Curriculum Exam

INTRODUCTION

Summative assessment near the end of a student's education is critical for PA program faculty to determine a student's readiness for graduation. Outlined below is a checklist to assist programs in discussions about End of Curriculum exam adoption and integration. We encourage program faculty to begin these conversations prior to adopting the exam.

Alignment with other program assessments

- What other types of summative assessments are conducted, particularly in the last four months of the program?
- How would the End of Curriculum exam integrate into these assessments?

Outcome mapping

- Using the exam blueprint, content area list, and core task areas and objectives, how does the End of Curriculum exam map to programmatic outcomes?
- How do other program assessments match with program outcomes?

Administration process

- At what point in the final four months of the program should the End of Curriculum exam be administered?
- Where will the exam be administered?
- Will students use university-owned or personal computers?
- Have you considered administration time and procedures?
- Do you have a proctoring plan?

Grade integration

- How will your program use the categorical and scale exam scores in grade determination and/or graduation readiness assessment?
- If you assign a final grade for the summative exam components, what proportion of the grade will be assigned to the End of Curriculum exam?

Remediation plan

- How will you work with a student who does not meet the program-required standard for the End of Curriculum exam?

ACHIEVING ALIGNMENT

PAEA recommends that when programs adopt any assessment tool, they have a thoughtful and meaningful reason as to why they are using it to evaluate their students. While PAEA has developed a suite of assessments for PA programs across the country, it is the responsibility of individual programs to justify how these assessment tools meet their own program mission, goals, and outcomes. We encourage programs to give thoughtful consideration to these issues prior to adopting our assessment tool. Taking the time to do this helps programs ensure that:

- Assessments, learning objectives, and instructional strategies are closely aligned.
- The content is appropriately mapped to the program's stated goals, outcomes, and objectives.
- Additional evaluation tools are used to meet the other three ARC-PA 4th Edition C3.04 or 5th Edition B4.01 requirements, as well as any specific individual program medical knowledge requirements for students to qualify for a degree from the program.
- Appropriate weighting is applied to each assessment as determined by the program.

The End of Curriculum exam focuses on the assessment of medical knowledge. The exam blueprint features targets for patient care setting and life course. In addition, the exam is only to be given as one component of the summative evaluation in the last four months of the PA program—per the ARC-PAs definition.

Programs should use the resources provided in this Faculty Guide to align program mission, goals, and outcomes to the End of Curriculum exam's blueprint, core tasks and objectives, and guiding principles.

One great way to accomplish this is to use the program's curriculum committee, or time during a faculty meeting or retreat, to develop a specific map that shows the program mission, goals, and outcomes and draws a direct connection to objectives, content areas, and other aspects of the End of Curriculum exam. Other parts of program summative evaluation (for example, program-developed OSCEs) should also be added to the map to demonstrate student evaluation related to program outcomes.

Mapping a Curriculum to the End of Curriculum Content Outline

The first step in adopting a new exam as one component of the summative evaluation is to review your current summative evaluation. Assess how it aligns with your program's goals and learning outcomes, the weight of each assessment relative to the overall summative evaluation, and where the criteria are documented for students. See a sample worksheet on the next page.



Summative Assessment Tool – Alignment Worksheet

Program Mission, Goals, and Outcomes	Didactic Course, Learning Activity, or Clinical Experience	Current Summative Assessment Tools	Weight of Category Relative to the Overall Summative Evaluation	Where Criteria Are Documented for Students
Conduct and document a thorough and accurate history and physical examination; appropriately interpret findings	1. History and Physical Examination 1, 2, 3 2. Clinical Medicine 1 and 2 3. Small Groups 4. Clinical Rotations (all) 5. Skills Lab 6. Capstone	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Student Handbook Learning Management System Course Syllabus Student File
Develop an appropriate differential diagnosis	1. Laboratory Science 2. Clinical Medicine 1 and 2 3. History and Physical Examination 2 and 3 4. Small Groups 5. Clinical Rotations (all) 6. Capstone	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Student Handbook Learning Management System Course Syllabus Student File
Initiate an appropriate diagnostic evaluation considering the differential diagnosis	1. Clinical Medicine 1 and 2 2. Laboratory Science 3. Small Groups 4. History and Physical Examination 2 and 3 5. Clinical Rotations (all)	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Student Handbook Learning Management System Course Syllabus Student File
Formulate a management plan including pharmacologic and non-pharmacologic modalities	1. History and Physical Examination 2 and 3 2. Small groups 3. Clinical Rotations (all) 4. Clinical Medicine 1 and 2 5. Clinical Pharmacology 1 and 2	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Clinical Handbook Learning Management System Student File Syllabus
Demonstrate technical accuracy in performance of clinical procedural skills	1. Skills Lab 2. Clinical Rotations (all)	1. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 2. Clinical skill practical with procedure documentation 3. Diagnostic interpretation worksheet 4. *Portfolio	**Pass/Fail - non-compensatory	Clinical Handbook Learning Management System Student File Syllabus
Demonstrate professionalism through action and communication	1. History and Physical Examination 1, 2, 3 2. Small Groups 3. Skills Lab 4. Professional Practice 5. Capstone 6. Clinical Rotations (all)	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Clinical Handbook Learning Management System Student File Syllabus

