40TH ANNUAL MEETING

TECHNOLOGIST SECTION PROGRAM

Proceedings of the 40th Annual Meeting of The Society of Nuclear Medicine June 8–11, 1993 • Toronto, Ontario, Canada

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40TH ANNUAL MEETING PROGRAM INFORMATION

GENERAL INFORMATION

On-Site Registration

Since Satellite Registration was a big success at the last Annual Meeting, the Society is going to offer it again this year, on the first days of the meeting. Satellite Registration will be at the Sheraton Centre Hotel & Towers on the Concourse Level and is open on Saturday and Sunday. Attendees will be able to pick up their pre-registration materials or register on-site as well. The Society will have its Standard Registration hours at the Metro Toronto Convention Centre.

The hours of the Satellite and Standard Registration areas are as follows:

Satellite Registration—Sheraton Centre Hotel & Towers

Saturday, June 5, 1993 10:00 A.M.–3:00 P.M.
Sunday, June 6, 1993 10:00 A.M.–3:00 P.M.

Standard Registration—Metro Toronto Convention Centre

Sunday, June 6, 1993
12:00 P.M.–5:00 P.M.
Monday, June 7, 1993
7:00 A.M.–5:00 P.M.
Tuesday, June 8, 1993
7:00 A.M.–5:00 P.M.
Wednesday, June 9, 1993
7:30 A.M.–4:00 P.M.
Thursday, June 10, 1993
7:30 A.M.–4:00 P.M.
Friday, June 11, 1993
7:30 A.M.–11:00 A.M.

Please note that name badges are required for admission into the Exhibit Hall, all educational meetings, and social events. Children under the age of 12 will not be admitted into the Exhibit Hall.

SNM MESSAGE CENTER

The Society of Nuclear Medicine will staff a booth in the registration area to provide information regarding SNM activities at the Annual Meeting and to help attendees with any meetings problems or questions. Messages for meeting attendees will be posted daily from 8:00 A.M.–5:00 P.M. Monday, June 7–Friday, June 11.

SOCIETY AND TECHNOLOGIST SECTION COMMITTEE MEETINGS

Committee meetings will convene in the Sheraton Centre Hotel & Towers, located only 6 blocks away from the Metro Toronto Convention Centre. All members are cordially invited to attend.

Technologist Section Meetings

Committees: Friday, June 4
National Council: Saturday, June 5
Business Meeting: Thursday, June 10

Society Meetings

Committees: Saturday, June 5 and Sunday, June 6
Council Presidents/Committee Chairs/Chapter Presidents and Executive Committee: Saturday, June 5
Board of Trustees: Monday, June 7

SNM PUBLICATIONS AND MEMBERSHIP BOOTHS

Books will be on sale at the SNM Publications booth from 9:00 A.M. to 5:00 P.M. on Tuesday–Thursday and on Friday from 10:00 A.M. to 12:00 P.M.

There will be a *JNMT* booth to answer members' questions about the *Journal* and authors' questions about writing articles. Suggestions for topics to discuss in future issues are welcome and encouraged.

Members and nonmembers are encouraged to stop by the membership booth. Hours: 8:00 A.M.–5:00 P.M., Monday–Thursday; 8:00 A.M.–12:00 P.M., Friday.

SPECIAL EVENTS AND SOCIAL ACTIVITIES

Opening Night Cocktail Reception
Monday, June 7, 7:30 P.M.–9:30 P.M. Sheraton Centre Hotel & Towers.

Awards Presentation, SNM Business Meeting, and Wine & Cheese Reception
Tuesday, June 8, 5:00 P.M.–6:00 P.M. Rooms 104C & 104D, Metro Toronto Convention Centre.

Technologist Section Business Meeting and Scientific Award Ceremony
Thursday, June 10, 12:00 P.M.–1:30 P.M., Rooms 206C & 206D, Metro Toronto Convention Centre.

1993 Technologist Party
Thursday, June 10, 8:00 P.M.–11:00 P.M. Grand Ballroom, Sheraton Centre Hotel & Towers.

Scientific Meeting Highlights
Friday, June 11, 3:30 P.M.—5:00 P.M. Room 106, Metro Toronto Convention Centre.

TECHNOLOGIST SECTION MATRIX

		Room 206D	Room 206B	Room 205D	Room 206F	Room 205B
MONDAY	JUNE 7 8:00-3:00	**MANAGING QUALITY SERVICE CATEGORICAL • Room 202B**				**TEACHING AND EVALUATING STUDENTS IN THE AFFECTIVE DOMAIN**
	7:30-9:30	**Opening Cocktail Reception at the Sheraton Centre Hotel & Towers**				
TUESDAY	JUNE 8 7:30-8:30	**First Time Participant to SNM Breakfast and Orientation • Room 204**				
	8:15-10:00	**Formal Opening and Plenary Session Rooms 105&106, Followed by the Grand Opening of the Exposition**				
	10:00-10:30	Coffee break in the **EXHIBIT HALL**, Sponsored by **McNeil Pharmaceutical**				
	10:30-12:00	**ORTHOPEDIC IMAGING IN THE EVALUATION OF THE BENIGN BONE DISEASE, INFECTION AND METASTASES I**	**SPECT I:** Establishing a SPECT Practice	**CURRENT ISSUES IN QUALITY ASSURANCE-MEETING THE REGULATIONS I**	**Scientific Papers:** Cardiovascular Technologist Investigator Competition	**10:30-1:30 STUDENT DAY**
	12:00-1:30	Visit Exhibits and have lunch in the **EXHIBIT HALL**				
	1:30-3:00	**ORTHOPEDIC IMAGING II**	**SPECT II:** Introduction to SPECT	**CURRENT ISSUES IN QUALITY ASSURANCE II**	**Scientific Papers:** Cardiac	**NMTCB: Item Writers Workshop**
	3:00-3:30	Visit Exhibits in the **EXHIBIT HALL**				
	3:30-5:00	**ORTHOPEDIC IMAGING III**	**SPECT III:** Advanced SPECT	**CURRENT ISSUES IN QUALITY ASSURANCE III**	**Scientific Papers:** PET/Neurology	**NMTCB: Item Writers Workshop** *(continued)*
WEDNESDAY	JUNE 9 7:00-8:00	**SNM INTRODUCTION • Room 206E**				
	8:30-10:00	**ONCOLOGY I:** A Nuclear Medicine Perspective	**CARDIAC I:** CAD Pathophysiology, Treatment and Imaging Techniques	**TOTAL QUALITY MANAGEMENT**	**Scientific Papers:** Bone/SPECT	**ETHICS SEMINAR:** A Case Study Approach to Teaching Nuclear Medicine Technology Students
	10:00-10:30	Coffee break in the **EXHIBIT HALL**, Sponsored by **McNeil Pharmaceutical**				
	10:30-12:00	**ONCOLOGY II:** A Nuclear Medicine Perspective	**CARDIAC I:** CAD Pathophysiology, Treatment and Imaging Techniques *(continued)*	**TOTAL QUALITY MANAGEMENT** *(continued)*	**Scientific Papers:** Pediatrics/Renal	**EDUCATORS FORUM:** Current Issues in Educating Nuclear Medicine Technologist
	12:00-1:30	**Poster Session** in the Exhibit Hall/Visit Exhibits and have lunch in the **EXHIBIT HALL**				**JRC FORUM**
	1:30-3:00	**ONCOLOGY III:** A Nuclear Medicine Perspective	**CARDIAC II:** Alternative Imaging Techniques	**TOTAL QUALITY MANAGEMENT** *(continued)*	**Scientific Papers:** Radiopharmacy	**EDUCATORS FORUM:** Partnerships Make High Tech/Low Enrollment Programs Possible
	3:00-3:30	Visit Exhibits in the **EXHIBIT HALL**				
	3:30-5:00	**ONCOLOGY IV:** A Nuclear Medicine Perspective	**CARDIAC II:** Alternative Imaging Techniques *(continued)*	**TOTAL QUALITY MANAGEMENT** *(continued)*	**Scientific Papers:** Radiopharmacy/ Gastroenterology	**LEGISLATION AND REGULATIONS IN THE NINETIES**
THURSDAY	JUNE 10 8:30-10:00	**ABDOMINAL AND GENITOURINARY IMAGING I**	**IMPLEMENTING YOUR NEURO-SPECT SKILLS I**	**THE HOW TO'S OF REIMBURSEMENT I**	**Scientific Papers:** Oncology/Infectious Diseases/Endocrinology	**ALTERATIONS IN THE BIODISTRIBUTION OF RADIOPHARMACEUTICALS I**
	10:00-10:30	Coffee break in the **EXHIBIT HALL**, Sponsored by **McNeil Pharmaceutical**				
	10:30-12:00	**ABDOMINAL AND GENITOURINARY IMAGING II**	**IMPLEMENTING YOUR NEURO-SPECT SKILLS II**	**THE HOW TO'S OF REIMBURSEMENT II**	**PRACTICING PET I**	**ALTERATIONS IN THE BIODISTRIBUTION II**
	12:00-1:30	**TECHNOLOGIST BUSINESS MEETING & SCIENTIFIC AWARD CEREMONY ROOMS 206 C&D**				
	1:30-3:00	**ABDOMINAL AND GENITOURINARY IMAGING III**	**IMPLEMENTING YOUR NEURO-SPECT SKILLS III**	**THE HOW TO'S OF REIMBURSEMENT III**	**PRACTICING PET II**	**PEDIATRICS I**
	3:00-3:30	Visit Exhibits in the **EXHIBIT HALL**				
	3:30-5:00	**ABDOMINAL AND GENITOURINARY IMAGING IV**	**IMPLEMENTING YOUR NEURO-SPECT SKILLS IV**	**THE HOW TO'S OF REIMBURSEMENT IV**	**PRACTICING PET III**	**PEDIATRICS II**
	8:00-11:00	**Don't Miss the SNM Technologist Party in the Grand Ballroom at the Sheraton Centre Hotel and Towers. The Technologist Party is Sponsored by All Exhibitors**				

= Continuing Education = Scientific Papers

ABSTRACTS OF SCIENTIFIC PAPERS

A Note on Scientific Papers

The Scientific and Teaching Sessions Committee of The Society of Nuclear Medicine—Technologist Section is pleased to present the abstracts of the scientific papers for the 40th Annual Meeting. The scientific papers will be presented commencing Tuesday, June 8, in sessions beginning at 10:30 A.M.. Please note that on Wednesday, June 9, scientific papers will be presented in sessions beginning at 8:30 A.M.

TUESDAY, JUNE 8, 1993

FORMAL OPENING AND PLENARY SESSION

8:15 A.M.–10:00 A.M. **Rooms 105 & 106**

Welcome and Opening Remarks
Paul Murphy, PhD
President, The Society of Nuclear Medicine

Edward B. Silberstein, MD
Chairman, 1993 Scientific Program Committee

Paul Hanson, CNMT
President, The Society of Nuclear Medicine—Technologist Section

The Paul Aebersold Award
Recipients:
Alan Davison, PhD
Alun Gareth Jones, PhD
Harvard Medical School
The Fourteenth Annual Georg Charles de Hevesy Nuclear Medicine Pioneer Award Presentation
Honoree: C. Craig Harris, MS
Introduction: R. Edward Coleman, MD

The Tenth Annual SNM Lectureship
Opportunities in Nuclear Medicine
H. William Strauss, MD
Bristol-Myers Squibb
Princeton, New Jersey

Opening of the 1993 SNM Exposition
Exhibit Hall, Metro Toronto Convention Centre

TUESDAY, JUNE 8, 1993

Session I

Cardiovascular Technologist Investigator Competition

10:30–12:00 **Room: 206F**

Moderators: Jim Bietendorf, CNMT and Jennifer Mattera, CNMT

No. 1500

TECHNETIUM-99m TETROFOSMIN: EVALUATION OF REDISTRIBUTION USING CIRCUMFERENTIAL PROFILES FOLLOWING STRESS INJECTION. M. McMahon, D. Jain, B. L. Zaret, A. J. Sinusas, F. J. Th. Wackers. Yale University, New Haven, CT

Tc-99m Tetrofosmin is a new myocardial perfusion imaging agent with apparently stable myocardial retention. In order to determine if redistribution occurs, 20 patients underwent serial imaging following a 6-8 mCi injection of Tc-99m Tetrofosmin at peak exercise and again following 24 mCi injection at rest 4 hours later. 13 patients had segmental perfusion abnormalities. Serial 5 min planar images were acquired at 5, 10, 15, 30, 60, 120, and 180 mins in the left anterior oblique projection. In addition standard 3 view planar studies were also acquired following both exercise and rest injection. A circumferential profile was obtained for LV activity in each image after interpolative background subtraction. Each profile was normalized to the hottest segment. Profiles for images obtained early (5 min) and late (180 min) after stress injection and those obtained early and late after rest injection were compared for evidence of redistribution between early and late stress images. No pts with ischemia on stress and rest images showed evidence of spontaneous redistribution. In conclusion, there is no significant redistribution of Tc-99m Tetrofosmin up to 3 hours in ischemic myocardium following exercise injection. These results are important for optimizing the imaging parameters with this new myocardial perfusion imaging agent.

