Nuclear Medicine Technology Certification Board Report: Equipment and Procedures Currently Used in the United States

Karen L. Blondeau and Martha W. Pickett

Nuclear Medicine Technology Certification Board, Atlanta, Georgia

The September 1993 NMTCB examination was the first administration of the new test blueprint developed from task performance criteria that were validated by the 1991 Critical Task Survey. The task survey was completed in December 1991. The 1991 task validation process appears in an earlier JNMT article (1). The Critical Task Survey also provides information on the types of equipment and procedures used in nuclear medicine practice across the U.S.

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The 1991 Critical Task Survey conducted by the Nuclear Medicine Technology Certification Board (NMTCB) for the purpose of examination development was completed by 371 professionals in all regions of the United States. It sampled those employed as staff nuclear medicine technologists, administrators, educators, physicians, scientists, and radiopharmacists in a variety of hospital settings. Of those who responded, 87.9% are certified by the NMTCB.

The survey requested information regarding types of equipment used in the workplace, the kinds of procedures performed, and other demographic data. The frequency and criticality of procedure or task performance was also requested and was published in an earlier *JNMT* article (1).

The body of this report is in table format, listed in the order the survey was presented. Table 1 is a complete listing of nuclear medicine equipment as outlined on the Critical Task Survey. Table 2 is an abbreviated version, highlighting the most frequently used equipment. Table 3 is the complete listing of nuclear medicine procedures as described on the Critical Task Survey, and Table 4 is an abbreviated version, focusing on the more commonly performed procedures. Table 5 is a list of procedures that respondents included as write-in information for which the frequency and criticality percentages were too low to be considered common practice.

In Tables 1–4, the column listing the number of respondents shows the number of people who responded in the affirmative that they either use a specified piece of equipment or perform a specified procedure. The percentage column simply reflects those same numbers as a percentage of the total number of respondents.

Caution should be exercised when reaching conclusions regarding the current practice of nuclear medicine technology, based on this data. However, at the time of the survey, 83.8% of the respondents practiced nuclear medicine in a hospital-based setting, thus giving credibility to certain trends.

The next NMTCB Critical Task Survey is scheduled for 1994–1995. The progress of the survey cycle will be discussed in a subsequent NMTCB Report in *JNMT* and in the NMTCB's newsletter.

For reprints contact: Karen Blondeau, CNMT, Nuclear Medicine Program, Orlando Regional Medical Center, 1414 S. Orange Avenue, Orlando, FL 32806.

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REFERENCE

1. Blondeau KL, Hartnett SD, Pickett MW, et al. Nuclear medicine technology certification board (NMTCB) 1991 Critical Task Analysis Validation Report. *J Nucl Med Technol* 1992;20:173–176.

TABLE 1. Nuclear Medicine Equipment Used in the United States

	Specialty Area	# of Respondents	% of Respondents
	Pharmacy		
a.	Automated QC radiopharmacy system	61	16.4
b.	Chromatography, column/TLC	125	33.7
c.	Dose calibrator	341	91.9
d.	Dose calibrator with PC and manager	95	25.6
e.	Filters, membrane	40	10.8
f.	Filters, millipore	70	18.9
g.	Generator, $^{99}Mo/^{99m}Tc$	156	42.0
h.	Generator, $^{81}Rb/^{81m}Kr$	17	4.6
i.	Generator, other	3	.8
j.	Hood, laminar flow/fume	186	50.1
k.	Microscope	66	17.8
l.	Multichannel analyzer	196	52.8
m.	Syringe shield	352	94.9
n.	Ultrasonic bath	78	21.0
o.	Personal computer	184	49.6
	Radiation Protection		
a.	Ring badge	363	97.8
b.	Whole-body badge	363	97.8
c.	Pocket dosimeter	91	24.5
d.	Survey meter, GM	361	97.3
e.	Survey meter, room monitor	213	57.4
f.	Gas proportional survey meter	54	14.6
g.	Ionization chamber (Cutie Pie)	182	49.1
	Imaging		
a.	Phantom, resolution, QC	283	76.3
b.	Film processor, automatic	312	84.1
c.	Phantoms, bar	272	93.3
d.	Bone densitometer, single photon	23	6.2
e.	Bone densitometer, dual photon	51	13.7
f.	Camera, multicrystal	84	22.6
g.	Camera, single head	333	89.8
h.	Camera, mobile	191	51.5
i.	Camera, SPECT	289	77.9
j.	Camera, multihead	65	17.5
k.	Camera, SPECT and whole body	225	60.6
l.	Camera, positron (PET)	26	7.0
m.	Camera, video	55	14.8
n.	Collimators	280	75.5
o.	Densitometer, film	67	18.1
p.	Phantom, flood	257	69.3
q.	Formatter, multi-imager	301	81.1
r.	Phantom, SPECT	160	43.1
s.	Tomographic scanner	64	17.3
t.	Oscilloscope, variable persistence	197	53.1
u.	Printer, hard copy	195	52.6
	Nonimaging		
a.	Analyzer, single channel	102	27.5
b.	Analyzer, multi-channel	211	56.9
c.	Automated RIA system	46	12.4
d.	Balance, analytical	65	17.5
e.	Centrifuge, microhematocrit	101	27.2
f.	Centrifuge	167	45.0

