**THE NUCLEAR MEDICINE TECHNOLOGY
CERTIFICATION BOARD, INC.**

N M T C B

ANNUAL
EXAMINATION
REPORT
2013
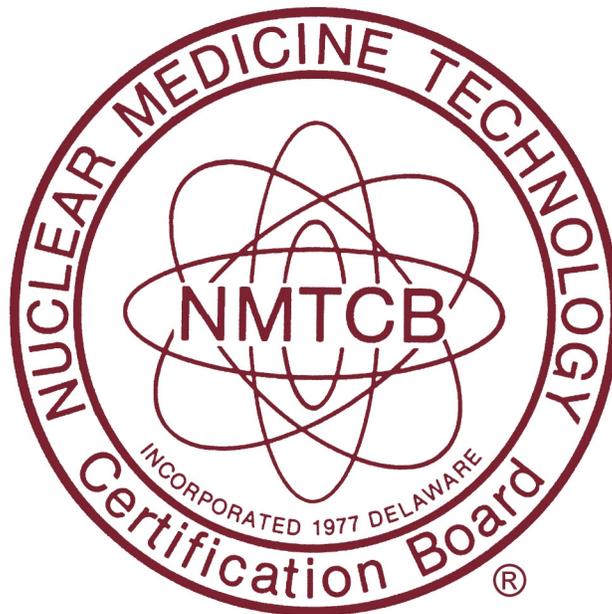
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All Examinees

Total Number:	958	
Total Number Pass:	845	88.20 %
Total Number Fail:	113	11.80 %

Performance breakdown:				**Summary Statistics:**	
Pass:	675	70.46 %		Range of Scores	60-91
Pass with Distinction:	113	11.80 %		Average Score	78.26
Pass with Highest Distinction:	57	5.94 %		Standard Deviation	3.79
Fail:	113	11.80 %		Median Score	78

First-Timers (Nuclear Medicine Program Graduates)

Total Number:	879	
Total Number Pass:	798	90.78 %
Total Number Fail:	81	9.22 %

Performance breakdown:				**Summary Statistics:**	
Pass:	628	71.44 %		Range of Scores	60-91
Pass with Distinction:	113	12.86 %		Average Score	78.59
Pass with Highest Distinction:	57	6.48 %		Standard Deviation	3.65
Fail:	81	9.22 %		Median Score	78

Repeaters

Total Number:	27	
Total Number Pass:	12	44.44 %
Total Number Fail:	15	55.56 %

Performance breakdown:				**Summary Statistics:**	
Pass:	12	44.44 %		Range of Scores	64-79
Pass with Distinction:	0	0.0 %		Average Score	73.85
Pass with Highest Distinction:	0	0.0 %		Standard Deviation	2.81
Fail:	15	55.56 %		Median Score	74

Alternate Eligibility Examinees

Total Number:	52	
Total Number Pass:	35	67.31 %
Total Number Fail:	17	32.69 %

Performance breakdown:				**Summary Statistics:**	
Pass:	35	67.31%		Range of Scores	63-81
Pass with Distinction:	0	0.0 %		Average Score	74.96
Pass with Highest Distinction:	0	0.0 %		Standard Deviation	3.50
Fail:	17	32.69 %		Median Score	75

NMTCB Annual Examination Overview
2013
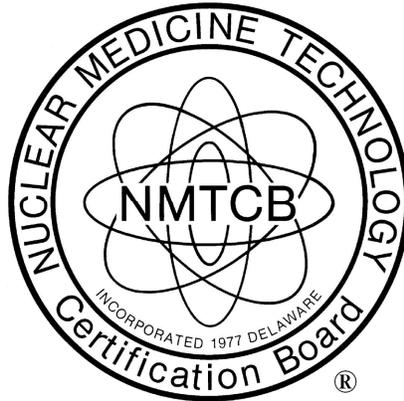
Introduction

This summary report is intended to provide detailed information about the 2013 certification examination. The primary purpose of this report is to serve the needs of program directors and administrators. It contains a description of computer adaptive test (CAT) for classification, and provides detailed information about scaled scores and examination performance. The performance section includes a summary of examination data sorted by different groups of examinees as well as visual aids for the year 2013.

Computer Adaptive Test (CAT) for Classification.