No. 1501

STANDARDIZED METHOD FOR RIGHT VENTRICULAR CINE DATA PROCESSING. E. Barlow, M. Tulchinsky, D.F. Eggli, C.E. Chambers. Division of Nuclear Medicine, Milton S. Hershey Medical Center/Penn State University Hospital, Hershey, PA

Currently, the right ventricular (RV) cine cycle (CC), generated from the ECG-gated first pass, is processed by a manual method (MM) to calculate RV ejection fraction (EF) that is time consuming and extremely operator dependant. We evaluated a semi-automatic method (SAM) developed in our clinic to standardize processing.

MM: A region of interest (ROI) was drawn around the RV on each frame of the RVCC, using filtered RVCC images as guides for tracing the RV outline. The end-diastolic (ED) and end-systolic (ES) values were the highest and lowest counts, respectively. SAM: A region of interest (ROI) was drawn around the RV, using the phase image as a guide. The time-activity curve was generated from the RVCC data set and the ED and ES frames were identified as those with highest and lowest counts, respectively. New fitted RV ROIs were drawn on the corresponding frames (using filtered image for guidance) to determine true ED and ES counts. Finally, MM processing was repeated (MM2) without phase or filtered RVCC image guides.

26 RVCC data sets were processed. Correlation of SAM and MM2 data with MM, and its statistical significance (p), was determined utilizing linear regression correlation coefficient (r).

Method	RVEF range	p-value	r
MM	0.15-0.77		
SAM	0.20-0.78	<0.0001	0.976
MM2	0.25-0.72	0.005	0.530

Study results indicate that if manual ROIs are drown without the use of filtered images, there is a poor correlation found with MM (the reference standard method). SAM, which uses phase and filtered RVCC images for guidance, correlated very well with MM. Hence, we recommend the use of guide images for processing of RVCC.

No. 1502

"NORTHERN LIGHTS" - SPECTACULAR ARTEFACTS OF MYOCARDIAL PERFUSION PRODUCED BY PIXEL OVERFLOW. R.J. Burke, K. Cheung, N.J. Petkovich, S.C.M. Lenkei, R.J. Burns. The Toronto Hospital, Toronto, Canada.

We perform routine dipyridamole (DYP) Tl-201 SPECT using 3.0 mCi of Tl-201, (0.56 mg/kg DYP)/4 min, and a GAP collimator. Peak myocardial hyperemia occurs at a variable interval after DYP infusion (and persists); we therefore begin SPECT acquisition 11 minutes after infusion. In 16 patients (2M/14F, mean age 61±5 years) with clinical low-intermediate pretest likelihood of CAD, acquisition of 30 frames step-and-shoot (40 s/frame) produced striking "transient LV dilation" as well as dramatic inferoposterior reversible "perfusion defects". Subsequently, 5 patients had normal coronary angiography and 1 patient had normal exercise Tl-201 SPECT. Review of projection data revealed myocardial and subdiaphragmatic (hepatic) ROI pixel overflow for all 16 patients. All patients had small stature (mean height = 159±2 cm; mean weight = 52±2 kg).

A Jaszczak cardiac phantom was used to acquire projection data with and without similar pixel overflow. "Myocardial" pixel overflow resulted in LV dilation. "Hepatic" pixel overflow resulted in reconstruction defects in adjacent myocardial segments.

Acquisition pixel overflow produces important, clinically misleading artefacts at myocardial perfusion scintigraphy, and is especially likely after pharmacologic stress in small patients. Marked myocardial and splanchnic hyperemia leads to reconstruction of very high regional counts surrounding the LV cavity and at the myocardial/hepatic confluence, leading in turn to arithmetic overflow during reconstruction. Additionally, backprojection filter functions apply negative coefficients to high counts in the spatial domain, producing large negative values (as may occur surrounding the urinary bladder on bone scans). Adoption of 60 frame (20 s/frame) acquisition for these studies to avoid acquisition pixel overflow has subsequently eliminated observation of these artefacts in our laboratory.

No. 1503

ACCURACY OF EJECTION FRACTION CALCULATION FROM GATED BLOOD POOL SPECT IMAGES USING SIMPSON'S RULE. T. George, J. Machac. The Mount Sinai Medical Center, New York, New York.

Gated blood pool tomographic imaging (GSPECT) has been available for several years, but a standard method of calculating the LV ejection fraction (LVEF) from the acquired data has not been established. We compared the accuracy of LVEFs obtained from GSPECT images using Simpson's Rule with LVEFs extracted from GSPECT planar image data using a semiautomatic planar technique. LVEFs obtained from standard LAO planar images served as the gold standard.

41 patients referred for resting GBP imaging were imaged with both planar GBP and GSPECT acquisition techniques. Planar GBP images were analyzed with a Technicare MICA program. Low-count, gated LAO images extracted from GSPECT data were analyzed with a semiautomatic planar LVEF program (Elscint CEFS) (GSPECT-CEFS). LV sectional areas were measured in serial short axis slices from apex to base with an automatic program (MTGSPEF) and summed for end systolic and end diastolic volumes (Simpson's Rule) and an LVEF (GSPECT-Simpson) was calculated. Both GSPECT-Simpson and GSPECT-CEFS were correlated with planar LVEFs.

Method	Correl Coeff
GSPECT-CEFS	0.96
GSPECT-Simpson	0.81

Theoretically, GSPECT-Simpson should have performed best, but the LVEFs obtained from the low count LAO images extracted from GSPECT image data (GSPECT-CEFS) performed better when compared to conventional planar GBP LVEFs.

No. 1504

FEASIBILITY OF SAME-DAY INTERVENTION/REST SESTAMIBI CARDIAC SCINTIGRAPHY. G.W. Guidry, J.J. Mahmarian, S.D. Obermueller, D.M. Gallik, U.S. Swarna and M.S. Verani. Baylor College of Medicine/The Methodist Hospital, Houston, TX.

The purpose of this investigation was to evaluate the feasibility of Tc-99m sestamibi (MIBI) for performing first-pass radionuclide angiography (FPRNA) and single-photon emission computed tomography (SPECT) using an intervention followed by a rest sequence. We studied 35 patients (pts) undergoing coronary angioplasty (PTCA) who had MIBI (11.8 mCi, range 9.8 to 13.6 mCi) injected during coronary occlusion followed immediately by FPRNA. Since MIBI localizes in viable myocardial tissue and because there is no significant redistribution and slow myocardial washout, SPECT perfusion images may be acquired up to 4 hours post injection. SPECT imaging was performed 2.1 ± 1.7 hours following the initial injection. Immediately following the SPECT study, the pts were injected with 20.0 (range 18.0 to 21.3) mCi MIBI, and baseline FPRNA and SPECT images were repeated. Time between injection and SPECT imaging was sufficient to allow for the clearance of MIBI uptake from the liver as this could affect visualization of the inferior wall. There was no significant interference from background counts between the intervention and rest injections. In fact, in nearly all patients the perfusion defects present during occlusion completely disappeared at rest. Most of the studies demonstrated an improvement in myocardial perfusion and global ventricular function from intervention to rest dependent upon the site of occlusion. In conclusion, Tc-99m sestamibi allows for the assessment of both ventricular function and myocardial perfusion during coronary intervention procedures and provides practical diagnostic information.

No. 1505

ASSESSMENT OF RISK AREA WITH Tc-99m SESTAMIBI SPECT: METHODOLOGY, REPRODUCIBILITY AND CORRELATION WITH FLOW. MP White, Q-X Shi, WL Bruni, MJ Singer, DP Dione, RC Fetterman, FJ Wackers, BL Zaret, AJ Sinusas. Yale University, New Haven, CT

Quantitative Tc-99m Sestamibi tomographic imaging has been used to assess myocardial risk area during acute myocardial infarction. To validate the efficacy of this approach, we performed quantification of defect size in closed chest dogs before and after myocardial infarction using several quantitative methods. Five dogs underwent SPECT imaging before and five hours after acute coronary occlusion. Quantification was performed on reconstructed short axis slices using a circumferential analysis. One method involved quantitation of defect magnitude (DM) by integrating the area between the baseline image and the infarct image. The second method quantified radial extent of defect (RED) using a five, ten and fifteen percent threshold change below baseline. Each image set was reconstructed and quantified twice to evaluate intra-observer variability. Reproducibility was excellent for each of the quantified approaches (r value range=0.98-0.99). Flow in the infarct area was assessed with radiolabeled microspheres. DM correlated well (r=-0.68) with the measured transmural flow in the infarct area. A correlation was also seen with examination of the RED, however only when a more stringent threshold was used (5%, r=0.45; 10%, r=0.61; 15%, r=0.65).

Thus tomographic quantitation of MIBI defect size is reproducible. Both methods which examine defect magnitude and extent correlated with flow.

Session II

Cardiac

1:30–3:00 Room: 206F

Moderators: Yasmin Allidina, CNMT and Raymond Figueroa, CNMT

No. 1506

INTRAVENOUS DOBUTAMINE WITH TECHNETIUM-99m SESTAMIBI SPECT IMAGING IN PATIENTS WITH REACTIVE AIRWAYS DISEASE. D.E. Messinger, A.W. Ahlberg, L.E. Sillaman, H.M. Andromalos, D.J. Cloutier, S.D. Herman, G.V. Heller. Memorial Hospital, Brown University, Providence, RI.

Patients (pts) with reactive airways disease (RAD) are often unable to exercise adequately for the evaluation of suspected coronary artery disease (CAD). The use of intravenous dobutamine (DOB) combined with technetium-99m sestamibi (MIBI) SPECT myocardial imaging in such pts has not been evaluated.

DOB was administered to 39 pts with RAD and suspected CAD begining at 5 mcg/kg/min, increasing to 10, 20, and 30 mcg/kg/min in 3 minute stages. Patient symptoms and 3-lead ECGs were monitored continuously; 12-lead ECGs and blood pressures were obtained at the end of each stage. Approximately 555 MBq (15 mCi) of MIBI was injected 1 minute prior to infusion termination. SPECT myocardial imaging was performed 1 hour following injection. Sixty-four projections (20 seconds/projection) were obtained in a 180° arc extending from 45° RAO to 45° LPO and stored in a 64x64x16 matrix. Rest imaging was performed on a different day after a separate MIBI injection.

There were no serious complications resulting from the DOB infusion. Infusion endpoints included: completion of the 30 mcg/kg/min stage in 29 pts, hypotension in 3, non-sustained ventricular tachycardia in 2, achievement of 100% age-predicted heart rate in 2, ventricular bigeminy in 1, hypertension in 1, and multifocal atrial tachycardia in 1. Non-cardiac side effects included headache in 4 pts and dyspnea in 1. Myocardial ischemia was detected by MIBI SPECT imaging in 17 pts (44%), while anginal chest pain occurred in 9 (23%) and ischemic S-T segment depression (≥0.1 mV) developed in only 4 (10%).

CONCLUSION: Intravenous dobutamine with technetium-99m sestamibi SPECT imaging can be used safely and identifies ischemia in patients with reactive airways disease in whom coronary artery disease is suspected.

No. 1507

AUTOMATIC SEGMENTATION OF GATED MR IMAGES OF THE MYOCARDIUM.

B. Ho[1], J. Li[1,2], J.S.Areeda[2] and G Germano[1,2].

[1] Department of Radiology, UCLA School of Medicine and [2] Department of Imaging, Cedars-Sinai Medical Center, Los Angeles.

Fusion of SPECT and MR images is crucial to the understanding of physiological activity as well as to diagnosing disease of the myocardium. The first step towards an automated image fusion protocol for routine clinical use is a method for accurate and automatic or semiautomatic segmentation of key features in each image set, to be used as alignment landmarks. Prominent features such as the edge of the myocardium can be automatically detected based on their edge sharpness, greylevel and other parameters such as distance from the ventricular axes.

This project concentrates on the MR segmentation problem. Various features of the heart will be segmented using fuzzy mathematics. The strength of fuzzy mathematics is its ability to mantain a large set of unrigorous parameters and derive a conclusion from it based on simple rules. In MR images, where the pixel greylevel lack a definite correspondence to the physical identity of the source (such as the energy stopping power in computed tomography), classical threshold segmentation breaks down. The approach used in this project aims at exercising common sense rules used in human vision, where edge and contrast definitions offer strong cues to aid interpretation without being restricted to a predefined range where conventional mathematics can easily apply. More abstract information such as texture, overall contour of a tomographic section and relative size of anatomical components, as well as "personal preferences" can also be incorporated into the fuzzy approach to solve a complex segmentation problem which evades the conventional methods.

In this project, key features which both yield to the fuzzy segmentation method and serve as good landmarks are identified. Preliminary results on matching such landmarks against related landmarks found in corresponding gated myocardial SPECT images for the purpose of image fusion have been obtained.

No. 1508

EVALUATION OF UNGATED MYOCARDIAL PERFUSION DERIVED FROM GATED CARDIAC SPECT USING TC-99M SESTAMIBI. LM Blackman, EH Botvinick, MW Dae, AT Shields, and W O'Connell. University of California, San Francisco, CA.

Myocardial SPECT imaging with 99mTc sestamibi now permits evaluation of both perfusion, in ungated images, and function , in gated images. However, a single acquisition is optimal. We compared ungated SPECT stress images to similar images derived from a separate gated SPECT acquisition in 10 patients with clinically indicated stress sestamibi perfusion imaging. Gated images were summed in each projection frame to produce a composite or degated image set. Both degated and ungated stress studies were compared with rest acquisitions in order to assess any computer or technically induced errors in the gating procedure.

Each patient study was reviewed both qualitatively and quantitatively. The SPECT slices were displayed on film in three different formats: ungated stress vs. rest, degated stress vs. rest, and ungated stress vs. degated stress. The films were visually assessed by 3 trained physicians and categoried as: normal, reversible (ischemic), or fixed (infarct).