Step two of exam adoption is mapping, which involves linking the program’s mission, goals, and outcomes to the End of Curriculum blueprint, core tasks and objectives, and guiding principles. To be effective, this process should include full faculty participation and support. See [Appendix E](#) for a sample worksheet to guide your program through this important exercise.

PAEA recommends that programs share PAEA’s Core Tasks and Objectives in conjunction with the blueprint so students can be prepared for the exams. We recognize that each program will have additional objectives that correspond to their local curricula. We encourage programs to tie the PAEA documents to their individual program objectives.

The End of Curriculum exam items are written and peer reviewed by PA educators from programs across the country. PAEA’s practice is to ask item writers to utilize multiple evidence-based sources when writing exam items. This is further verified in the peer review process. PAEA does not set out to develop obscure exam items where the answer could only be found in one source. Rather the student should be able to find answers to exam items in multiple evidence-based resources. As a result, programs need not make specific reading recommendations for PAEA exams. Students can continue to utilize references and resources most appropriate for their specific program.

SECTION 5

Preliminary Research on the Components of a Summative Evaluation

At PAEA, we recognize that there are many ways to measure student success. While we are proud to offer standardized assessments, including the End of Curriculum exam, the adoption, use, and grading of these exams are not standardized. This leads many programs to inquire about how best to utilize these examinations in their individual programs. This concern prompted a PAEA-developed research project led by Betsy D. Ekey, MPAS, PA-C, program director and associate professor at the University of Mount Union in Alliance, Ohio. Ms. Ekey initiated a qualitative study, performed in the spring of 2019, to examine how programs should use assessment tools, and more specifically, the summative evaluations programs conduct. Here is a partial synopsis of her research findings:

SUBJECTS

After obtaining Institutional Review Board (IRB) approval from the University of Mount Union, PAEA provided a list of member programs from across the U.S. Programs were divided into four quadrants by location and then selected randomly. Following selection, the director of each program was contacted to see if he or she was interested in participating in the study. Upon agreement, a one-hour call was scheduled with the primary researcher. Twelve program directors agreed to participate in the study.

SURVEY

The survey consisted of 18 open-ended questions pertaining to supervised clinical practice experiences (SCPE) and summative evaluations. The question that was relative to the summative evaluation was “What comprises your summative evaluation.” The survey was reviewed by content experts, and any questions that were unclear were revised.

PROCEDURE

This qualitative study utilized program directors from across the country. Once the call was scheduled, the primary researcher called the program director or a designee. Calls were recorded and transcribed upon their completion. The primary investigator of the study continued calling program directors until data saturation was reached.

DATA ANALYSIS

Once all calls were completed, the data were analyzed using thematic analysis. The information on SCPE evaluations will be published separately.

RESULTS

All 12 programs provided their students with a multiple-choice exam. In addition, all 12 programs required some form of an Objective Structured Clinical Examination (OSCE), which varied from a “full summative OSCE,” “clinical OSCE a couple months prior to graduation (three scenarios, 20 minutes each with a combined score on all three of greater than 75%,” “OSCE both full H&P and problem-focused,” “summative OSCE with 30-minute timeframe for vignette and simulation,” “OSCE patient case scenarios

general medicine with SOAP note documentation,” and “OSCE with H&P, documentation, and patient education,” and one program performed “OSCE stations that contained physical exam scenarios, patient histories, patient education, and professionalism.” Five programs had skill stations that consisted of a “skill test,” “one to two clinical skills assessments,” or “clinical skills practical with procedure note documentation.” Two programs gave students “ethical scenarios” to work through. One program included a “diagnostic interpretation worksheet–EKG/CXR/CBC.” One program offered a “Summative Week with three days of lectures/seminars, non-graded PACKRAT II, and 3-day mandatory PANCE prep course.” One program required students to do a “poster presentation of their research” and “a small group collaboration activity.” Another program had students do a “case presentation.” Another program made students perform an “exit interview.” Lastly, one program used “patient logs” as part of their summative evaluation.