TABLE 1. Continued

	Specialty Area	# of Respondents	% of Respondents
	Nonimaging (continued)		
g.	Detector, well, single	201	54.2
h.	Detector, well, multiple	89	24.0
i.	Detector, single probe	188	50.7
j.	Detector, dual probe	13	3.5
k.	Digital ratemeter	68	18.3
l.	Incubator	69	18.6
m.	Liquid scintillation counter	44	11.9
n.	Pipettes	184	49.6
o.	Refrigerator	300	80.9
p.	Strip-chart recorder	70	18.9
q.	Well counter, single sample	174	46.9
r.	Well counter, multiple sample	89	24.0
s.	Water bath	159	42.9
t.	Other	9	2.4
	Miscellaneous		
a.	Archiving media	121	32.6
b.	Aerosol delivery system	165	44.5
c.	Calculator	338	91.1
d.	Cyclotron	23	6.2
e.	EKG gating device	330	88.9
f.	EKG monitor	287	77.4
g.	Emergency cart	292	78.7
h.	Ergometer, bicycle/table	229	61.7
i.	Intravenous infusion pump	187	50.4
j.	Stethoscope/sphygmomanometer	307	82.7
k.	Personal computer and printer	225	60.6
l.	Positioning aids	231	62.3
m.	Oxygen equipment	330	88.9
n.	MRI unit (NMR)	64	17.3
o.	Spirometer	43	11.6
p.	Stress table	180	48.5
q.	Treadmill	263	70.9
r.	Xe delivery system/gas trap	232	62.5
s.	Other	51	13.7

TABLE 2. Sample of Equipment Used in Nuclear Medicine

Type of Equipment	# of Respondents	% of Respondents
Single-head cameras	333	89.8
Multi-head cameras	65	17.5
Dose calibrators	341	91.9
Automatic film processors	312	84.1
SPECT cameras	289	77.9
EKG gating device	330	88.9
Treadmill	263	70.9
Xenon delivery system/gas trap	232	62.5
Mo-99/Tc-99m generator	156	42.0
Chromatography, column/TLC	125	33.7
Automated RIA system	46	12.4
Analytic balance	65	17.5
MRI unit	64	17.3
PET camera	26	7.0
Cyclotron	23	6.2

This table is an extract from Table 1.

TABLE 3. Nuclear Medicine Procedures Used in the United States

	Specialty Area	# of Respondents	% of Respondents
	CNS		
a.	Brain imaging with vascular flow	229	61.7
b.	Brain imaging	200	53.9
c.	Cerebral vascular only	169	45.6
d.	Cisternogram	281	75.7
e.	CSF leak	215	58.0
f.	Shunt patency	198	53.4
g.	Brain SPECT	198	53.4
h.	Other	22	5.9
	Endocrine		
a.	Adrenal imaging	69	18.6
b.	Parathyroid imaging	242	65.2
c.	Thyroid imaging	343	92.5
d.	Thyroid uptake	329	88.7
e.	Thyroid, whole body, ^{201}Tl	83	22.4
f.	Thyroid, whole body, ^{131}I	262	70.6
g.	Thyroid, metastasis survey, ^{131}I	255	68.7
h.	Thyroid, other	31	8.4
	Pulmonary		
a.	Lung aerosol imaging	164	44.2
b.	Lung perfusion imaging	337	90.8
c.	Lung ventilation imaging	256	69.0
d.	Lung ventilation/perfusion quantitation ratios	203	54.7
e.	Lung, SPECT	50	13.5
f.	Lung, other	24	6.5
	Cardiovascular		
a.	Cardiac infarct detection	283	76.3
b.	Cardiac perfusion, rest only (planar)	205	55.3
c.	Cardiac perfusion, rest only (SPECT)	221	59.6
d.	Cardiac redistribution (planar)	225	60.6
e.	Cardiac redistribution (SPECT)	273	73.6
f.	Stress or pharmaceutical intervention	270	72.8
g.	Cardiac shunt evaluation	114	30.7
h.	Cardiac stress perfusion (planar)	216	58.2
i.	Cardiac stress perfusion (SPECT)	269	72.5
j.	Cardiac, first pass EF, rest	195	52.6
k.	Cardiac, first pass EF, stress	84	22.6
l.	Cardiac, gated blood pool EF, rest	329	88.7
m.	Cardiac, gated blood pool EF, stress	208	56.1
n.	Cardiac, other	28	7.5
	Gastrointestinal		
a.	Digestive system, other	31	8.4
b.	Esophageal motility	95	25.6
c.	Gastric emptying	281	75.7
d.	Gastroesophageal reflux	208	56.1
e.	Gastrointestinal bleeding	310	83.6
f.	Hepatobiliary imaging	341	91.9
g.	LeVeen shunt	171	46.1
h.	Liver imaging	322	86.8
i.	Liver imaging (SPECT)	246	66.3
j.	Liver imaging with blood flow	211	56.9
k.	Liver/lung imaging	114	30.7
l.	Liver/spleen imaging	316	85.2
m.	Liver/spleen imaging (SPECT)	214	57.7
n.	Meckel's diverticulum imaging	327	88.1
o.	Salivary/parotid imaging	161	43.4
p.	Schilling test w/intrinsic factor	198	53.4
q.	Schilling test wo/intrinsic factor	190	51.2
r.	SPECT, other	34	9.2