Five images sets were read as entirely normal in all 3 formats. The 5 remaining images sets all indicated "ischemic" change when ungated or degated sets were compared to rest images. Studies were read as "fixed" or with "infarct pattern" in the ungated/degated comparison, indicating an excellent match in defect extent and localization. Similarly, there was no significant difference between quantitative measurement of abnormalities projected on polar maps derived from degated and ungated image sets.

In view of the comparability of the 2 studies, with no evident loss of any clinical information between the degated and ungated stress images, post processing of a single gated SPECT sestamibi study can yield reliable information regarding both myocardial perfusion and function.

No. 1509

DEFECT SIZE CAN BE REPRODUCIBLY QUANTIFIED WITH PLANAR SESTAMIBI IMAGING IN A CLOSED CHEST CANINE INFARCT MODEL.

W Bruni, Q-X Shi, M Singer, M White, D Dione, FJ Wackers, BL Zaret, AJ Sinusas. Yale University, New Haven, CT.

Serial Tc-99m Sestamibi (MIBI) imaging is used to evaluate risk area and myocardial salvage following thrombolysis. A reduction in defect size has been equated with reperfusion and myocardial salvage. Therefore, reproducibility of image quantification is critical for this analysis. To evaluate several quantitative methods we performed planar MIBI imaging before and after surgical myocardial infarction in 6 closed chest canines. ECG gated planar images were obtained 15 min after injection of MIBI (25-30 mCi). Planar images were quantified using circumferential analysis following interpolative background subtraction. All studies (n=11) were processed twice to define intra-observer variability. Defect magnitude (DM) was computed by integrating the area between each profile and the corresponding baseline profile. The radial defect extent (RDE) was computed using a 5%, 10%, and 15% threshold below baseline. Quantification of DM showed excellent reproducibility (r=0.93). In evaluation of RDE, reproducibility for a 15% threshold (r=0.94) was found to be better than the reproducibility for both a 10% threshold (r=0.86) and a 5% threshold (r=0.77). In a subset of 3 dogs, defect size was evaluated acutely and 1 week post infarction. DM (19±3 to 6.7±2.3) and RDE 15% (16.3± 2.3 to 7.7±2.3) both decreased in spite of persistent coronary occlusion. The observed change in defect size exceeded the variability in processing. This significant reduction in defect size was observed even in the presence of an occluded artery. Thus, quantification of planar MIBI defect size by examination of both DM and RDE is highly reproducible. Changes in planar quantitative defect size were observed even in the presence of an occluded infarct related artery.

No. 1510

TECHNICAL CONSIDERATIONS AND PROJECT DESIGN FOR A LARGE COMMUNITY STUDY OF CORONARY ARTERY DISEASE IN WOMEN. Y. Takamiya, M.W. Groch, A. Al-Hani, R. Cerceo, W.D. Erwin. St. James Hospital and Health Centers, Chicago Heights, IL; and Applied Physics and Research Group, Siemens Gammasonics Inc., Hoffman Estates, IL

The Women Take Heart Project is a study of coronary artery disease (CAD) in women utilizing treadmill (TM) stress ECG (GXT) testing followed by myocardial perfusion imaging (MPI) for women with 1

mm or more ST-segment depression (PosGXT) and, when indicated by an abnormal MPI, coronary arteriography (CATH).

PROTOCOL: 35 year and older women with minimal or no cardiac symptoms underwent GXT with a peripheral venous access in place. Women with PosGXT underwent MPI with Tc-99m SestaMIBI (MIBI). Twelve GXT rooms were specifically designed to meet patient privacy, noise abatement, and staff access requirements. Three SPECT scanners were installed at the study center (SC) in proximity to GXT rooms. All nuclear scans and films were processed on a daily basis at the SC. A data processing area and adequate space for radiopharmaceutical materials handling were included in SC design to insure safety and efficiency. During the project, 5 Nuclear Medicine Technologists participated, 2-3 in the SPECT area, 2 in the treadmill/injection area, and 1 in the data processing center.

RESULTS: 5932 women were studied over 57 days, each spending an estimated 90-180 min. at the SC. 1345 women (22.7%) with PosGXT underwent MPI; 46 of 47 women (98.8%) with abnormal MPI results returned for rest MPI on subsequent day.

CONCLUSION: 1. A large cohort of community volunteer women can be studied over a relatively short period of time, including large numbers of MPI procedures, without significant time delays or scheduling difficulties, given appropriate site, equipment, staffing, and administrative planning.

No. 1511

COMPARISON OF CT,MRI,PET SCANNING D.A Dines, S.L. Riggin, R.J. Smith and J.S. Karp, A.Alavi, University of Pennsylvania, Philadelphia

The PET Center at the University of Pennsylvania has two PENN PET cameras and a JSW cyclotron. The PET Center employs 2 technologists and a research Physicist, as well as 3 cyclotron technicians to perform research and clinical trial scans. Currently we perform on average 15 studies or 6-9 patient protocols per week. There are currently 8 different protocols and more than 15 approved projects at the Pet Center. These range from multiframe equilibrium and slow bolus oxygen (O-15) studies in the brain to whole body F18-FDG cancer studies in the body. The duration of these scans range from 30 min to 3hr scans for brain scans and 1hr to 2hr for body scans. Whole body scans are acquired in multiple frames and a 40 min post injection. The wide range of study types and the dynamic nature of research Positron Emission Tomography present unique challenges to a Medical Technologist who must interact more closely with both the Physics and Medical staff to achieve quantitative results. The degree of involvement in analysis is much greater than in general Nuclear Medicine or CT/MRI. On the basis of combined experience in Nuclear Medicine and in CT/MRI scanning, the implications of working in PET, from a technologists perspective, will be discussed. A Nuclear Medicine Department may employ up to 12 technologists to perform up to 25 to 30 patient protocols per day (eg bone and cardiac studies) and a CT or MRI Department may employ 3-6 technologists to perform 15-20 scans per day all using predefined acquisition and reconstruction menus. On the other hand, a research and clinical development PET Center such as ours employs fewer technologists yet the patient preparation, including (psychological and EEG pre-tests, arterial lines and multiple positionings), calibrations and quality control, reconstruction and analyses are both more varied and more involved. The technologist is required to continually develop and acquire new skills on a daily basis.

Session III

PET/Neurology

3:30–5:00 **Room: 206F**

Moderators: Anita Palant CNMT and Kathy Thomas, CNMT

No. 1512

ASSESSMENT OF EARLY MYOCARDIAL FDG STUDIES TO INCREASE PATIENT THROUGHPUT. D.A. Rich, C.K. Ng, H.M. Dey, R. Soufer. Yale University School of Medicine/VA PET Center, West Haven, CT.

F-18 labeled 2-Fluoro-2-Deoxyglucose (FDG) is commonly used to evaluate myocardial viability with PET. With a prior glucose load, FDG is known to have the appropriate blood pool clearance and myocardial uptake suitable for high quality imaging at 40 min post injection. Images obtained at an earlier time interval, however, may potentially have less problem with image artifact due to patient motion. In addition, earlier imaging increases patient comfort and throughput which are critical to a clinical PET site. Therefore we investigated the validity of performing cardiac FDG studies at earlier time intervals.

A total of 22 patients, injected with 10 mCi of FDG, were imaged with the pre-selected protocols: I. from 40 min to 60 min (n=22), II. from 10 min to 30 min (n=10), III. from 30 min to 40 min (n=17). Results from protocols II and III were compared to those from protocol I which were considered to be the clinical standard. Data, acquired on a POSICAM 6.5 scanner, was reconstructed into horizontal, vertical and short axis views. Counts in each image were normalized to the maximum activity in the corresponding image set. Segments with less than 60% activity were considered to be non-viable. An interpreter visually rated 5 segments (anterior, lateral, inferior, septal and apical) in each randomly coded study. Duplicate readings were performed two weeks apart. The average agreement for protocols II and III with protocol I was 85% and 82% respectively. 3 new disagreements were generated in reading 2, an intra-observer variability of 10% (3/27).

In summary, these preliminary data suggest that imaging cardiac FDG studies at earlier time intervals retains diagnostic accuracy as compared to the standard (40 min to 60 min). This finding is important for the potential reduction of image artifact and a positive effect on patient comfort and throughput in a clinical setting.

No. 1513

A SIMPLIFIED METHOD TO POSITION PATIENTS IN CLINICAL CARDIAC PET STUDIES. D.A. Rich, J.K. Markey, C.K. Ng, R.A. Rembish, H.M. Dey, R. Soufer. Yale University School of Medicine/VA PET Center, West Haven, CT.

Currently available PET systems employ an average axial field of view (FOV) of 11 cm. Accurate positioning of the myocardium in this restricted FOV is critical for efficient patient throughput and maximal diagnostic information from an emission scan. Although using the transmission scan for positioning is the most common method, poor tissue contrast between the myocardium and the surrounding organs may result in mis-interpretation of the myocardial position. N-13 labeled ammonia (NH3) with a half-life of 10 min is rapidly extracted by the myocardium and cleared from the blood pool. Using this perfusion tracer, we have developed a preview method to eliminiate the potential for mis-positioning the myocardium.

Each patient was positioned in the gantry of a POSICAM 6.5 scanner by placing the point of maximal impulse (PMI) 3 cm into the FOV. An image was acquired from 4 min to 8 min post injection of 4 mCi of NH3. Two projection images, anterior and left anterior oblique, were generated for viewing in 1 min. After the borders of the heart were identified, the computer software provided the measurement necessary for repositioning the heart within the FOV. The patient position was adjusted accordingly and the cardiac PET study was initiated.

The preview method has decreased the incidence of mis-positioning the myocardium within the FOV to less than 1%. In addition, this method requires only a total of 9 min while the transmission method requires 15 min for acquisition and 15 min for image reconstruction. Using NH3 to position the myocardium has proven to be a reliable and time-saving methodology.

No. 1514

IMAGE NOISE: TEXTURE, PRECISION AND REPRODUCIBILITY IN 2D AND 3D PET DATA

T.J. Dobko, D. Bailey* & S. Meikle*. TRIUMF/University of British Columbia PET Department, Vancouver, Canada and *Department of Nuclear Medicine, Royal Prince Alfred Hospital, Sydney, Australia.

We defined texture as noise within a given region of interest (ROI), precision as variation in the mean of multiple ROI's throughout a plane and reproducibility as variation of the mean in a ROI over dynamic frames. These types of noise were investigated to determine noise characteristics with and without attenuation correction (AC) in 2D and 3D PET data.

A solid Ge-68 cylinder source was scanned for one 5 min and one 40 min static frame and for eight 5 min dynamic frames, in 2D and 3D, and reconstructed with and without AC. Six ROI's (radius of 7.0 mm each) were placed on five circumferences of increasing diameter on multiple planes of the static scans. The absolute standard deviation (ASD) ie. the numerical

value of the magnitude of the SD was calculated. A set of annuli was positioned for radii of 1-9 cm and placed on the static 2D and 3D frames. Six ROI's of increasing diameter were placed on multiple planes of each frame of the dynamic 2D and 3D series. The ASD over frames and the standard deviation of ROI means were calculated.

Average ASD of the six ROI's versus the different circumferences at which they were positioned was plotted for AC and non-AC data. ASD was independent of location in the non-AC data. The AC data decreased radially from the centre out. ASD was independent of ROI size. The SD of ROI means of the dynamic data versus ROI radius showed that for radius up to 20 mm there was a rapid decrease, becoming more gradual for larger radii.

In general the trends were the same in 2D and 3D, with 3D always showing less noise for a similar acquisition time. The findings are: 1) absolute noise levels are constant across images reconstructed without AC, 2) absolute noise levels increase towards the center of the image reconstructed with AC, 3) absolute noise is independent of ROI size and is consistent over independent measurements, 4) estimation error of ROI mean decreases with increasing ROI radius, and 5) estimation error of ROI mean is independent of ROI location for a given ROI size.

No. 1515

BLOOD SAMPLING PROCEDURE FOR DETERMINING ARTERIAL INPUT FUNCTIONS FOR QUANTITATIVE P.E.T IMAGING. J.A. Koeppel, L.L. Boles Ponto, E.E. Argenyi, J. Clark, J.W. Richmond, D.J. Rodeghiero Johnston, S.D. Wollenweber, L.A. Wollenweber, R.D. Hichwa. P.E.T. Imaging Center, University of Iowa, Iowa City, IA.

We have developed the necessary hardware and software tools to efficiently draw and analyze discrete blood samples that describe arterial input functions for quantitative P.E.T. imaging of [F-18] FDG, [O-15] water, and [C-11] neuroreceptors. These techniques require only two people.

The specialized equipment utilized for arterial blood sampling includes flat-top capped 1.5 ml centrifuge microtubes, a customized light weight acetyl rack and cover designed to hold 25 tubes with funneled openings for the blood. The arterial line is equipped with a 20G x 1-1/4 in. JELCO IV catheter, a Sorenson custom made pressure monitoring assembly, a double male luer lock adapter, and a SURFLO 21G x 3/4 in. winged infusion set. During high frequency blood sampling, the arterial line is opened and the blood is allowed to flow into the numbered sample tubes. During lower frequency sampling, a volume of blood in excess of the dead-space of the system is withdrawn prior to sample acquisition.