As far as overall assessment percentages given, two programs stated they gave percents, with one program requiring a 70% on all assessments to pass the summative evaluation and another requiring at least a 75% on all assessments to pass.

CONCLUSION

The results highlight that all 12 programs gave their students some form of multiple choice knowledge based assessment. Additionally, all 12 programs conducted an OSCE. While programs share common assessment practices, all decisions regarding what constitutes an appropriate student summative evaluation should be done at the local level. The PAEA End of Curriculum exam is a multiple choice exam that can measure one component of a student’s medical knowledge. To be efficacious, it needs to be adopted intentionally, after programs determine how it aligns with their outcomes, goals and objectives, and how it complements their other assessment tools.

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Glossary of Terms

Anchor Items – Examination items that are common across forms and used to ensure comparability of those forms as part of the equating process

Assessment – The systematic collection of valid, reliable, and unbiased (to the extent possible) data about formal and informal educational activities, programs, and courses undertaken for the purpose of identifying what learners know, understand, and can do as a result of educational experiences

Assessment Tools/Instruments – Techniques and/or instruments used to collect assessment data

Benchmark – A standard point of reference used for comparison/assessment

Bloom’s Taxonomy – A classification system used to define and distinguish different levels of cognition—e.g., thinking, learning, and understanding

Blueprint – A structured examination outline with associated area weights usually formatted as an outline or matrix

Categorical Scores – Scores assigned through a standard setting process that categorizes test takers into specific performance areas defined by policy level descriptors

Clinical Vignette – Patient-related cases and scenarios that are often used to describe a problem in a multiple-choice exam

Construct/Content Validity – Degree to which a measurement instrument accurately represents the knowledge, skill, or characteristic it is designed to measure

Content Area – Organ systems such as Cardiology or Endocrinology

Course-Embedded Assessment – Data generated as part of course learning activities or assignments

Criterion Referenced Testing – A test style that utilizes test scores to generate a statement about the knowledge that can be expected of the student completing the test

Curriculum – A set of interrelated and integrated activities that facilitate student learning in a developmentally appropriate manner, designed to foster satisfactory achievement of student learning outcomes

Curriculum Mapping – Creating a schematic representation of a curriculum to identify appropriate educational experiences to foster satisfactory achievement of student learning outcomes

Data – The raw observations or measurements from which information is derived to be used as a basis to form reasoning

Direct Assessment – Examination or observation of student knowledge, skills, attitudes, and/or abilities measured against defined learning outcomes and/or indicators

Distractor – Incorrect or inferior alternatives on a multiple-choice test item

Equating – Statistical process used to convert scores on two or more alternative forms of an assessment instrument to a common score for purposes of comparability and equivalence

Entrustable Professional Activity – A key task that an individual can be trusted to perform in a given health care context

External Assessment – Use of criteria, assessment tools, or instruments external to the program (i.e., PAEA End of Rotation exams, PANCE)

Evaluation – The qualitative and/or quantitative analysis of assessment data so that they may be used to determine merit, worth, value, or significance

Feedback – Information provided to the learner, instructor, and/or program director to guide future action

Form – A particular set of items that conform to the specifications of a blueprint

Formative Evaluation – Evaluation of assessment data during the course of an educational experience in order to provide timely feedback and facilitate learning

Goal – The end toward which one directs effort; describes the competence, skills, or characteristics required at the end of a course or program

High Stakes Assessment – Use of assessment results to set a bar or level that must be reached (i.e., for graduation, certification)

Information – Data in context

Items – A general term referring to questions that appear in assessment instruments to which candidates must respond

Item Bank – The system by which test items are stored and classified to facilitate item development, item review, and exam construction

Item Discrimination – Used to determine how well an item is able to discriminate between high- and low-performing students

Item Response Theory (IRT) – A mathematical model of measurement in which it is assumed that a single latent trait underlies a student’s ability, and the probability of a response is related to the individual’s level of underlying ability

Key – Correct answer on a multiple-choice exam item

Key Validation – A statistical analysis of item performance conducted after an exam to help verify that the answer key was correct and that individual test items are free of flaws

Lead-in – The part of the stem in a multiple choice item that tells the student exactly what needs to be answered, for example, “what is the most likely diagnosis?”