TABLE 3. Continued

	Specialty Area	# of Respondents	% of Respondents
	Renal/Genitourinary		
a.	Cystogram, direct	151	40.7
b.	Cystogram, indirect	43	11.6
c.	ERPF	109	29.4
d.	Genitourinary, other	20	5.4
e.	Glomerular filtration rate	184	49.6
f.	Renal blood flow studies	338	91.1
g.	Renal imaging	341	91.9
h.	Renal transplant evaluation	138	37.2
i.	Testicular blood flow	325	87.6
j.	Testicular imaging	318	85.7
k.	Tubular function, (renogram)	253	68.2
l.	Urinary bladder, residual volume	104	28.0
m.	Renal SPECT	32	8.6
	Bone/Musculoskeletal		
a.	Bone absorptiometry	64	17.3
b.	Bone imaging, limited	299	80.6
c.	Bone imaging, whole body	338	91.1
d.	Bone imaging, 2 phase	183	49.3
e.	Bone imaging, 3 phase	324	87.3
f.	Bone, SPECT	256	69.0
g.	Bone, other	23	6.2
	Oncology/Infection/Miscellaneous		
a.	Gallium imaging	336	90.6
b.	WBC imaging	284	76.5
c.	Liver/lung imaging	96	25.9
d.	Monoclonal antibody imaging	62	16.7
e.	Tumor, other	58	15.6
f.	Dacrocystography	55	14.8
	Vascular		
a.	Venography	180	48.5
b.	Major vessel flow	117	31.5
c.	Organ perfusion	102	27.5
d.	Vascular, other	15	4.0
	Hematopoietic		
a.	Bone marrow imaging	110	29.6
b.	Lymphoscintigraphy	96	25.9
c.	Plasma volume, RISA	112	30.2
d.	Platelet imaging ^{111}In	66	17.8
e.	Red cell mass ^{51}Cr	156	42.0
f.	Red cell sequestration	104	28.0
g.	Red cell survival	111	29.9
h.	Hematologic, other	9	2.4
	Radionuclide Therapy		
a.	^{131}I therapy, cancer	221	59.6
b.	^{131}I therapy, hyperthyroidism	284	76.5
c.	^{32}P colloidal therapy	87	23.5
d.	^{32}P sodium phosphate therapy	103	27.8
e.	Therapy, other	22	5.9
	Radioimmunoassay		
a.	Folic acid	37	10.0
b.	Gastrin	20	5.4
c.	Serum B_{12}	45	12.1
d.	T-3, RIA	56	15.1
e.	T-4, RIA	56	15.1
f.	Other, (please list)	28	7.5

TABLE 4. Sample of Procedures Used in Nuclear Medicine

Type of Procedure	# of Respondents	% of Respondents
Brain imaging with vascular flow	229	61.7
Cisternography	281	75.7
Thyroid imaging	343	92.5
Lung perfusion	337	90.8
Lung ventilation	256	69.0
Cardiac stress perfusion (SPECT)	269	72.5
Cardiac redistribution (SPECT)	273	73.6
Cardiac, gated blood pool EF, resting	329	88.7
Cardiac, gated blood pool EF, stress	208	56.1
Gastrointestinal bleeding	310	83.6
Renal flow studies	338	91.1
Bone imaging, whole body	338	91.1
Bone absorptiometry	64	17.3
Gallium imaging	336	90.6
WBC imaging	284	76.5
Monoclonal antibody imaging	62	16.7
Red cell mass, ^{51}Cr	156	42.0
Plasma volume, RISA	112	30.2
Schilling test with intrinsic factor	198	53.4
^{131}I therapy, cancer	221	59.6
^{131}I therapy, hyperthyroidism	284	76.5
T-4 by RIA	56	15.1
B-12 by RIA	45	12.1
Gastrin	20	5.4

This table is an extract from Table 3.

TABLE 5. Miscellaneous Procedures Used in the United States

	Procedures
a.	^{201}Tl brain with vascular flow
b.	^{133}Xe brain perfusion (SPECT)
c.	^{123}I whole-body scan
d.	Fine-needle aspiration/biopsy
e.	MIBG whole-body scan
f.	Perchlorate wash-out
g.	Barrett's esophagus
h.	"Infusaid" pump (liver scan)
i.	Liver hemangioma
j.	Pancreas imaging
k.	Spleen (labeled RBCs)
l.	Ferrokinetics
m.	Hepatitis by radioassay (all forms) (3)
n.	BhCG (11)
o.	CA-125
p.	CEA (10)
q.	Cortisol (6)
r.	Digoxin (10)
s.	Ferritin (2)
t.	PAP (3)
u.	TSH (23)

Each of the procedures a through l was written-in by one respondent. The number of respondents to procedures m through u is indicated in parentheses after the procedure.