Three specialized software programs were developed to record data and generate decay corrected blood curves. The first is to record blood draw times (time post injection) via foot pedal. The second is to record weights of the sample tubes (before and after blood draw) with a computer interfaced balance and record counts and count times from a well counter. The third program is to combine the above two files and calculate appropriate decay and weight/volume corrections in order to generate the arterial concentration vs. time profile. Corrected blood data are then combined with the P.E.T. image data to give functional images in physiological units.

No. 1516

CHARACTERISATION OF PATIENT MOTION ARTIFACTS IN CEREBRAL SPECT ACQUISITION. K.M. Silver, G.M. Currie, A.F. McLaughlin. Department of Nuclear Medicine, Royal Prince Alfred Hospital, Sydney, Australia.

There have been a number of studies of motion artifacts in Tl-201 myocardial SPECT scans characterising certain easily recognisable artifacts. Cerebral perfusion studies often have motion artifacts due to the nature of the patients studied (dementia, epilepsy). A knowledge of characteristic defects, if they occur, due to motion was thought to be useful for cerebral SPECT.

In order to tabulate and characterise patient motion artifacts during cerebral SPECT studies, a series of SPECT acquisitions were performed using a 3-D Hoffman brain phantom on a single headed Philips Diagnost SPECT camera rotating counter clockwise from the posterior projection. The phantom was filled with 200 MBq of Tc-99m. A 360 degree, 64 projection SPECT acquisition was performed utilising a high resolution collimator. The time per projection was corrected for decay ensuring comparable counting statistics between studies.

Vertical (superior and inferior) movement and simulated lateral (left and right) movements were made at 45°, 115°, 180°, 210° and 270° for 0.5 cm and 2 cm where the phantom remained in this position for 1 frame, 6 frames or the remainder of the study before returning to its' original position. Clockwise and counter clockwise rotation of the phantom on its own axis was also performed at 45°, 115°, 180° 210° and 270° for 1 frame, 6 frames or the remainder of the study before returning to its' original position with rotations of 5°, 10° and 25°.

Each of the studies were reconstructed, attenuation and scatter corrected and the transaxial slices were compared to the control study to assess the location, type and extent of the resultant artifact. These results were then tabulated providing an accurate predictor of patient motion during acquisition since the artifact is characterised by the type of motion and the extent of the artifact is related to the size of the movement. This provides two main advantages:

1). in a study where an unexpected defect is demonstrated, the table can be consulted and if the defect is characterised as typical of a motion artifact, the raw data can be more closely examined for motion allowing the defect to be confidently identified as a real defect or an artifact,

2). when patient motion is apparent and the study cannot be repeated, the table may be able to be used to differentiate between real defects and artifacts so the study can still be considered to have diagnostic value.

It should be noted that these results are only relevant for single headed SPECT systems with counter clockwise rotation starting form the posterior aspect. It can easily be adapted for various starting positions and clockwise rotation but is not adaptable to multi-headed SPECT systems.

No. 1517

Tc-99m HMPAO SCANNING FOR CEREBRAL VIABILITY AND BRAIN DEATH - IT'S BLACK OR WHITE. G.M. Currie, A.F. McLaughlin, M.A. McGee, S. Angelides and R.J. Dickinson. Department of Nuclear Medicine, Royal Prince Alfred Hospital, Sydney, Australia.

There is an increasing need for a simple and accurate method to determine brain death to cease unnecessary, expensive life support and to facilitate early organ harvest for transplantation. Current non-radionuclide methods have limited value due to depresant drugs and head/facial trauma. The radionuclide method of arterial flow and venous phase imaging is simple and physiological and can be used in any patient. However, the significance of sagittal sinus activity is unreliable as it can fill from the external carotid system. Hence, Tc-99m HMPAO adds the dimension of a positive brain image where brain death has not occured.

Three Nuclear Medicine Physicians were asked to give a diagnosis of cerebral viability or brain death using:

1). only the cerebral blood flow and blood pool data which is provided by the dynamic phase of the study,

2). with the cerebral perfusion data provided by Tc-99m HMPAO.

Diagnosis was made with the knowledge that the ITLC results showed greater than 85% primary Tc-99m HMPAO content. The results were then correlated.

There have been 18 cerebral viability studies using Tc-99m HMPAO on 15 patients in this department. ITLC results were calculated to be greater than 85% primary Tc-99m HMPAO in all cases. 13 studies indicated brain death which corresponded to the clinical findings of probable brain death. 5 studies were negative for brain death on both the cerebral blood flow data and the cerebral perfusion data. The studies demonstrated 100% correlation between the flow and perfusion studies with 100% sensitivity and 100% specificity.

Although our results did not demonstrate that Tc-99m HMPAO is a more accurate method of assessing cerebral viability, it did provide data which enabled the physicians to give a diagnosis of cerebral viability or brain death with greater confidence. Tc-99m HMPAO also provides data which is independent of a good bolus which is often a problem in this type of study.

WEDNESDAY, JUNE 9, 1993

Session IV

Bone/SPECT

8:30–10:00 **Room: 206F**

Moderators: Chris Carlson, CNMT and Ann Voslar, CNMT

No. 1518

Clinical Significance of Lumbar Spine SPECT Imaging In Early Detection of Spinal Abnormalities. M. Merry, R. Gladding, J. Reilley, A. Alavi, MD., University of Pennsylvania Medical Center, Philadelphia, PA.

The Clinical advantage of SPECT over planar imaging in the early diagnosis of abnormalities in the lumbar spine has been well documented. The significance of early detection of metastatic disease can not be over emphasized.

Twenty-four patients were chosen at random to have planar and SPECT imaging of the lumbar spine. The patient disorders ranged from chronic low back pain with no history of neoplastic disease to patients with known primary cancer with and without bone pain.

All of the SPECT studies were acquired on a Prism multi-head camera system. The acquisition was set to acquire for 60 stops at 15 seconds per stop, for a total acquisition time of 22 minutes. The data were processed with a Low- Pass prefilter with a 4.0 Order of Magnitude and a cut-off frequency of .4. A Ramp filter was applied for reconstruction of

images to be displayed in a 2 pixel width thickness in the transverse, sagittal and coronal planes.

Careful interpretation of all studies revealed the following results. Seven (7) patient studies were read as normal on both planar and SPECT scans. Ten (10) patient studies revealed a positive area of increased uptake of the radiopharmaceutical in one or more of the lumbar vertebrae with planar imaging. Of these ten (10) all abnormalities were more clearly delineated with SPECT imaging. Five (5) of the patients were interpreted as within normal limits from planar images, although the SPECT images showed clear abnormalities in one or more areas of the lumbar spine in all five (5) studies. Two (2) patient studies showed questionable abnormalities with planar imaging. SPECT images of these two (2) patient studies demonstrated clearly delineated abnormalities.

From the data obtained we must conclude that it is possible to detect abnormalities within the lumbar spine that went undetected with planar imaging. Therefore, it is our contention that all patients with known primary cancer being evaluated to rule out metastatic disease with planar whole body bone scan be further evaluated with lumbar spine SPECT imaging.

No. 1519

EVALUATION OF A SPECIALLY DESIGNED CARDIOFOCAL COLLIMATOR FOR MYOCARDIAL SPECT IMAGING. A. Kreft, J.R. Halama, R.E. Henkin, R. H. Wagner. Loyola University of Chicago Medical Center, Maywood, IL.

The Siemens Gammasonics Cardiofocal collimator (CFC), whose septa converge at its center but gradually revert to parallel at its edge, is a low-energy, high-resolution, yet high-sensitivity collimator specially designed for myocardial SPECT imaging. The CFC enhances the sensitivity in the heart, while avoiding body truncation artifacts in SPECT. Ten patients injected with 5 mCi of 201-Tl chloride were imaged at rest with the low-energy, high-resolution parallel hole collimator (HRPHC) then imaged with the CFC. SPECT images were acquired over 180 degrees in 64 steps at 20 seconds/step. Five additional CFC steps were acquired to complete the 180 degree angular sampling of the converging septa. Tomographic images were reconstructed with identical Hann filters.

The CFC yielded on average 2.7 million counts compared to 4.3 million counts for the HRPHC. The lower total count for the CFC is attributable to its design, which includes less of the body axially. In tomographic images of the heart region, the CFC is predicted to have twice the sensitivity of the HRPHC for a 29 cm radius-of-rotation (ROR). For six patients with a 27-30 cm ROR, the CFC and HRPHC yielded on average 13,000 and 8,500 counts, respectively. The CFC/HRPHC count ratio was 1.52. In patients with a shorter 25-26 cm ROR, a count ratio of 1.39 was observed. Both count ratios are lower than predicted because the heart does not remain at the center-of-rotation at all acquisition angles.

Two nuclear medicine physicians read the images in a blind study. Of the ten patient studies performed with CFC and HRPHC, five of the CFC studies had superior resolution, contrast, and overall quality. Four were judged equal and one HRPHC study was rated better in overall quality.

In conclusion, the sensitivity of the CFC is approximately 1.5 times greater than the HRPHC. The CFC design enhances myocardial SPECT imaging as compared to the HRPHC.

No. 1520

SURFACE RENDERING OF CARDIAC PERFUSION TOMOGRAPHIC SCANS FOR ADDED EVALUATION OF SUSPECTED ARTIFACTS AND REGISTRATION MISALIGNMENTS. J. Ward, R. Taylor, C. Boyce, N. Newlin. Herrick Memorial Hospital, Tecumseh, Michigan

Tomographic perfusion imaging, while offering more sensitivity to cardiac disease, is prone to artifacts caused by changes in patient position between scans, changes in cardiac tilt and size between rest and stress imaging, and breast and diaphragmatic attenuation. Another difficulty arises in registration of the two sets of images when the defect is in the apex and therefore, the exact location of the apex needs to be estimated. Registration artifacts can also be caused by processing the two phases of the scan by different technologists, where tilt and angulation may not be perfectly matched. When processing errors, registration artifacts or attenuation defects are suspected by the physician, surface rendering is useful in confirming diagnosis. Using a program specifically designed to display surface rendering of the trans-axial and horizontal short axis images of both rest and stress images simultaneously has proven useful in our institution. Trans-axial images show the apex, septal and lateral walls while the H.S.A. images allow better assessment of the inferior, posterior and anterior walls. This program is also helpful in marketing services to the prescribing physician as it is easier to visualize the defects. Surface rendering takes only an extra 2 minutes with our program and, in our institution, has helped lower the false positive rate (as measured by angiography).

No. 1521

THE EFFECT OF ECG SIGNAL FLUCTUATION ON Tc-99m SESTAMIBI MULTIGATED SPECT. RD Folks, EV Garcia, Emory University School of Medicine, Atlanta, Ga.

Review of multigated SPECT (MS) can be complicated by fluctuation in frame to frame counts, which manifests as visible flicker during rapid review of summed projections. To determine the prevalence of count fluctuation artifact (CFA), 200 consecutive MS studies performed at our institution were reviewed retrospectively, and CFA was seen in 24 (12%).

One cause of count loss in any multigated study is loss of gate signal integrity. Thus, to generate a study with CFA of known magnitude, MS studies were performed using Tc-99m in an elliptical phantom with myocardial insert, and defect volume containing 75% of "normal" concentration. Acquisition was exactly as for clinical studies: 8 frames/cycle, 20 seconds/frame with no arrhythmia rejection. A constant trigger source was provided by an ECG simulator. In one study the ECG source was physically disconnected for 1 second during acquisition of every other frame, resulting in a loss of 3-5 seconds of acquisition time and an average count loss of 14% per frame. An ungated study was done as a control.

The correction methodology involved fitting a fourth-order polynomial to the time-activity curve of raw data, calculating each data frame's deviation from the fit (DF), and multiplying the frame by the ratio of DF to raw frame counts. Max count circumferential profiles were used to measure defect contrast ((Max - Min)/Max) in the phantom before and after correction. Patient studies exhibiting CFA were corrected and reviewed.

The phantom with gate interruption exhibited marked CFA by visual inspection; the mean % DF was 10.04 ± .04. Mean defect contrast in the ungated phantom was .422 ± .065 and with gating .417 ± .056. Contrast fell to .397 ± .410 with gate interruption but the difference was not significant (p=.04). In patients the mean % DF was 5.06 ± .99.

A patient specific correction can be applied in <60 seconds to MS data exhibiting CFA, and may be an aid in the important step of visually assessing the projections for tissue attenuation, cardiac size and patient motion.

No. 1522

LEFT VENTRICULAR EJECTION FRACTION CALCULATED FROM GATED SPECT 99M-TC SESTAMIBI STUDIES. S.R. Kupfer, C.K. Hoh, S. Khanna, W. Doucette, C. Carlson, D. Marciano, R.A. Hawkins. UCLA School of Medicine, Los Angeles, CA.

Cardiac perfusion imaging gives a non-invasive evaluation of coronary artery disease. The addition of gated SPECT acquisitions provide further information about the cardiac wall motion without adding any extra imaging time for the patient. The ability to quantify this wall motion, particularly by a calculated left ventricular ejection fraction (LVEF) would provide an efficient, non-invasive method of assessing cardiac function. This study included 10 patients who had undergone gated SPECT and recent contrast angiography. Each patient was given 22-25mCi of 99m-Tc sestamibi based weight. The SPECT acquisition consisted of 64 views over a 180 degrees at 20 seconds/view using a Siemens Orbiter camera. Projection images were gated into one of eight time bins based on the R-R interval. Left ventricular volumes (LVV) were calculated using a derivative edge detection technique to calculate the volume from the center of the left ventricle to the midmyocardial wall. The LVEF was calculated using the LVVs determined at end systole and at end diastole. There was a good correlation between the LVEF from SPECT and the LVEF from contrast angiography r=0.91.