In July 1996, the NMTCB began offering a computer adaptive test (CAT) for classification in association with ACT, Inc. The CAT for classification is designed to render a pass/fail decision. In a CAT of this type, examinees are NOT rank-ordered along a score scale in order to make a precise and accurate classification decision. In order to administer a CAT for classification, the items themselves are ranked at the decision point on the score scale according to their ability to classify accurately and quickly. Each item in the item pool is associated with the information on its difficulty (the proportion of examinees answering an item correctly) and discrimination (the ability of an item to distinguish between passing and failing individuals) levels. An item that has a difficulty level at or near the passing score and has good discrimination will be a better item for decision-making than another item that is too difficult or too easy or has little ability to discriminate between those examinees who should pass and those who should fail. ACT, Inc. psychometric staff obtained Item Response Theory (IRT) statistics for all items in the item pool.

A "classification" CAT is still adaptive in that an individual whose performance is significantly above or below the passing score will require fewer questions for classification. On the other hand, an individual whose performance is not clearly identified will need to answer more questions to demonstrate the required knowledge to pass the exam. The classification process will not be obvious to the examinee since there will be a certain number of unscored pretest questions that will be asked in order to obtain statistics on new questions for future use. For the classification CAT, the items that are administered to each and every candidate are the same type: there are no "difficult items for better examinees" or "easier items for poorer examinees." Each examinee answers a total of 90 items, and the items are different for each examinee. Items for the classification CAT are selected in the following approximate proportions for each of four content domains of nuclear medicine technology. I. Radiation safety (15%), II. Instrumentation (20%), III. Clinical procedures (45%), and IV. Radiopharmacy (20%). Decisions for pass/fail were based on the passing score from the benchmark examination administered in September 1993. The September 1993 examination was the first test developed under the current test blueprint. The algorithm used in the classification CAT adjusts for differences in test form difficulty. For example, candidates that receive a CAT that is easier relative to the benchmark exam must answer more items correctly to receive a passing score. Conversely, if a candidate receives a set of items that is more difficult, they would be required to answer fewer questions correct to pass the exam. In essence, each CAT administered is equated so the passing level is appropriate for the set of items selected for administration to each candidate.

The CAT for classification, while providing a high degree of confidence in the pass/fail decision does not allow the same analysis of individual performance and subgroup performance obtained with the paper and pencil exam. In the past, because all examinees that sat at the same administration of a test took the same test, comparative information was obtained. Because the primary purpose of the CAT exam is to classify candidates as pass or fail, CAT for classification selects items that are optimal for minimizing errors in classification, a critical consideration in an occupation certification program. Candidates whose ability estimates are close to the passing score require more items to make a

pass/fail decision; whereas, those that are clearly significantly above the pass/fail mark need fewer items. Candidates may not skip a test question, and are not permitted to return to an item. Candidates are permitted to change their answers before moving on, at which time the item is scored by the computer.

Scaled Score Information:

Examination results are reported in terms of the scaled score, the mean scaled score, and a measure of the variability of the scaled score distribution -- the standard deviation.

As noted above, the main objective of the NMTCB CAT is to obtain a pass/fail decision with a high degree of precision. However it was recognized that there are occasions when there is a need to know whether an examinee's performance is close to the passing score or a distance from it. Consequently, scaled scores were developed and reported beginning midway through the 1997 testing cycle and subgroup performance in rank order was made available at this time, also. The scaled score is a transformation of the IRT value that is calculated based on the examinee's responses to the items presented during the examination. The scaled passing score was set to 75. That is, the ability estimate obtained from IRT required to pass the examination was "anchored" at 75. It is very important to note that the scaled score value is not a percentage value. Classifications of passing were set up as "Pass" for a scaled value of 75 through 81, "Pass with Distinction" for a scaled value of 82 through 84 and "Pass with Highest Distinction" for a scaled value of 85 or better.

Overall Examinee Performance:

Please refer to Table 1 for a general overview of the examination. This table presents the number of examinees who took the test, their average scaled score and the pass rate for eighteen years beginning 1996, the year CAT was started, to 2013.