Learning – What students know and what they can do with what they know

Learning Indicator – A subcomponent or metric with which a learning outcome can be measured (see also Learning Outcome and Learning Objective)

Learning Objective – An expressed, anticipated, and measurable result of educational experiences based in the cognitive, affective, and/or psychomotor domain (see also Learning Outcome and Learning Indicator)

Learning Outcome – Knowledge, skills, attitudes, and abilities attained through participation in an educational experience (see also Learning Objective and Learning Indicator)

Local Assessment – Program-developed criteria, tools, and instruments based upon teaching approaches, students, learning goals

Mean – Arithmetic average obtained by adding all scores and dividing by the total number of scores

Mission Statement – A statement that articulates an organization’s or academic unit’s values and purpose

Norm Referenced Testing – Testing in which test items are selected by examining the test performance of a reference (norm) group against which a student’s individual performance will be compared

Operational Item (scored item) – Items that have been pre-tested and are scored on an exam

Outcome – An anticipated result

P-value – Percentage of examinees choosing the correct answer

Performance Level Descriptors – Outline of the knowledge, skills, and practices that students performing at any given level achieve in each content area

Point-Biserial Correlation (r) – Measure of item discrimination used to determine if an item is behaving as expected or if it may be miskeyed

Policy Level Descriptors – High-level definitions that determine how rigorous and challenging the standards will be for an assessment

Pre-Test Item (unscored) – Newly developed items on an exam that are being tested to evaluate if they are performing within acceptable statistical parameters prior to the item affecting a test-taker exam score

Pre-Test Tail – A group of pre-test or unscored items added to a form to gather performance data. Referred to as a tail because they are added to the tail end of the exam during form construction (although in the testing environment they are randomly ordered)

Psychometrics – The science and technology of mental measurement, including psychology, behavioral science, education, statistics, and information technology

Psychometricians – An expert and/or practitioner in psychometrics

Quantitative Methods of Assessment – Methods that directly generate numerical scores or ratings; for example: surveys, inventories, institutional/departmental data, or departmental/course-level exams (locally constructed, standardized, etc.)

Qualitative Methods of Assessment – Methods that rely primarily on descriptions rather than numerical scores; for example: ethnographic field studies, logs, journals, reflective writing, artifacts, images, audio clips, video clips, participant observation, and narrative responses to questions on interviews and surveys

Raw Score – The number of items correct out of the total number of items taken. The raw score is a data point that has not been transformed

Reliability – The degree to which scores on an assessment instrument are free of measurement error

Remediation – Process to correct identified deficits in knowledge, skills, behavior, etc.

Reporting – The process by which assessment information is communicated to constituents for use in evaluation

Retest/Reassessment – To test again; should be done after a deficiency is detected and remediated to confirm that the student has successfully learned the knowledge/skill or can properly demonstrate the desired behavior

Rubric – A guide for assessing performance outcomes.

Scale Score – A general term for any of a variety of transformed scores; derived from the raw scores through mathematical conversion so that the scores from different forms of the same test can be reported on a common scale and are, therefore, comparable

Standard Deviation – A measure of the variability or dispersion of a distribution of scores. The more the scores cluster around the mean, the smaller the standard deviation; the greater the dispersion, the greater the standard deviation.

Standard Error of Measurement (SEM) – As applied to a single obtained score, the amount by which the score may differ from the hypothetical true score due to errors of measurement. The larger the SEM, the less reliable the score.

Standard Setting – A systematic method for determining a categorical score on an examination

Stem – The scenario or problem section in a multiple-choice item

Student Outcomes Assessment and Evaluation – The act of collecting, assembling, and analyzing quantitative and qualitative data to provide meaningful feedback

Subject Matter Expert – A person with documented expertise in a profession, occupation, or role whose input into the development and validation of assessment instruments helps to ensure validity

Summative Evaluation – Evaluation of assessment data at the end of an educational experience in order to provide feedback on the attainment of learning goals and objectives

Task Area – Knowledge and skill areas on the End of Curriculum exam, for example: Diagnosis and Clinical Intervention

Validity – The degree to which accumulated evidence supports specific interpretations of all components of a certification program