We conclude that measuring LVEFs from the gated SPECT sestamibi studies is feasible, and provides a non-invasive method for estimating the LVEF.

No. 1523

OPTIMIZATION OF BRAIN SPECT FILTER SELECTION USING A BRAIN PHANTOM. D.C. Vines, J.M. Lucas, M. Ichise, B.G. Gray, J.C. Kirsh, Division of Nuclear Medicine, Mount Sinai Hospital, Toronto, Ontario, Canada

The purpose of this study is to determine the optimal back-projection filter for reconstruction of Tc-99m HMPAO Brain SPECT images acquired at clinically relevant count levels.

SPECT imaging of a single slice brain phantom (Data Spectrum's Hoffman Brain Phantom Model 8080) containing Tc-99m pertechnetate, was performed using a single head rotating gamma camera (Elscint 409 ECT). The acquisition was done twice, yielding total counts of less than 3.5 million and 3.6-4.5 million. A "gold standard" image was obtained by planar acquisition with the phantom resting on the top of the collimator. Hanning and Butterworth filters were evaluated by varying the cutoff frequentcies (Fc). The ranges of Fc were 0.33 to 0.56/cm for Hanning and 0.35 to 0.49/cm for Butterworth. The order of the Butterworth filter was kept constant at 5. Optimal filter selection was determined by visual comparison of the SPECT filtered images to the "standard" by three nuclear medicine physicians.

The Butterworth filter was preferred for both ranges of total counts. As the total counts increased, the preferred Fc also increased. The Fc selected for the lower count acquisition was 0.42/cm and for the higher it was 0.48/cm.

In conclusion, this simulation of a clinical study using a phantom was useful in determining the optimal filter for reconstruction of HMPAO Brain SPECT images.

Session V

Pediatrics/Renal

10:30–12:00 **Room: 206F**

Moderators: Sue Weiss, CNMT and Nellie Kelty, CNMT

No. 1524

FIRST-PASS RADIONUCLIDE ANGIOGRAPHY USING THE MULTIWIRE GAMMA CAMERA AND TANTALUM-178 FOR EVALUATING THE CARDIOTOXIC EFFECTS OF CHEMOTHERAPY ON VENTRICULAR FUNCTION IN PEDIATRIC ONCOLOGY PATIENTS. G.W. Guidry, J.L. Lacy, Z. Dreyer, J.J. Mahmarian, and M.S. Verani. Baylor College of Medicine/The Methodist Hospital, Houston, TX.

Although anthracycline therapy is known to be cardiotoxic in adults, its effects on ventricular function in pediatric oncology patients remains to be determined. First-pass radionuclide angiography (FPRNA) using the multiwire gamma camera in association with the short-lived (T-1/2=9.3 min) radioisotope tantalum (Ta)-178 is an accurate method for assessing both the right ventricular (RV) and left ventricular (LV) ejection fraction (EF) at rest and during exercise. Accordingly, we performed FPRNA on 113 long-term survivors of childhood cancer treated with anthracycline drugs. Patient age at the time of diagnosis ranged from 1 to 14 years; however, patient age ranged from 6 to 26 years at the time of FPRNA (mean age 14 years). Ta-178 was injected intravenously through either an antecubital arm vein or, less often, through a currently accessible central venous line. All of these patients underwent FPRNA at rest and 74 underwent combined rest/stress imaging. Injected doses of Ta-178 ranged from 24.0 to 36.8 mCi, with a mean dose of 32.0 mCi. Resting LV function was abnormal in 32% of the patients. In patients undergoing exercise, 38% had an abnormal LV response with a mean decrease in EF from 58% to 51%. Thus, FPRNA with Ta-178 permits detection of occult underlying cardiac dysfunction which may be important when deciding whether to give additional anthracycline therapy.

No. 1525

HEPATIC UPTAKE SEEN DURING TC-99m MAG-3 RENOGRAPHY IN CHILDREN. S. Ferency, R. Bolton, D. Rosenbaum, T. Motley, and M. Abrahamson. Children's Hospital and Medical Center, Seattle, WA.

We studied 189 pediatric patients having radionuclide diuresis renography using Tc-99m Mag-3. Significant visual uptake of the radiotracer in the liver was noted in 48 patients. The uptake was quantified by setting regions-of-interest (ROI's) over the liver, kidney, and mid-kidney region and calculating the count ratios in these areas over the duration of the study. Factors analyzed to explain the presence of the hepatic uptake included patient age, quality of radiopharmaceutical (as defined by time post-reconstitution), and sex of patient. Of those patients exhibiting positive qualitative uptake, we found the average age to be 9.2 years (ranging from 0 to 22). In comparison, the average age for the 141 children without liver uptake was 2.2 years (ranging from 0 to 19). We saw no difference in hepatic uptake based on either the time post reconstitution of the Mag-3 nor the sex of the patient.

No. 1526

PEDIATRIC NUCLEAR MEDICINE - TECHNICAL ASPECTS. S. Fischer. Clinic for Nuclear Medicine, University Hospital Mainz, Germany

In medicine children need special attention. They cannot be handled as "small adults", but examinations with children are exacting very much to the staff in the nuclear medicine department.

There are a lot of things which have to be considered to reach a high standard imaging in a way which affects the child as less as possible:

- a special waiting room for the reason of radiation protection
- outfit of the camera room
- time schedule
- dosage of the radiopharmaceutical
- preparation of the child for the injection
- special preparation for the different tests
- sedation
- positioning and fixation during the imaging

The paper will present the experience with nuclear medicine examinations in a German University Hospital where about 10 % of the patients are children. The most important thing is a very low radiation dose for the little patients and a good quality of the images.

No. 1527

EARLY EXPERIENCE USING A TRIPLE-HEADED DEDICATED SPECT SYSTEM WITH THE PEDIATRIC PATIENT. R.T. Davis, J.S. Ulanski, T.S. Wilson, D.J. Shea, J. Costello, K.D. Mitchell, R.E. Zimmerman and S.T. Treves. Children's Hospital and Harvard Medical School, Boston, MA.

Triple-headed dedicated SPECT systems can significantly reduce imaging time and substantially increase image quality in pediatric nuclear medicine. Decreased imaging time has also reduced the frequency of sedation. Our early comparison looking at bone, brain, renal and cardiac imaging, between single head versus a triple headed system has shown a 40-60% decrease in imaging time with a 90-100% increase in counting statistics hence improved image quality. Extensive work with the zoom factors has allowed the optimization of the system for even the smallest pediatric patient. In our setting, magnification scintigraphy using a pinhole collimator has virtually been replaced by triple headed imaging utilizing zoom factors in the evaluation of renal cortical defects, some skeletal abnormalities, and

myocardial perfusion defects. Specific quality control procedures have virtually removed all ring artifacts from reconstructed patient images. Center of rotation stability has consistently been <1.3 mm. A dedicated triple headed SPECT system has proven so far to be an excellent tool in pediatric nuclear medicine with an even greater future potential.

No. 1528

ESTIMATION OF THE EXCRETORY INDEX FOR Tc-99m MAG3 WITHOUT URINE COLLECTIONS: P. Corrigan, R. Folks, A. Taylor. Department of Radiology, Emory University School of Medicine, Atlanta, GA

The excretory index is the ratio of the percent of the injected dose in the urine at 35 minutes to the percent dose expected in the urine. The percent dose expected in the urine is calculated using a regression equation and the effective renal plasma flow (I-131 OIH clearance). The excretory index provides an index of parenchymal retention and is useful in the evaluation of renal transplants. Furthermore, the excretory index for MAG3 has been shown to be equivalent to the excretory index for OIH (J Nucl Med 29: 1933, 1988). Nevertheless, the requirement for urine collection increases the time of the study and increases the risk of infection.

Parenchymal retention can be also be estimated from the renogram curve by calculating the ratio of the cortical activity at 20 minutes to the maximal cortical activity. The purpose of this study was to compare the 20 min/maximal cortical count ratio to the excretory index. The ERPF was calculated by multiplying the 44 minute plasma concentration of MAG3 by 0.56 and applying the Tauxe formulas for OIH clearance. The percent dose excreted was measured at 30-35 minutes and included a correction for bladder residual. In a prospective series of 14 patients, there was an excellent correlation between the two measurements, r = 0.89. Twenty additional patients will be added to the data base but preliminary results suggest that the cortical ratio derived from the MAG3 renogram curve will provide a good index of parenchymal retention and that it will be comparable to the excretory index.

No. 1529

EVALUATION OF KIDNEY FUNCTION IN POST-OPERATIVE LIVER TRANSPLANT PATIENTS.
D.G. Religioso, A. Manasia, S. Vallabhajosula, N. McManus, H. Lipszyc, A. Leibowitz, C. Miller, T.J. Iberti, J. Machac, Mount Sinai Medical Center, New York, NY

Acute renal failure is a frequent and serious complication in patients who undergo orthotopic liver transplantation (OLT) and is a major factor contributing to patient morbidity and mortality. In 8 patients who underwent liver transplantation, we measured the glomerular filtration rate (GFR) and effective renal plasma flow (ERPF) using a single bolus injection and 2 plasma sample (60 & 180 min for GFR; 20 & 44 min for ERPF) method.

Patients were injected with 148MBq of Tc-99m-DTPA and 3.7MBq of I-131-Hippuran simultane-ously within 12 hours after the surgery. The syringes were weighed before and after injection to determine the exact amount injected. Standards were prepared from the injection mixture. Blood samples were obtained at 20, 44, 60 and 180 min. Radioactivity in plasma was expressed as cpm/ml plasma. Based on the creatinine levels pre and immediately post OLT only 2/8 patients (25%) had poor renal function (serum creatinine >1.5 mg/dL). However, the GFR studies performed after OLT showed that 5/8 patients (62%) had impaired renal function (4 patients had severe (GFR,35 ± 6 ml/min), and one mild (GFR,73.4 ml/min)). In addition, 6/8 patients (75%) showed significant (<400 ml/min) reduction in ERPF (197 ± 74 ml/min). At the same time serum creatinine in 4 of these patients was normal.

These results clearly demonstrate that patients who undergo OLT show depressed renal function early after surgery. In addition, measurement of GFR and ERPF by radiotracers may provide more information earlier regarding renal function than standard serum creatinine levels.

Session VI

Radiopharmacy

1:30–3:00 **Room: 206F**

Moderators: Donna Marciano, CNMT and Kathy Richmond-Cox, CNMT

No. 1530

IN VIVO COMPARISON OF ACD VERSUS HEPARIN FOR USE AS AN ANTICOAGULANT WITH THE ULTRATAG® RBC KIT. M.W. Gebhard, J.F. Wieseler, J.C. Hung, B.P. Mullan, and M.E. Wilson. Mayo Clinic, Rochester, MN.

The package insert for the UltraTag® RBC kit recommends the use of either heparin or anticoagulant citrate dextrose (ACD) solution as an anticoagulant. A comparison study was done between heparin and ACD solution A to access image quality. The patients' red blood cells were labeled with the UltraTag® RBC kit and Tc-99m using 10 units of heparin or 0.15 ml ACD solution A per ml of blood. The labeling efficiency of the Tc-99m labeled blood was determined, and MUGA and whole body images subsequently obtained. The images were analyzed by comparing heart to background (bkg) ratio, heart to lung ratio, and kidney to bkg ratio. The results are summarized below:

	Labeling Efficiency (%)	Heart/Bkg Ratio	Heart/Lung Ratio	Kidney/Bkg Ratio
ACD	96.6±2.8 *n*=6	2.24±0.41 *n*=6	2.09±0.39 *n*=6	1.99±0.59 *n*=6
HEPARIN	97.4±0.9 *n*=7	2.43±0.23 *n*=7	2.11±0.14 *n*=4	2.08±0.22 *n*=4

Both heparin and ACD as the anticoagulant gave similar labeling efficiencies and ratios of regions of interest. There was no significant difference between ACD and heparin groups in overall image quality either on MUGA or whole body image by visual inspection. It has been reported that kidney uptake has been associated with the use of heparin. This may be caused by the use of excessive amounts of heparin although our study did not confirm this. Unlike heparin, the commercially available ACD does not contain any bacteriostatic agent and is therefore not designed for multiple dose usage. We conclude that either heparin or ACD may be used as the anticoagulant with the UltraTag® RBC kit.

No. 1531

A SIMPLE, RAPID METHOD FOR PREPARATION OF Tc-99m MAA FOR PEDIATRIC USE. J.R. Krzos, S.M. Karesh, R.E. Henkin. Loyola Univ Med Center, Maywood, IL

No currently available lung perfusion agent is approved or suitable for pediatric use. A kit prepared according to manufacturer's specifications results in a product containing 3-10 times as many particles per mCi as desired for use in children. Too many particles pose a physical risk to the patient, while too few particles produce a poor quality scan. Careful control of the number of particles injected produces an excellent lung scan while posing essentially no risk to the patient since fewer than 0.1% of capillaries are occluded. Our goal was to prepare a suspension of Tc-MAA containing 100,000 particles/mCi and 1 mCi/ml. The resulting range of particles per injection varies from 50,000 for neonates to 200,000 for children weighing 70 kg; the corresponding injected dose varies from 0.5 to 2.0 mCi.