Table 1. 1996 - 2013 NMTCB CAT Examinees

	Number of Examinees	Mean Scaled Score	Overall Pass Rate	Pass Rate for NMT Program Graduates
1996	671	78.9	88.1%	94.4%
1997	757	78.8	85.6%	92.4%
1998	664	78.4	83.8%	92.9%
1999	696	78.3	83.9%	93.0%
2000	792	78.2	81.0%	90.4%
2001	879	77.9	81.9%	90.1%
2002	1072	78.02	78.6%	88.4%
2003	1327	77.99	79.9%	87.1%
2004	1459	78.35	82.6%	91.6%
2005	1652	78.74	84.1%	90.0%
2006	1590	79.05	87.9%	93.7%
2007	1694	79.19	86.7%	91.7%
2008	1712	79.30	86.3%	91.7%
2009	1466	80.00	89.9%	94.3%
2010	1298	79.33	88.2%	92.4%
2011	1184	78.47	91.4%	94.9%
2012	1038	78.25	88.2%	91.3%
2013	958	78.26	88.2%	90.8%

From Table 1, it can be seen that the number of examinees taking the test ranged from a low candidate volume of 664 in 1998 to a high candidate volume of 1712 in 2008. Since the beginning of the CAT, the average scaled scores of examinees have been steadily constant around 78.

Table 2. 2013 Overall Examinee Performance

	Total Number	Total Number Pass	Pass Percentage for Each Group	Total Number Fail	Fail Percentage for Each Group
Program Graduates	879	798	90.78 %	81	9.22 %
Repeat Examinees	27	12	44.44 %	15	55.56 %
Alternate Eligibility	52	35	67.31 %	17	32.69 %
All Examinees	958	845	88.20 %	113	11.80 %

Program Performance 2013: Table 3 (below) provides a percentile rank of the average score for each program for 2013. It provides each school's average score and the percentile rank for each score. For example, if the average scaled score of students graduating from a program is 80.4 %, the program is ranked to the 83rd percentile on the scale.

Table 3. Percentiles by school average

| Average Score	Percentile		Average Score	Percentile		Average Score	Percentile
87	100		79.33	65		76.92	28
86	99		79.25	65		76.9	27
85.33	98		79.12	63		76.86	27
85	97		79	62		76.75	26
83.5	96		78.89	60		76.67	25
82.88	95		78.88	59		76.6	24
82.75	94		78.86	58		76.52	23
82.2	93		78.77	57		76.5	22
82	92		78.71	56		76.43	21
81.75	91		78.7	55		76.33	20
81.7	90		78.67	54		76.31	19
81.6	89		78.62	53		76.3	18
81.58	88		78.6	52		76.25	17
81.38	87		78.56	50		76.1	16
81.22	86		78.5	50		76.05	14
81.18	85		78.43	47		76	14
80.67	84		78.33	47		75.92	12
80.4	83		78.14	45		75.89	11
80.33	82		78.12	40		75.83	10
80.29	81		78	41		75.69	8
80.25	78		77.86	38		75.5	8
80.2	78		77.8	36		75.13	6
80.17	76		77.67	36		74.75	5
80.13	72		77.63	34		74.5	4
80	73		77.27	33		74.33	3
79.8	70		77.23	32		74	2
79.5	69		77.2	31		73.5	1
79.42	68		77.13	30		71	0
79.4	67		77	29			

Group Performance 2013

All Examinees:

A total of 845 out of 958 examinees (88.2 percent), who attempted, passed the NMTCB certification examination in 2013 (Table 4). Out of those who attempted, 57 examinees (5.94 percent) passed the examination with highest distinction, and 113 examinees (11.8 percent) passed the examination with distinction. A total of 113 examinees (11.8 percent) failed the examination in 2013. A frequency distribution of all examinees' scaled scores is also presented below (Graph 1).