APPENDIX A

Exam Blueprint



End of Curriculum™ Exam Blueprint

PROPOSED ENTRUSTABLE PROFESSIONAL ACTIVITIES	Gather essential and accurate information about patients through history-taking, physical examination, and the use of laboratory data, imaging, and other methods			Develop and implement patient management plans		Provide preventive health care services and education	Locate, critically evaluate, integrate, & appropriately apply scientific evidence to patient care	Totals	
	End of Curriculum 250-Question Exam	History & Physical	Diagnostic Studies	Diagnosis	Clinical Intervention	Clinical Therapeutics	Health Maintenance		Scientific Concepts
		(18%)	(10%)	(22%)	(12%)	(18%)	(10%)	(10%)	(100%)
Cardiology	(16%)	7	4	9	5	7	4	4	40
Pulmonology	(12%)	5	3	7	4	5	3	3	30
Gastrointestinal/nutritional	(10%)	5	3	6	3	4	2	2	25
Orthopedics/rheumatology	(10%)	5	3	6	3	4	2	2	25
Head, ears, eyes, nose, oral cavity, and throat (HEENOT)	(8%)	4	2	4	2	4	2	2	20
Obstetrics/gynecology	(8%)	4	2	4	2	4	2	2	20
Endocrinology	(6%)	3	2	3	2	3	1	1	15
Neurology	(6%)	3	2	3	2	3	1	1	15
Psychiatry/behavioral medicine	(6%)	3	2	3	2	3	1	1	15
Urology/renal	(6%)	3	2	3	2	3	1	1	15
Dermatology	(4%)	2	1	2	1	2	1	1	10
Hematology	(4%)	2	1	2	1	2	1	1	10
Infectious diseases	(4%)	2	1	2	1	2	1	1	10
Totals:	(100%)	48	28	54	30	46	22	22	250

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End of Curriculum™ Exam CONTENT AREA LIST

This content area list covers the 13 systems on which a PA should be educated, each divided into disease processes associated with the organs and tissues within each system, along with the percentage of the exam content for each area. Content areas included on this list are considered only a sample of what might be covered in PA education, and the list is not intended to be all-inclusive. The areas are organized to include topics in broad categories and do not necessarily indicate a greater importance or emphasis on that area in the exam. Questions are typically presented in vignette format so that the exam can better assess students' capacity for problem-solving and critical thinking.

CARDIOLOGY 16%

Cardiac disorders

- Blood vessel and lymphatic disorders
 - Peripheral vascular disease
- Heart disease
 - Cardiomyopathy
 - Congenital heart disease
 - Coronary heart disease
 - Heart failure
- Infectious heart disease
- Pericardial disease
- Valvular heart disease
- Hypertension
- Lipid disorders
- Shock
- Systemic arrhythmias/conduction disorders

PULMONOLOGY 12%

Pulmonary diseases

- Acute respiratory failure
- Acute respiratory distress syndrome
- Airway disorders
- Disorders of pulmonary circulation
- Environmental and occupational lung disorders
- Interstitial lung disease
- Pleural diseases
- Pulmonary infections
- Pulmonary neoplasms
- Sleep-related breathing disorders



GASTROINTESTINAL/NUTRITIONAL 10%

- | | |
|--|-----------------------|
| Biliary tract disorders | Hepatic disorders |
| Gastrointestinal disease | Nutritional disorders |
| <ul style="list-style-type: none"> • Anorectal diseases • Colon and rectum diseases • Esophageal diseases • Gastric diseases • Small intestine diseases | Pancreatic disorders |

ORTHOPEDICS/RHEUMATOLOGY 10%

- | | |
|---|---|
| Disorders of the musculoskeletal system | <ul style="list-style-type: none"> • Knee disorders • Shoulder disorders • Upper extremity disorders |
| <ul style="list-style-type: none"> • Ankle/foot disorders • Back/spine disorders • Hip disorders • Infectious disorders | Rheumatologic disorders |

HEENOT (Head, Ears, Eyes, Nose, Oral Cavity, and Throat) 8%

- | | |
|---------------------|------------------------------------|
| Ear disorders | Nose and paranasal sinus disorders |
| Eye disorders | Oral cavity disorders |
| Laryngeal disorders | Pharyngeal disorders |

OBSTETRICS/GYNECOLOGY 8%

- | | |
|--|--|
| Gynecology disorders | <ul style="list-style-type: none"> • Uterine and adnexal disorders • Vaginal/vulvar disorders |
| <ul style="list-style-type: none"> • Breast disorders • Cervical disorders • Contraception • Menopause • Menstrual disorders • Ovarian disorders | Obstetric disorders |
| | <ul style="list-style-type: none"> • Complicated pregnancy • Perinatal care • Uncomplicated pregnancy |



ENDOCRINOLOGY 6%

Diabetes mellitus and hypoglycemia

- Endocrine disorders
- Disorders of the adrenal gland
- Hypothalamus and pituitary gland disorders

- Metabolic bone disease
- Multiple endocrine neoplasia
- Thyroid and parathyroid gland disorders

NEUROLOGY 6%

Developmental delay disorders

Disorders related to altitude

Neurologic disorders

- Dementia
- Infectious disorders
- Intracranial and spinal masses
- Movement disorders
- Multiple sclerosis

- Myasthenia gravis
- Peripheral nerve disorders
- Seizure disorders
- Sensory disturbances
- Traumatic brain injury
- Types of headache
- Vascular disorders