To develop an optimal method for preparing Tc-MAA for pediatric use, we tested kit preparations using only a fraction of the manufacturer's kit. The number of particles per vial was obtained from each commercial vendor. Each vial was reconstituted with 5 ml of 0.9% NaCl solution, then 1.0 ml was removed from the kit, transfered to a sterile evacuated vial, and 8-10 mCi of Tc-99m pertechnetate in a 2 ml volume was added to the vial. After gentle swirling for 5 sec, the vial was permitted to incubate at room temp for 15 min, a critical time period since kinetics are much slower due to reduced concentrations. Radiochemical purity (RCP) was determined using the paper/acetone system to quantitate the amount of free Tc present. The RCP of Tc-MAA prepared from each of the 5 vendors' kits using the technique described above exceeded the manufacturers' RCP specification of 90% at all times tested up to 6 hr post-reconstitution. In conclusion, a simple, rapid, reliable, readily available, and inexpensive method is available for preparing Tc-MAA for

patients varying in weight from neonate to 70 kg. Any of the commercially available Sn-MAA kits will work well within the guidelines described above.

No. 1532

THE EFFECT OF JOB DUTIES IN CONTRIBUTING RADIATION EXPOSURE TO NUCLEAR MEDICINE TECHNOLOGISTS. T.P. Owens and J.C. Hung. Nuclear Medicine, Department of Diagnostic Radiology, Mayo Clinic, Rochester, MN.

Our unique and highly specialized nuclear medicine department has allowed analysis of the radiation exposure to the nuclear medicine technologists incurred from various duties they perform. Whole body (WB) and hand exposures were recorded over a 15-16 month period using thermoluminescent dosimeters. Radiation exposure readings were taken in 4 different areas and job duties - nuclear pharmacy (NP), radiopharmaceutical injection (RI), nuclear cardiology (NC), and general nuclear medicine (GNM). The majority of the generator elution and Tc-99m kit preparation were performed by the same technologist, and all of the radiopharmaceuticals were dispensed through the NP. Results of our monitoring are summarized below:

	NP	RI	NC	GNM
Studies/month	1962	559	380	1582
WB (mrem)	24.0±4.9	24.4±4.9	11.7±3.4	6.0±2.4
Hand (mrem)	1,767.3±42.0	83.1±9.1	6.3±2.5	5.3±2.3
n	16	16	48	47

Though it is generally thought that most of the radiation exposure to the technologist is from patient contact, we have shown that higher WB and hand exposures are caused from direct handling and injecting of radiopharmaceuticals. Although GNM had three times more study load than NC, the average WB exposure of GNM technologists was only half of the NC technologists. This is probably due to increased direct patient contact when performing cardiac imaging.

No. 1533

THE REDUCTION OF RADIATION EXPOSURE TO WORKERS IN A NEWLY DESIGNED NUCLEAR PHARMACY. T.P. Owens and J.C. Hung. Nuclear Medicine, Department of Diagnostic Radiology, Mayo Clinic, Rochester, MN.

Radiation exposure incurred by nuclear medicine technologists is usually greatest in the nuclear pharmacy or hot lab. A total of 57 months of hand and whole body exposure readings were recorded for an employee who works full-time in the nuclear pharmacy. The first 11 months were spent in a standard design hot lab, and the last 46 months were spent in a newly designed nuclear pharmacy. The changes in the nuclear pharmacy included a redesigned leaded hood for preparing kits, drawing doses, and storing various radiopharmaceuticals. The ion chamber well of the dose calibrators was placed within the hood. Generators were stored in an area separated from the nuclear pharmacy. Improved containers for radioactive waste were developed, along with using a specially designed device for measuring Mo-99 breakthrough.

Results of our study showed that the whole body exposure received with the standard hot lab was 42.7±6.5 mrem (n=11) compared to the exposure with the new design of 29.8±5.5 mrem (n=46). The decreased whole body exposures are more impressive when considering that the number of doses drawn up in the newly designed nuclear pharmacy increased by 70% (monthly average of 1,150 doses for the old hot lab vs. 1,960 doses for the new nuclear pharmacy). The increase in the number of doses being dispensed is reflected in the increased hand exposure values, 638.2±25.3 mrem for standard design vs. 1,873.9±43.3 mrem for new design.

Therefore, with the implementation of the various changes in our nuclear pharmacy, we have demonstrated that it is possible to significantly lower the radiation exposure of the nuclear pharmacists and/or nuclear medicine technologists even with increased nuclear medicine procedure loads.

No. 1534

TECHNETIUM BASED RADIOPHARMACEUTICAL ADHERENCE TO I.V. TUBING - A COMPARATIVE STUDY USING 10cc AND 20cc FLUSHES. J.K. Russell, K. Reilly, A. Rodriguez, P. Duch, S. Dadparvar, J. Murphy. Hahnemann University Hospital, Philadelphia, PA.

The purpose of this study was to compare the adherence of commonly used technetium 99m (Tc-) based radiopharmaceutical (RP) to intravenous (I.V.) tubing and the amount of saline flush necessary to significantly reduce RP adherence.

Twelve commonly used RPs were tested 20 times each, for a total of 240 trials. Approximately 10mCi bolus of each agent was passed through 8 inches of sterile, non-pyrogenic, basic solution I.V. tubing, followed by a 10cc and 20cc flush of normal saline.

The result of I.V. adherence are expressed as the percent of the total dose for 10cc and 20cc flushes.

RP	10cc	20cc	RP	10cc	20cc
Tc-MIBI	1.5 %	0.4 %	Tc-PYP	0.7 %	0.4 %
Tc-DTPA	0.27	0.05	Tc-RBC	0.11	0.04
Tc-HSA	1.9	0.89	Tc-MAA	0.82	0.41
Tc-SC	0.17	0.1	Tc-O4	1.2	0.64
Tc-HDP	0.09	0.04	Tc-HIDA	0.38	0.1
Tc-MAG3	0.38	0.19	Tc-HMPAO	0.74	0.44

In conclusion: Tc-HSA; Tc-MIBI; Tc-O4 adherence to I.V. tubing was significant with both 10cc and 20cc flushes. In all cases the 20cc flush was more effective in significantly reducing RP adherence.

No. 1535

A COMPARISON STUDY OF RADIOCHEMICAL PURITY ANALYSES FOR Tc-99m HMPAO. T.R. Taggart, M.E. Wilson, J.C. Hung, and T.P. Owens. Mayo Clinic, Rochester, MN.

Tc-99m HMPAO is the first radiopharmaceutical that the package insert states a radiochemical purity (RCP) determination must be performed prior to injection (RCP≥80%). According to the package insert, the standard method for radiochemical purity (RCP) determination of Tc-99m HMPAO involves three paper chromatography strip and solvent systems and requires 15 min to complete. Considering the 30-min. shelf life of Tc-99m HMPAO, it would seem that a more rapid procedure for RCP analysis would be advantageous. This study was undertaken to compare a modified standard RCP analysis with two other proposed methods. Since the recommended CH_3CN paper strip is not necessary for the assessment of the lipophilic Tc-99m HMPAO it was eliminated in our study. The two-strip revised method (TS) used ITLC-SG MEK and ITLC-SG saline systems. The other two methods involved the uses of either Whatman 17 or Gelman paper as solid phases with ethyl acetate (EA) and ether (ER) as mobile phase, respectively. The mean solvent developing time for TS/MEK, TS/saline, EA, and ER was 130.4±9.0 sec, 86.7±9.4 sec, 205.9±13.0 sec, and 90.2±7.5 sec, respectively (n=55). Both EA (r=0.97) and ER (r=0.96) correlated closely with TS in the measurement of RCP values ranging 45.0-94.6% (n=61). However, in the intermediate RCP range (75-85%, n=25) EA resulted in 40% (10/25) false acceptances whereas ER had a false acceptance rate of 4% (1/25). Although TS requires less time than the standard three-strip method, the small and fragile ITLC-SG paper is difficult to handle and it is cumbersome to measure and calculate the RCP with two paper strips. From our study it can be seen that using ER offers the quickest and simplest method of RCP determination for Tc-99m HMPAO with relatively accurate results.

Session VII

Radiopharmacy/Gastroenterology

3:30–5:00 **Room: 206F**

Moderators: Joni Herbst, CNMT and Susan Gilbert, CNMT

No. 1536

A POLICY CONCERNING THE CONTINUATION OF DUTIES OF PREGNANT NUCLEAR MEDICINE TECHNOLOGISTS. M.T. Hackett, R. Thompson, N. Perdikaris. McGuire Department of Veteran Affairs Medical Center, Richmond, VA.

Several years ago, questions were raised in our department concerning pregnant nuclear medicine technologists (NMT) and their clinical duties involving exppsure to ionizing radiation. We had no written policy on this matter. Through careful research of radiation safety techniques and practices, past technologists' radiation exposures, Nuclear Regulatory Commission (NRC) regulations/guidelines and National Council on Radiation Protection and Measurements (NCRP) recommendations, a well-defined policy was written. The primary goal of this policy was for the NMT to continue performing her usual clinical duties with minimal restrictions. Emphasis was placed on education, recognition of the risks and good radiation safety practices. This policy included voluntary use of lead aprons. Also, it included an additional bimonthly film badge to be worn by the pregnant technologist at the level of the abdomen (under lead aprons, if used) from the time the radiation safety officer was notified of the pregnancy till the termination of the pregnancy. The abdomen badge was used to estimate the unborn child's exposure. During the past three years, this policy has been activated twice. Lead aprons (skirt only) were worn by both employees for a majority of the time. Their average mrem/month radiation exposure readings were as follows:

	NMT#1	NMT#2
Exposure History - Lapel	22.0	17.5
Known Gestation Period - Lapel	10.0	5.0
Known Gestation Period - Abdomen	2.5	M

M = Minimum Dose Equivalent Reported

The above readings are well below the NCRP's recommended and NRC's proposed regulation of 50 mrem per month during the gestation period. They demonstrate the effectiveness of a policy that minimizes the radiation exposure to the technologist and the unborn child and does not limit the duties of pregnant nuclear medicine technologists. This is critical during the present national technologist shortage.

No. 1537

POSITIVE PATIENT AND SAMPLE IDENTIFICATION FOR NUCLEAR MEDICINE BLOOD LABELING PROCEDURES THROUGH THE USE OF A COMPUTER BASED BARCODE SYSTEM. S.D. Waite and J.C. Hung. Mercy Center for Health Care Services, Aurora, IL, and Mayo Clinic, Rochester, MN.

With many nuclear medicine procedures involving the withdrawal and re-injection of blood or blood products, the potential for transmission of blood-borne pathogens exists. Three patients have been reported to have received blood or a blood product from patients infected with human immunodeficiency virus (HIV) while undergoing nuclear medicine procedures.

Due to the potential for transmission of HIV and other contagious diseases, a system for identifying both the patient and the blood product needs to be developed and implemented. We have developed a personal computer based barcode verification system for accurately identifying blood samples used during the leukocyte radiolabeling process. The system involves production of a barcode label with patient number for each syringe and tube used in the cell labeling process. During the radiolabeling procedure the labels on the tubes are scanned to match the label on the blood-withdrawal syringe.

At the time of blood withdrawal, the patient is issued a return appointment card containing a barcode label. Upon the patient's return for reinjection, the barcodes are scanned for verifying patient on the syringe and card. In addition to the barcode system, patient identification is also confirmed by identifying patient's name verbally and by comparing signatures signed by the patient before drawing and reinjecting labeled cells.

In conclusion, the implementation of a barcode verification system enables us to minimize the risk of patients receiving the wrong labeled cells without the need to involve more personnel to perform such identification procedures.

No. 1538

The Effect of Different Forms of In-111 on the labeling of In-111 Macroscint® DTPA IgG D. Jester, H. F. Solomon, E. Caldwell, G. Thompson, D. Croll, R. W. Johnson Pharmaceutical Research Institue, Spring House, Pa.

In-111 Macroscint® DTPA-IgG, currently under development for imaging focal sites of infection/inflammation, has used Indium-Chloride as the radiolabel form in Phase 1 dosimetry; and Phase 2 and 3 efficacy trials. This study was conducted to duplicate the clinical experience of radiolabeling the product (In-111 Macroscint® DTPA-IgG) and to compare the use of several commercially available forms of Indium which might be available in the radiopharmacy. Three forms of Indium were used: Indium Chloride, Indium DTPA and Indium Oxine, (Indium Chloride is the chemical form specified for labeling). Labeling efficiency was measured at fifteen minutes using ITLC-SG chromatographic strips with 0.1M sodium citrate as the solvent. The percent labeling efficiency of IgG with indium in various forms was, coupled to the polyclonal IgG were: In-Chloride + Macroscint DTPA (96.5), In-Oxine + Macroscint DTPA (98.1), In-DTPA + Macroscint (0.07). The controls without the antibody were: In-DTPA (0.05), In-Oxine (9.61), and In-Chloride (0.99). The Spearman rank correlations demonstrated a strong relationship between In-Chloride and In-Oxine in their ability to bind to Macroscint® DTPA-IgG. There is an inverse relationship in the ability of In-DTPA to bind to Macroscint® DTPA-IgG. The background labeling of In-Oxine was somewhat elevated (9.61), giving the appearance of binding in the absence of antibody. This may result in the percent incorporation reported being higher than actual binding. The biodistribution of Macroscint® DTPA labeled with In-Chloride and In-Oxine, in a rat model of focal infection, was not significantly different ($p<0.05$). Other chemical forms of ^{111}Indium are available, but have not been investigated. In summary, In-Oxine labeling efficiency is similar to In-Chloride, in addition, the biodistribution in the rat focal infection model is comparable. Toxicology studies have not been performed with In-Oxine + Macroscint® DTPA-IgG.