Table 4. All 2013 Examinees

Total Number:	958	
Total Number Pass:	845	88.2 %
Total Number Fail:	113	11.8 %

Performance breakdown

Pass:	675	70.46 %
Pass with Distinction:	113	11.80 %
Pass with Highest Distinction:	57	5.94 %
Fail:	113	11.80 %

| Range of Scores:	60-91
Average Score:	78.262
Standard Deviation:	3.78
Median scaled Score:	78

Graph 1. All 2013 Examinees

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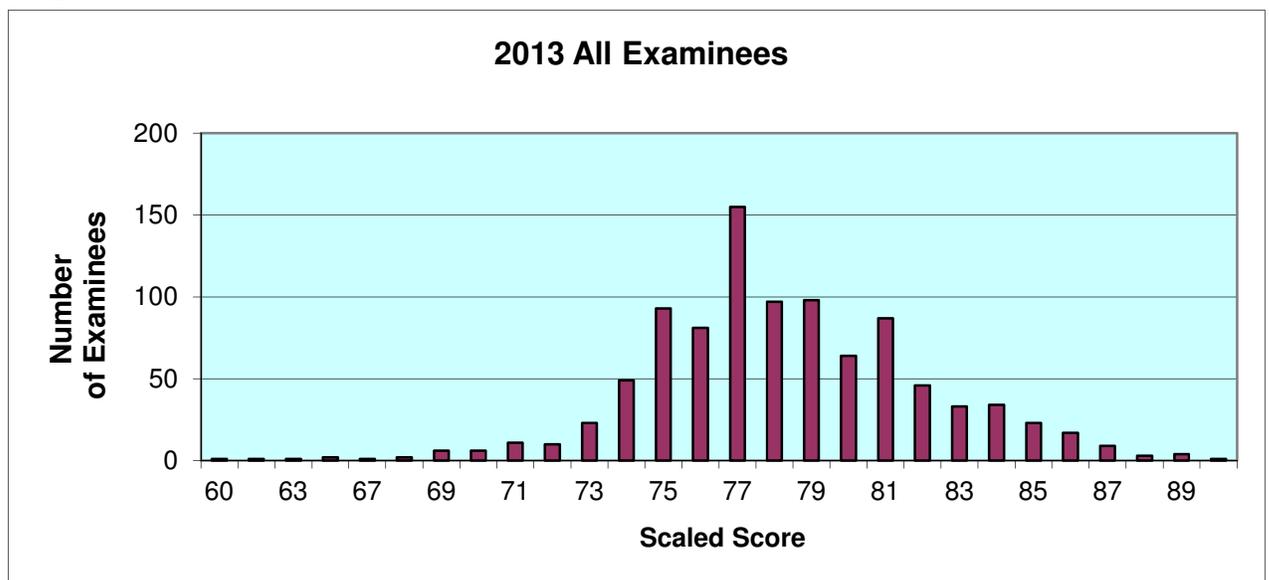
Repeat Examinees:

Twenty-seven (27) examinees were repeat examinees in 2013 (Table 5). A total of 12 out of 27 examinees (44.44 percent) passed the examination. No examinees passed with highest distinction and no examinees in this group passed the examination with distinction. A frequency distribution of these repeat examinees scaled scores is also presented below (Graph 2).

Total Number	27	
Total Number Pass	12	44.44%
Total Number Fail	15	55.56%

Performance breakdown

Pass	12	44.44%
Pass with Distinction	0	0.00%
Pass with Highest Distinction	0	0.00%
Fail	15	55.56%

| Range of Scores	64-79
Average Score	73.85
Standard Deviation	2.81
Median scaled Score	74