Neurologic manifestation of chronic disease

PSYCHIATRY/BEHAVIORAL MEDICINE 6%

Psychiatric disorders

- Anxiety disorders
- Chronic pain disorders
- Delirium
- Disruptive, impulse-control, and conduct disorders
- Feeding or eating disorders
- Mood disorders
- Neurodevelopmental disorders
- Obsessive-compulsive related disorders

- Personality disorders
- Psychosexual disorders
- Schizophrenia spectrum and other psychotic disorders
- Sleep-wake disorders
- Somatic symptom and related disorders
- Stress and adjustment disorders
- Substance-related disorders
- Suicide and suicidal ideation
- Trauma and stressor related disorders



UROLOGY/RENAL 6%

- | | |
|---|---|
| <p>Electrolyte and acid/base disorders
Poisoning
Renal disorders
Urologic disorders</p> <ul style="list-style-type: none"> • Genitourinary tract disorders | <ul style="list-style-type: none"> • Infectious diseases of the genitourinary tract • Male infertility • Sexual dysfunction • Stone disease |
|---|---|

DERMATOLOGY 4%

- | | |
|--|--|
| <p>Dermatologic disorders by type</p> <ul style="list-style-type: none"> • Blistering • Crusted • Erythemic • Inflammatory • Papular • Pigmented • Pustular | <ul style="list-style-type: none"> • Scaling • Vesicular • Violaceous <p>Disorders related to environmental exposure
Skin manifestations of chronic disease
Wounds and injuries</p> |
|--|--|

HEMATOLOGY 4%

- | | |
|--|---|
| <p>Blood disorders</p> <ul style="list-style-type: none"> • Anemias • Malignant neoplasias • Polycythemia | <p>Disorders of hemostasis and thrombosis</p> <ul style="list-style-type: none"> • Coagulation disorders • Platelet disorders |
|--|---|

INFECTIOUS DISEASES 4%

- | | |
|--|---|
| <p>Bacterial and chlamydial diseases
Fungal diseases
Human immunodeficiency virus and acquired immunodeficiency syndrome
Mycobacterial disease</p> | <p>Protozoal and helminthic diseases
Spirochetal disease
Viral and rickettsial diseases</p> |
|--|---|

PAEA Assessment Core Tasks and Objectives

PAEA Assessment's Core Tasks and Learning Objectives are assessed by all of the PAEA examinations and should be provided to students in conjunction with the individual examination blueprints and topic lists so students can be prepared for the exams. We recognize that each program will have additional objectives that correspond to their curricula. We encourage programs to tie the PAEA Assessment Core Tasks and Learning Objectives to individual program objectives.

HISTORY TAKING AND PHYSICAL EXAMINATION

- Identify elements of, and need for, comprehensive and focused interviews appropriate for the age and gender of the patient, reason for visit, urgency of the problem, and patient's ability to provide history.
- Recognize and interpret* pertinent historical information.
- Identify history commonly associated with specific medical conditions.
- Identify elements of, and need for, comprehensive and focused physical examinations appropriate for the age and gender of the patient, reason for visit, urgency of the problem, and patient's ability to participate in the examination.
- Identify required techniques in the physical examination.
- Recognize and interpret* pertinent physical examination findings when presented in written or illustrated form.
- Determine the need for other resources (e.g., past records, consultation, other members of the health care team, etc.) to expand knowledge of the patient's history.
- Interpret history and physical examination findings in order to differentiate one disorder from another.

**Interpret means to determine whether normal or abnormal, or to determine the meaning of the finding relative to pathophysiologic processes and disease.*

DIAGNOSTIC STUDIES

- Demonstrate knowledge of appropriate patient and family education related to laboratory and diagnostic studies.
- Identify techniques and potential complications for common diagnostic procedures.
- Select the appropriate initial and subsequent laboratory and diagnostic studies based on initial impressions determined from the history and physical examination or germane to the health-screening situation.
- Identify the indications for specific laboratory and diagnostic studies.
- Identify risks associated with laboratory and diagnostic studies.
- Recognize normal and abnormal values for routine laboratory and diagnostic studies.
- Interpret the results of routine laboratory and diagnostic studies.
- Select appropriate laboratory and diagnostic testing by considering and evaluating the cost, probable yield, invasiveness, and contraindications of laboratory and diagnostic studies.

- Determine if and when additional diagnostic studies are required.
- Identify laboratory and clinical studies considered to be the best for the diagnosis of certain conditions.

DIAGNOSIS

- Determine a differential diagnosis based upon historical information, physical examination findings, and laboratory and diagnostic study findings.
- Select the most likely diagnosis based on historical information, physical examination findings, and laboratory and diagnostic study findings.