No. 1539

UTILITY OF PERFORMING MULTIPLE LIQUID AND SEMI-SOLID SWALLOWS IN ESOPHAGEAL TRANSIT SCINTIGRAPHY. L. Boshko, R. Deeley, M. Kramer, J. Taylor, G. Isakoff, V.V. Cherico, N.D. Charkes, L.C.Knight, and A. H. Maurer. Temple University Hospital, Philadelphia, PA.

The best method for performing esophageal transit scintigraphy(ETS) has not been established. Studies have shown that multiple swallows rather than a single-swallow(S) and the use of a semi-solid(SS) rather than water may increase the sensitivity of ETS. We compared multiple liquid swallows(LS) to SS swallows(SSS) done as a single study. The results of ETS were compared to esophageal manometry in 15 consecutive patients(pts) with dysphagia. The pts first performed a single LS(125 µCi Tc-99m sulfur colloid in 15 cc water). Regional transit of the LS was immediately reviewed cinematically on a computer display as well as by generating time activity curves for each third of the esophagus. Up to 3 LS's were performed if all were normal(NL). After 3 NL LS's or an abnormal(ABN) LS, the pt proceeded to perform up to 3 SSS's with 5cc gelatin cubes with the same radiolabel. Up to 3 SSS's were performed until an ABN SSS was recorded or for a max of 6 swallows. Manometry results were abnormal in 13/15 pts: achalsia or stricture (n= 4), non-specific motility disorder(n=6), scleroderma(n=1), hyper or hypotensive lower esophageal sphincter(n=2). All 6 LS's and SSS's were normal in the NL pts(n=2). In no case did the SSS add additional diagnostic information compared to multiple LS's, and there was 1 case ABN by LS which was NL by multiple SSS. A single LS was diagnostic in 12/13(92%) ABN subjects and in 1/13 multiple LS's were required for diagnosis. Thus, all 13 ABN patients were identified with multiple liquid swallows. We conclude that the addition of a gelatin SSS appears unnecessary to detect abnormal esophageal transit if multiple LS's are used.

No. 1540

CORRELATION OF THE RATES OF ATTENUATION CORRECTED LIQUID AND SOLID GASTRIC EMPTYING. P. Flick, L. Boshko, V.V. Cherico, L.C. Knight, N.D. Charkes, J.L. Urbain, and A. H. Maurer. Temple University Hospital, Philadelphia, PA.

Earlier studies have shown that once solids(S) are triturated and suspended with liquids(L) that the gastric emptying(GE) rates of S and L are equal. These studies however were based on anterior only data. The purpose of this study was to determine whether this equivalence holds with attenuation correction and whether the rate of GE of L or S alone can be used to study GE. Dual isotope, (S)(250 µCi Tc-99m sulfur

colloid egg) and (L)(125 μCi In-111 DTPA in water) GE studies were performed on 20 patients(pts)and compared to 14 normals(Nl). Anterior and posterior 60 sec images were obtained every 15 min for 2 hrs. Geometric mean and decay corrected data were fit using the function, $y(t)=1-(1-e-kt)^{\beta}$, where y(t) = the fraction of gastric activity at time,t, k = the terminal slope(Sl) or emptying rate and ß = the y intercept. For classification purposes a pt was considered abnormal(Abn) if the T1/2 was > 110 min (mean+2SD Nl). When Nl and Abn pts were grouped together there was no significant difference in the S-Sl(mean±1SD)(0.014±0.008) vs L-Sl(0.015±0.006) (p= 0.37). No differences were found when Nl (S-Sl = 0.017±0.008) vs. (L-Sl = 0.017 ±.006)(p=0.96) or Abn(S-Sl = 0.0094±0.004) vs. (L-Sl = 0.012 ±0.006)(p=0.16) were considered separately. Based however on an Abn Sl of <mean-2 SD for either S or L, 4/12 pts using L-Sl and 2/12 pts using S-Sl were incorrectly classified normal compared to T1/2 analysis. We conclude that while attenuation corrected S and L GE Sl's correlate, use of L or S Sl alone will fail to identify pts with ABN solid T1/2's due to a prolonged lag phase.

No. 1541

THE RELATIONSHIP BETWEEN GASTRIC EMPTYING AND CHANGES IN GASTRIC pH. D. Principe, B. Kuo, T. Sanders, L. Cone, D. O. Castell. The Graduate Hospital, Philadelphia, PA.

The purpose of this study was to determine if there is any relationship between gastric emptying, pH changes, and secretory capacity of the stomach. Nine normal volunteers (6M/3F; mean age 26.4) underwent simultaneous imaging and pH monitoring of the stomach after ingesting a meal composed of an egg sandwich labeled with 250 μCi of Tc-99m Sulfur Colloid, followed by 200 cc of water. Prior to the meal, a pH monitoring probe was placed into the stomach, enabling measurement of gastric pH in the body and fundus of the stomach. Proper positioning was confirmed by an x-ray. Immediately following the meal, gastric pH was continuously monitored as anterior and posterior static images of the stomach were acquired sequentially using a single-headed gamma camera. Each volunteer was studied for two hours or until gastric pH returned to its baseline value (pH < 2). The half-emptying time ($T_{1/2}$) of the meal was measured using the geometric mean obtained from the anterior and posterior counts and corrected for decay. A few days later an additional gastric analysis was performed on each subject using pentagastrin stimulation to determine the secretory capacity of the stomach. A gastric pH curve was obtained and divided into the plateau phase (end of the meal when the gastric pH > 4 until the pH dropped > 0.5 units), and decline phase (end of plateau phase until pH < 2).

According to our results, a significant correlation was found between the $T_{1/2}$ of gastric emptying and the decline phase of gastric pH after the egg sandwich meal. There was poor correlation between the gastric analysis values and the plateau or decline phase.

In conclusion, we have found that in normal subjects gastric pH changes are more closely related to gastric emptying than to gastric secretory function.

THURSDAY, JUNE 10, 1993

Session VIII

Oncology/Infectious Diseases/Endocrinology

8:30–10:00 **Room: 206F**

Moderators: Frances Neagley, CNMT and Lisa Ann Trembath, CNMT

No. 1542

LOCALIZATION OF In-111 IgG, Tc-99m IgG and In-111 LABELED WHITE BLOOD CELLS AT SITES OF ACUTE BACTERIAL INFECTION IN RABBITS. S.A. Barrow[1], W. Graham[1], S. Jyawook[1], S.C. Dragotake[1], H.F. Solomon[2], J.W. Babich[1], R.H. Rubin[1], A.J. Fischman[1]. [1]Massachusetts General Hospital, Boston MA and [2]The Robert W. Johnson Pharmaceutical Research Institute, Spring House, PA.

Biodistribution and infection imaging properties of In-111 IgG, Tc-99m IgG and In-111 labeled white blood cells were compared in a rabbit model of E. coli infection. IgG was radiolabeled with In-111 and Tc-99m via DTPA and hydrazino nicotinamide (HYNIC) conjugates. Twenty-four hours after infection, groups of 6 rabbits with gross swelling in the infected thigh were injected with: 10 mCi of Tc-99m IgG plus 0.5 mCi of In-111 IgG or 1 mCi Tc-99m IgG plus 0.05 mCi of In-111 WBC's. At 4-5 and 18-20 h after injection dual photon whole body gamma camera images were acquired. All images were corrected for In-111 photons in the Tc-99m window. After recording the final images, the animals were sacrificed and biodistribution was determined.

At both imaging times, the distribution on Tc-99m and In-111 IgG were nearly identical. The sites of infection were well visualized with all three radiopharmaceuticals. At 4-5 h after injection, the T/B ratios for In-111 and Tc-99m IgG were 1.95±0.26 and 2.57±0.38 (p=NS). At the later imaging time, the T/B ratios increased significantly (p < 0.01) to 3.56±0.49 and 4.90±0.98. At both imaging times, the ratios for In-111 WBC's were significantly (p < 0.01) higher; 4.1±0.78 at 4-5 h and 8.52±1.52 at 18-20 h. In contrast, count density at the site of infection was greatest with Tc-99m IgG.

These results indicate that all three agents yield excellent images at sites of acute bacterial infection. Although In-111 WBC's yielded higher T/B ratios at both imaging times, the ease of preparation and lack of blood handling with the radiolabeled proteins makes them attractive alternatives for infection imaging.

No. 1543

TECHNICAL CONSIDERATIONS OF THALLIUM-201 WHOLE BODY SCANNING.
I.S. Zolty, S. Murthy, M.L. Delaney & J. Machac.
Mount Sinai Medical Center, New York, New York.

Thallium 201 whole body scanning (WBT) is gaining acceptance for a variety of malignancies including those from thyroid carcinoma. The goal of this study was to optimize a single method for use in our department.

We evaluated the usefulness of WBT in the diagnosis of metastases from thyroid carcinoma. 4 patients with previously diagnosed thyroid carcinoma were injected with 3-4 mCi of Tl-201 chloride with no patient preparation and imaged 20-30 minutes post injection. In an effort to reduce gastrointestinal (GI) activity seen in these 4 patients, the subsequent 6 patients were NPO for at least 8 hours prior to injection. All patients were imaged on a large field of view gamma camera with a low energy high resolution collimator.

In addition, 3 patients being evaluated in our nuclear cardiology laboratory who were NPO for at least 8 hours prior to injection were injected with 3.5-4 mCi of Tl-201 according to the thallium stress test protocol and used as a control group for abdominal imaging.

Abdominal images of patients where there was no significant preparation were suboptimal due to GI activity. Patients who were NPO showed minimal or total absence of gastrointestinal activity with clean abdominal images. 2 patients showed abdominal/pelvic lesions that could have potentially been masked by gastrointestinal activity. The control group also showed low GI activity.

In conclusion, the quality of images improved with proper patient preparation producing technically superior images thereby increasing the likelihood of diagnosing metastatic lesions of the abdomen and pelvis. Patients for WBT should be NPO for 8-12 hours prior to injection for optimal image characteristics which might facilitate lesion detection.

No. 1544

IMAGING BONE AND SOFT TISSUE SARCOMAS USING Tl-201 AND 3 PHASE BONE SCANS (Tc-99m MDP). Y.D. Grant, H. Macapinlac, S. Macalintal, A.M. Scott, R. Jennings, S. J. Goldsmith, and S.M. Larson. Memorial Sloan Kettering Cancer Center, New York

Ga-67 and delayed bone scans are routinely performed to assess bone & soft tissue sarcoma. We are currently evaluating Tl-201 and 3 phase bone scans as a means of more accurately assessing tumor viablity.

Daily floods and images were acquired on Dual head ADAC Genesys cameras with a low energy high resolution collimator interfaced to a PEGASYS workstation. Good IV access, patient positioning with

camera as close as possible, sedation of pediatric patients, and shielding of heart/gut/liver activity are needed to ensure quality images. Tl-201 (2-4mCi) images are acquired 15-30 min post injection on a 128 X 128 X16 matrix for 750K counts. A flow study is done with a bolus injection of Tc-99m-MDP (5-25 mCi), 1sec/frame images were acquired compressed to 5 sec/frame. Tumor/normal ratios were obtained by drawing ROI in the Tl-201, blood pool, and flow images.

22 pts with bone and soft tissue sarcomas were studied. Both Tl-201 uptake ratios andblood pool ratios correlated with tumor viability. Tl-201 uptake in tumor was not solely dependent on blood flow, and presumably tumor viability & metabolic rate were contributing factors.

3 phase bone scanning provides soft tissue & bone tumor localization & perfusion information, while Tl-201 indicates viabilty. These studies are done in a single day compared to Ga-67 which requires 2-3 days.

No. 1545

TECHNETIUM-99m-MIBI UPTAKE PATTERNS IN NORMAL AND ABNORMAL THYROID GLANDS.

N.C. McManus, S. Murthy, J.W. Hart, J. Machac,
Mount Sinai Medical Center, New York, NY

There have been several studies that demonstrate the use of Tc-99m-MIBI (sestamibi) to visualize suppressed thyroid tissue and detect metastasis of thyroid carcinoma. To understand the kinetics of MIBI uptake in normal thyroid tissue we evaluated 11 normal control patients. In addition, we studied 5 patients with cold thyroid nodules who were previously studied with I-123. All 16 subjects were injected with 740 MBq of Tc-MIBI. All subjects had early (at 10 min) images, 6 controls and 5 patients had images at 60 min and the remaining 5 controls were imaged at 90 min. All images were acquired for 15 min using a high resolution collimator and stored in a 128 X 128 image matrix. In normal subjects, compared to the initial Tc-99m activity in the thyroid, 46% (20-62%) washed out at 60 min and 65% (50-75%) washed out at 90 min. 3/5 patients showed initial Tc-MIBI uptake in the cold nodule which subsequently washed out. One of the patients had no uptake of the tracer in the cold nodule. The 5th patient with thyroiditis (<1% radioiodide uptake) and questionable substernal extension of the thyroid showed normal size and position of the thyroid gland.