Graph 2. 2013 Repeat Examinees

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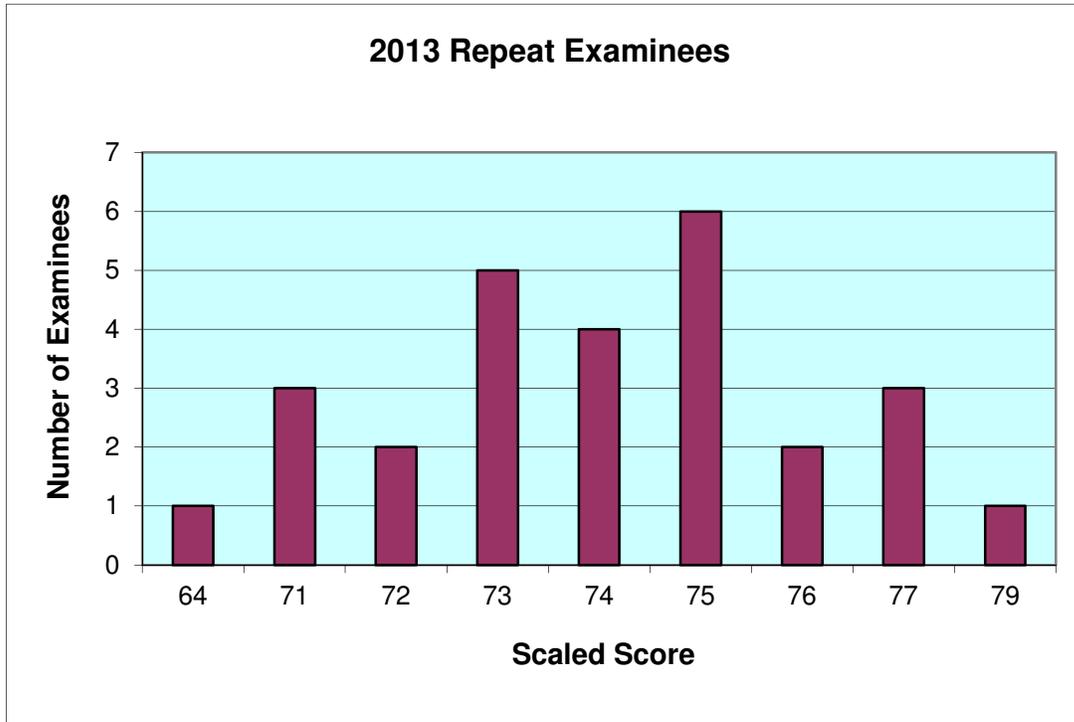
Alternate Eligibility:

Fifty-two (52) examinees qualified to sit for the examination through the Alternate Eligibility Pathway in 2013 (Table 6). A total of 35 out of 52 examinees (67.31 percent) passed the examination. No examinees passed with highest distinction and no examinees in this group passed the examination with distinction. A frequency distribution of the alternate eligibility examinees is presented below (Graph 3).

Table 6: 2013 Alternate Eligibility Examinees

Total Number	52	
Total Number Pass	35	67.31%
Total Number Fail	17	32.69%

Performance Breakdown:		
Pass	35	67.31%
Pass with Distinction	0	0.00 %
Pass with Highest Distinction	0	0.00 %
Fail	17	32.69%

Range of Scores	63-81
Average Score	74.96
Standard Deviation	3.50
Median scaled Score	75

Graph 3. Alternate Eligibility Examinees

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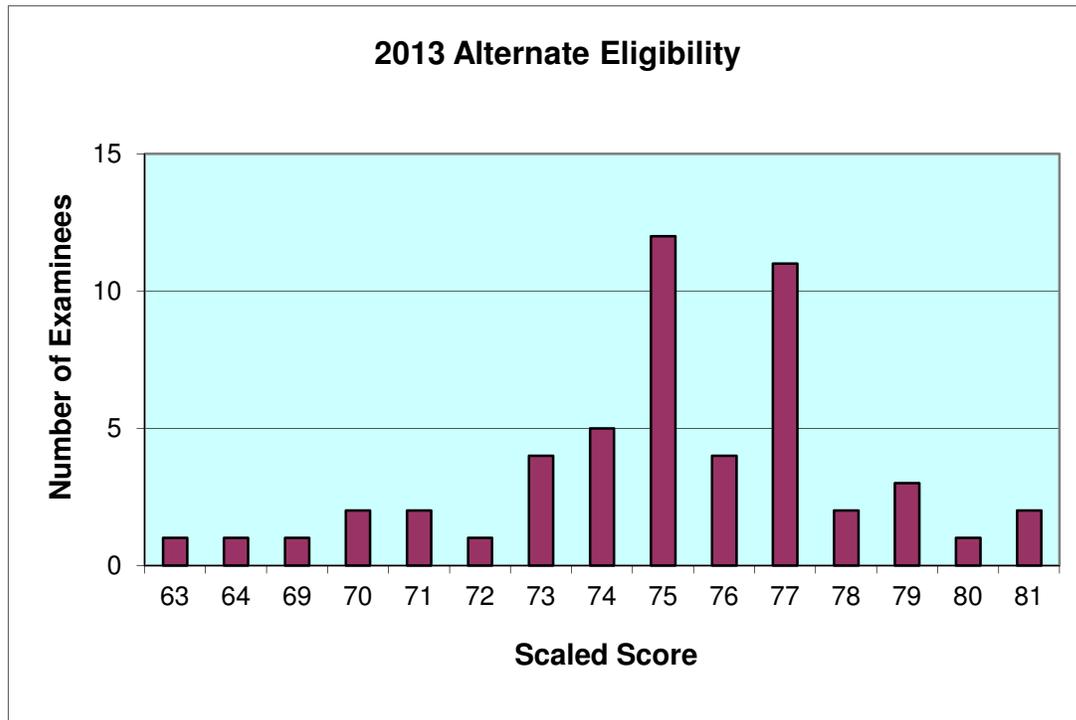
NMT Program Graduates - First Time Examinees:

A total of 879 out of 958 examinees (91.75 percent) were graduates of nuclear medicine technology training programs who took the examination for the first time (Table 7). A total of 798 out of 879 first-time examinees (90.78 percent) passed the examination in 2013. Of those, 57 examinees (6.48 percent) passed the examination with highest distinction and 113 examinees (12.86 percent) passed the examination with distinction. Only 81 program graduate first-time examinees (9.22 percent) did not pass the examination in 2013. A frequency distribution of these first-time examinees is provided below (Graph 4).

**Table 7.** First Time Examinees (Nuclear Medicine Program Graduates)

Total Number:	879	
Total Number Pass	798	90.78%
Total Number Fail	81	9.22%

Performance Breakdown

Pass	628	71.44%
Pass with Distinction	113	12.86%
Pass with Highest Distinction	57	6.48%
Fail	81	9.22%

Range of Scores:	60-91
Average Score:	78.59
Standard Deviation:	3.65
Median scaled Score:	78

Graph 4. First Time Examinees (Nuclear Medicine Program Graduates)
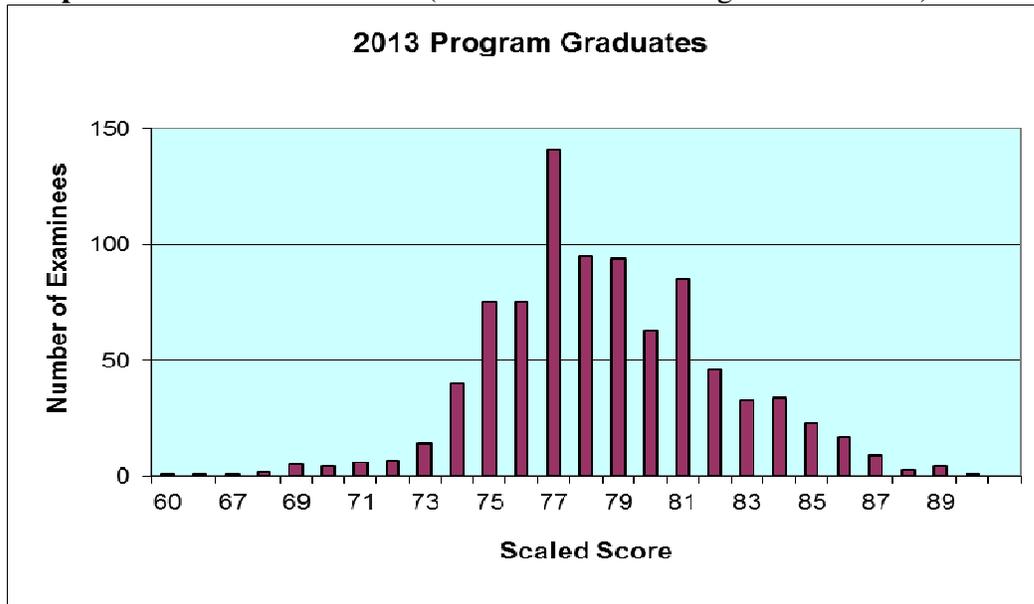
Overall, the year 2013 was a successful year for both program directors and students of nuclear medicine technology programs. Of the 879 examinees who graduated from nuclear medicine technology training programs, 798 (90.78 %) passed the examination in 2013. Among those examinees who passed the examination in their first attempt, about one out of five (19.3 percent) passed the examination with distinction or highest distinction.

As always, the NMTCB remains sensitive to the needs of the program directors and their students. The Board is committed to offering the premier certification program for nuclear medicine technologists. Please let us know if there is anything that should be included in future exam reports. We welcome your comments/suggestions.