HEALTH MAINTENANCE

- Determine appropriate counseling, as well as patient and family education, related to preventable diseases, communicable diseases, immunization schedules, and healthy lifestyles.
- Determine the appropriate history and physical examination in screening an asymptomatic patient during well-care visit based on age.
- Recognize risk factors for conditions amenable to prevention or detection in an asymptomatic individual.
- Recognize the impact of stress on health and the psychological manifestations of illness and injury.
- Recognize the effects of aging and family roles on health.
- Recognize the impact of environmental and occupational exposures on health.
- Recognize the signs and symptoms of abuse and neglect and the indications for intervention and referral.
- Identify common barriers to care.
- Identify the risks and benefits of immunizations.
- Select the appropriate laboratory and diagnostic screening studies and identify normal ranges.
- Identify growth and human development milestones.
- Match anticipatory guidance to the appropriate age level and to the sequelae it is intended to prevent.

CLINICAL INTERVENTION

- Select the application or technique required for common clinical interventions.
- Identify appropriate monitoring for patients after interventions, including checking for compliance, adverse reactions, and effectiveness.
- Recognize appropriate counseling and patient and family education related to clinical interventions.
- Identify proper referral strategies for patients to other services for clinical intervention as appropriate.
- Determine appropriate follow-up from referrals.
- Select a clinical intervention plan that is consistent with the working diagnosis.
- Prioritize clinical interventions in emergent, acute, and chronic care situations.

- Evaluate severity of patient condition in terms of need for medical and/or surgical referral, admission to the hospital or other appropriate setting.
- Determine appropriate surgical treatment and postsurgical/postprocedural management.
- Identify potential complications of specific clinical interventions and procedures.
- Recognize appropriate plans for patient discharge and appropriate medical, surgical, and rehabilitation follow-up.
- Select nonpharmacologic modalities (e.g., physical therapy, surgery, counseling) to integrate into patient management plans.

CLINICAL THERAPEUTICS

- Identify appropriate counseling and patient and family education related to a clinical therapeutic agent including drug-drug interactions.
- Identify key safety factors related to the administration of medications (oral, topical, sublingual, subcutaneous, intramuscular, rectal, otologic, vaginal, and ophthalmic).
- Recognize appropriate plans to monitor pharmacotherapy, checking for compliance, side effects, adverse reactions, and effectiveness.
- Select a clinical therapeutic plan that considers the cost, efficacy, possible adverse reactions, contraindications, and drug interactions for medications selected.
- Recognize the pharmacokinetic properties, indications, and contraindications for the use of pharmacologic agents. Apply this knowledge to the safe and effective selection and administration of medications.
- Identify side effects, adverse reactions, contraindications, precautions, therapeutic effects, and dosing of the major classes of clinically important drugs and commonly used medications.
- Identify the risks for, and signs and symptoms of, drug interactions resulting from polypharmacy in the therapeutic regimen.
- Recognize the appropriate actions to take in response to acute, specific drug toxicity.
- Modify therapeutic regimen within the context of continuing care.

SCIENTIFIC CONCEPTS

- Apply basic sciences (anatomy, physiology, microbiology, genetics, etc.) to the diagnosis and management of specific medical conditions.
- Recognize associations of disease conditions and complications through application of scientific concepts.
- Demonstrate understanding of concepts of public health in the management of the population's and an individual patient's health and well-being, as well as disease.
- Identify underlying processes or pathways responsible for a specific condition or disease.

APPENDIX D

End of Curriculum Exam – Alignment Worksheet

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<http://paeaonline.org/wp-content/uploads/2020/02/end-of-curriculum-exam-alignment-worksheet-blank-20200204.docx>



End of Curriculum™ Exam – Alignment Worksheet

PAEA's EPAs & End of Curriculum Task Areas		Program Mission, Goals, and Outcomes					
EPA	Task Area	Program Outcome #1:	Program Outcome #2:	Program Outcome #3:	Program Outcome #4:	Program Outcome #5:	Program Outcome #6:
		_____	_____	_____	_____	_____	_____
		_____	_____	_____	_____	_____	_____
		_____	_____	_____	_____	_____	_____
		_____	_____	_____	_____	_____	_____
Gathering essential and accurate information about patients through history-taking, physical examination, and the use of laboratory data, imaging and other methods	History & Physical						

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<http://paeaonline.org/wp-content/uploads/2020/02/end-of-curriculum-exam-alignment-worksheet-blank-20200204.docx>

	Diagnostic Studies						
	Diagnosis						
Develop and implement patient management plans	Clinical Intervention						
	Clinical Therapeutics						

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<http://paeaonline.org/wp-content/uploads/2020/02/end-of-curriculum-exam-alignment-worksheet-blank-20200204.docx>

Provide preventive health care services and education	Health Maintenance						
Locate, critically evaluate, integrate, & appropriately apply scientific evidence to patient care	Scientific Concepts						

SAMPLE WORKSHEET



End of Curriculum™ Exam – Alignment Worksheet

PAEA's EPAs & End of Curriculum Task Areas		Program Mission, Goals, and Outcomes					
EPA	Task Area	Program Outcome #1: Conduct and document a thorough and accurate history and physical examination; appropriately interpret findings	Program Outcome #2: Develop an appropriate differential diagnosis	Program Outcome #3: Initiate an appropriate diagnostic evaluation considering the differential diagnosis	Program Outcome #4: Formulate a management plan including pharmacologic and non-pharmacologic modalities	Program Outcome #5: Demonstrate technical accuracy in performance of clinical procedural skills	Program Outcome #6: Demonstrate professionalism through action and communication
Gathering essential and accurate information about patients through history-taking, physical examination, and the use of laboratory data, imaging and other methods	History & Physical	✓					
	Diagnostic Studies			✓			
	Diagnosis	✓	✓				
Develop and implement patient management plans	Clinical Intervention				✓		
	Clinical Therapeutics				✓		
Provide preventive health care services and education	Health Maintenance				✓		
Locate, critically evaluate, integrate, and appropriately apply scientific evidence to patient care	Scientific Concepts	✓	✓				

APPENDIX E Summative Assessment Tool – Alignment Worksheet

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Summative Assessment Tool – Alignment Worksheet

Program Mission, Goals, and Outcomes	Didactic Course, Learning Activity, or Clinical Experience	Current Summative Assessment Tools	Weight of Category Relative to the Overall Summative Evaluation	Where Criteria Are Documented for Students

SAMPLE WORKSHEET



Summative Assessment Tool – Alignment Worksheet

Program Mission, Goals, and Outcomes	Didactic Course, Learning Activity, or Clinical Experience	Current Summative Assessment Tools	Weight of Category Relative to the Overall Summative Evaluation	Where Criteria Are Documented for Students
Conduct and document a thorough and accurate history and physical examination; appropriately interpret findings	1. History and Physical Examination 1, 2, 3 2. Clinical Medicine 1 and 2 3. Small Groups 4. Clinical Rotations (all) 5. Skills Lab 6. Capstone	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Student Handbook Learning Management System Course Syllabus Student File
Develop an appropriate differential diagnosis	1. Laboratory Science 2. Clinical Medicine 1 and 2 3. History and Physical Examination 2 and 3 4. Small Groups 5. Clinical Rotations (all) 6. Capstone	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Student Handbook Learning Management System Course Syllabus Student File
Initiate an appropriate diagnostic evaluation considering the differential diagnosis	1. Clinical Medicine 1 and 2 2. Laboratory Science 3. Small Groups 4. History and Physical Examination 2 and 3 5. Clinical Rotations (all)	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Student Handbook Learning Management System Course Syllabus Student File
Formulate a management plan including pharmacologic and non-pharmacologic modalities	1. History and Physical Examination 2 and 3 2. Small groups 3. Clinical Rotations (all) 4. Clinical Medicine 1 and 2 5. Clinical Pharmacology 1 and 2	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Clinical Handbook Learning Management System Student File Syllabus
Demonstrate technical accuracy in performance of clinical procedural skills	1. Skills Lab 2. Clinical Rotations (all)	1. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 2. Clinical skill practical with procedure documentation 3. Diagnostic interpretation worksheet 4. *Portfolio	**Pass/Fail - non-compensatory	Clinical Handbook Learning Management System Student File Syllabus
Demonstrate professionalism through action and communication	1. History and Physical Examination 1, 2, 3 2. Small Groups 3. Skills Lab 4. Professional Practice 5. Capstone 6. Clinical Rotations (all)	1. Multiple choice exam 2. Full H&P and problem focused OSCE with case presentation, patient education, and documentation 3. Clinical skill practical with procedure documentation 4. Diagnostic interpretation worksheet 5. *Portfolio	**Pass/Fail - non-compensatory	Clinical Handbook Learning Management System Student File Syllabus

***Portfolio.** Includes a compilation of documentation and assessments including things such as patient logs, preceptor evaluations, papers, skills checklists, H&Ps, SOAP notes, and research papers.

**** Pass/fail-non-compensatory.** Also known as pass/fail–conjunctive hurdle, requires student to pass every individual component of the summative exam. It’s called non-compensatory because a student cannot compensate for a low score on one exam with a high score on another.



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