In conclusion, we found that there is rapid uptake and washout of Tc-MIBI in normal thyroid tissue with a wide range variability. Since the mechanism of Tc-MIBI uptake by thyroid gland appears to be unrelated to iodide trapping and organification, Tc-MIBI scans would be useful in visualizing suppressed or non-functioning thyroid tissue even in the presence of iodide overload.

No. 1546

Tc-99m Sestamibi: A new agent for Parathyroid Scintigraphy.

A.M. Alessi, M. Afriyie, M. Chinol, G. W. Moskowitz, C.J. Palestro. Long Island Jewish Medical Center, New Hyde Park, N.Y.

Technetium-99m (Tc)/thallium-201 (Tl) subtraction scintigraphy is a useful technique for preoperative localization of parathyroid adenomas (PTA). The relatively poor imaging characterisitics of Tl and the low dose that can be administered to a patient, make this technique less than optimal. In a prospective ongoing study we are comparing Tc/Tl subtraction scintigraphy to Tc-99m sestamibi (S) for the preoperative localization of parathyroid adenomas in patients with hyperparathyroidism. To date we have completed both studies in 13 patients, 10 women and 3 men. Tc/Tl imaging was performed using simultaneous dual isotope acquisition and computer subtraction in all 13 cases. For Tc/S images, S images were acquired and followed immediately by TC imaging and computer subtraction, in the first 6 pts. In the last 7 pts. early (E) S images were followed by late (L) S images 2-3 hrs. later, and then Tc imaging and computer subtraction were performed. 12 PTA's were surgically confirmed, ranging in weight from 50 mg to 7500 mg. Histologically 5 were chief cell, 5 oxyphil, and 2 mixed cellularity. 2 readers independently evaluated all images for scintigraphic evidence of PTA, defined as focally increased activity relative to surrounding activity. The results averaged across the readers were:

	Tl	Tc/Tl	ES	LS	Tc/S
Sens	67%	96%	58%	88%	73%
Spec	93%	83%	96%	84%	75%

The results of Tc/S imaging did not differ significantly from those of Tc/Tl. These preliminary data suggest that, with its better imaging characterisitics and lower pt. radiation burden, sestamibi parathyroid imaging deserves further investigation.

No. 1547

PARATHYROID IMAGING: AN APPROACH TO PROTOCOL EVALUATION.

J Yoder, C. Eubig, T.L. Wilson, J.H. Corley. Medical College of Georgia, Augusta, Ga.

A review of the literature demonstrates that even though the basic subtraction approach to parathyroid imaging remains the same, there are a number of technical variables that can be adjusted to optimize the parathyroid procedure. The volume of parathyroid studies is not sufficient to allow a comparison of technical parameters with separate groups of patients. Also, this type of study can not be repeated with different parameters without reinjecting the patient. We propose the use of a phantom, which would simulate realistic imaging situations, to help in protocol evaluation. We examined this approach with collimator selection because collimator parameters can be readily measured.

The purpose of our study was to determine if the phantom images could predict collimator performance. Two collimators, the high resolution and the 6 mm pinhole, were evaluated for both sensitivity and resolution. We then compared these conclusions to those derived from our phantom measurements. Our phantom consisted of a polymethyl methacrylate hollow shell molded from a cadaver thyroid mounted in a chamber to simulate the neck. The parathyroids were simulated using three small plastic cylinders, with adjustable volumes, mounted on plastic rods. The rods were inserted through the top of the phantom in such a way that the adenomas, filled with radioactive material, could be positioned at different locations behind the thyroid. Accurate repositioning could take place during the study without moving the phantom. The phantom was imaged for equal times with both collimators.

In conclusion, we were able to demonstrate that our high resolution collimator should be superior in the imaging of parathyroids. There was basic agreement with both phantom and collimator parameter measurements. We further conclude that this type of phantom could be useful in analysis of parathyroid imaging parameters.

POSTER SESSIONS

The following scientific papers will be presented as poster presentations. Posters may be viewed throughout the meeting in the Exhibit Hall on the second level of the Metro Toronto Convention Centre. Authors will be present on Wednesday, June 9 from 12:00 P.M.–1:30 P.M.

Cardiovascular Clinical

Posterboard No. 1600

REST TL-201/EXERCISE MIBI VS REST MIBI/EXERCISE MIBI IMAGING: COMPARISON OF DEFECT REVERSIBILITY. D.Natale, F.J.Th. Wackers, J. Mattera. Yale U., New Haven, CT

To improve laboratory logistics one day rest/exercise myocardial perfusion imaging is performed utilizing Tl-201(Tl) at rest, followed by Tc-99m Sestamibi(MIBI) at peak exercise rather than lengthy rest MIBI/ex MIBI one or two day protocol. Quantitative analysis must be done to determine if reversibility of ex-rest defect sizes is similar using single and dual isotope techniques. To evaluate the difference, TL and MIBI were compared in 48 patients. Each pt underwent a rest Tl followed by an ex MIBI study, and a rest MIBI was obtained on a different day. 12 pts had planar imaging, 8 had abnormal ex studies, 4 were normal. 36 pts had SPECT imaging, 21 had abnormal ex studies, 15 were normal. The planar images were quantified using modified background correction, circumferential profiles compared to appropriate isotope normal database. 1 pt showed a fixed defect with both MIBI and TL, 2 pts were reversible with both MIBI and Tl , 5 showed reversibility with Tl and fixed with MIBI. Quantitation of EX MIBI defect reversiblility was 18±21% with RMIBI and 60±25% with RTL ($p<0.025$). SPECT slices were quantified and compared to a MIBI normal database. 2 pts were fixed with both MIBI and TL, 11 were reversible with both, 6 were reversible with Tl, fixed with MIBI, and 1 was reversible with MIBI, fixed with Tl. Quantitation of EX MIBI defect reversibility was 13±15% with RMIBI and 20±17 with RTL ($p<0.005$). In conclusion, it is apparent that there is significantly greater defect reversibility defects seen with TL in both planar and SPECT imaging than with MIBI alone. However, it is uncertain if these changes were artifacts by comparing isotopes of different properties.

Posterboard No. 1601

COMPARISON OF SUPINE AND LATERAL POSITIONS IN MYOCARDIAL PERFUSION SPECT STUDIES USING Tc-99m SESTA MIBI. E. Higazy, A.M. Omar, S. Mahyssain, A.K. Ibrahim, S. Al-Mohannadi, F. Abu Al-Huda, S. Balg, K. Al-Zaabi, H.M. Abdel-Dayem. Faculty of Medicine, Kuwait University, Ministry of Public Health, Kuwait & St. Vincent's Hospital, New York, NY, USA

The supine position routinely used for myocardial perfusion imaging has problems of diaphragmatic and breast attenuation artefacts. We evaluated the left lateral position in order to minimize these problems. Patients were laid on their right side and the gamma camera rotated from left posterior oblique to right anterior oblique. Twenty four patients (12 male 12 female) referred for Tc-99m Sesta MIBI SPECT studies were imaged one hour after the first injection (Stress) in both the routinely used supine position and immediately followed by a second acquisition in the left lateral position. Nine more patients were imaged both ways following the rest injection. All acquisition and processing parameters were the same. Data was displayed in short axis, vertical and horizontal long axis cuts plus the Bull's eye display. Studies were interpreted independently by four nuclear medicine physicians. Each tomographic slide was divided into four areas. Sesta MIBI uptake was graded 0=normal 1=minimal 2=moderate 3=severe ischemic changes.

17 studies showed improved perfusion of inferior wall (10 improved from grade 2 to zero) and 7 from grade 1 to zero. Five studies showed improvement of perfusion in anterior wall (4 from grade 2 to zero and one from grade 1 to zero). None of grade 3 lesions in interior or anterior wall showed improvement. However four studies showed changes in anterior wall and septum from grade zero to grade one, creating another artefact.

The interobserver agreement was 84% for inferior wall, 85% for anterior wall improvements and 80% for anterior wall created artefact.

We conclude that lateral SPECT avoids problems related to diaphragmatic attenuation and increases the accuracy of Tc-99m MIBI test. However it could create antero-septal artefact due to breast mass effect.

Posterboard No. 1602

IMPACT OF IMAGING TIME POST INJECTION ON STRESS Tc-99m SESTAMIBI MYOCARDIAL PERFUSION SPECT. S.F. Grant J.R. Galt, N.P. Alazraki, Veterans Affairs Medical Center and Emory University School of Medicine, Atlanta, GA.

Tc-99m Sestamibi (MIBI) has proven to be an effective radiotracer for the detection of coronary artery disease (CAD). The optimal imaging protocol for this agent has yet to be determined and recent reports indicate that MIBI does redistribute in the myocardium and imaging should begin as early as possible. The purpose of this study is to compare the extent and severity of defects detected by quantitative software in stress imaging while beginning the tomographic acquisition at 30 minute and 60 minutes post injection.

Twenty-six patients referred for evaluation of CAD had stress (exercise or pharmacologic) MIBI scans. 22-26 mCi intravenous MIBI was administered at peak stress or at 2 minutes after the infusion of intravenous dipyridamole. SPECT imaging was performed at 30 minutes and at 60 minutes post injection (180° orbits for 64 stops at 20 seconds per stop). Either 8oz of whole milk or 2oz of Neo-Cholex were given 15 minutes post injection. In twenty patients maximum pixel counts were extracted from regions of interest (ROI) placed over the highest count myocardial area and lung area on an anterior planar projection. Comparable myocardial counts were obtained at 30 vs 60 minutes (6.9±2.3 counts/mCi vs 6.6±2.5) and there was no significant difference in the ratio of heart to lung counts (2.2±0.8 vs 2.3±0.8).

Bullseye plots were created with the CEqual software and defect extent (number of abnormal pixels) and severity (sum of standard deviations in the defects) were tabulated. Four patients did not have defects at either 30 or 60 minutes. Quantitative results divided the remaining patients evenly with 11 having larger and more severe defects at 30 minutes and 11 with larger and more severe defects at 60 minutes. Paired t test indicated that there was no significant difference between the extent or severity distributions at the two times ($P << 0.1$).

The data indicate that stress imaging at 60 minutes post injection does not demonstrate an advantage or disadvantage versus 30 minutes.

Posterboard No. 1603

OPTIMAL CENTRIFUGATION: PARAMETERS FOR LABELING EFFICIENCY DETERMINATION OF TECHNETIUM-99m LABELED RED BLOOD CELLS. S. Chowdhury and J.C. Hung. Mayo Clinic, Rochester, MN.

The UltraTag® RBC and pyrophosphate (PYP) kits have been used to bind Tc-99m to red blood cells (Tc-99m RBC) for blood pool imaging and detection of sites of gastrointestinal bleeding. Since the labeling efficiency (LE) of Tc-99m RBC could be affected by various factors, it is usually a good practice to measure the extent of LE.

Centrifugation technique is the most commonly used method for the determination of Tc-99m RBC's LE. However, there are no standard parameters for operating the centrifugation procedure. The purpose of this study was to investigate the optimal centrifugation setting for assaying LE of Tc-99m RBC. Prior to the reinjection, 0.3 ml of Tc-99m RBC was transferred to a centrifuge tube and diluted with 1 ml of anticoagulant citrate dextrose and 0.9 % NaCl mixture. Centrifugation processes were performed at 900 g/10 min, 900 g/1 min, and 150 g/1 min. The LE results are summarized below:

	900 g/ 10 min	900 g/ 1 min	150 g/ 1 min
UltraTag® (n=6)	98.7±0.3	98.8±0.3	98.3±0.4
PYP (n=6)	97.4±2.0	96.4±2.1	97.6±1.6

There was no significant difference among the LE values obtained by three different centrifugation settings. Since it would take twice the amount of time to increase the g value from 150 g to 900 g for the centrifuge, we believe that centrifugation of the Tc-99m RBC sample at 150 g/1 min provides the most efficient way to separate the Tc-99m RBC from plasma for the determination of LE.

Gastroenterology

Posterboard No. 1604

A MODIFIED METHOD OF NEORECTAL SCINTIGRAPHY FOR ESTABLISHING NORMAL POUCH EMPTYING. S. Woo, C. Carlson, C. Bernstein, E. Mayer, D Marciano, RA Hawkins. UCLA SCHOOL OF MEDICINE, Los Angeles , CA

Patients with neorectal reconstruction procedures often experience a variety of complications that warrant functional evaluation. A method for evaluating these patients has been previously reported by O'Connell et al., J Nuc Med 27:460, 1986. We have modified the technique in order to establish a range for normal pouch function in subjects with ileocecal anastomoses. Five subjects were studied, including 3 males and 2 females (ages 32-52yrs), with "J" ileorectal pouch reconstruction. 4 of this group had clinically normal pouch function while one had clinically poor function. Approximately 240-300 cc of Veegum (an aluminum magnesium silicate stool substitute) labelled with 1 mCi 99m Tc Sulfur Colloid was instilled. Static images were obtained immediately using a Siemens Orbiter 7500 gamma camera infaced with a Microdelta/Vax 750 computer. Pre and post evacuation images were magnified to 1.5 and acquired in the supine and prone projections for 2-5 minutes, depending on count rate. Regions of interest (ROI's) were drawn around the pouch activity to calculate the percent of pouch emptying for each evacuation. Results were calculated by determining the geometric mean from anterior and posterior views. Evacuation values in 4 subjects was 57.0 ± 16.9 %, while one subject had a value of 2.5 %. On repeat evacuation, 3 subjects with normal function had values of 59.1± 3.6%. These values were comparable to the 57.0 ± 3% previously reported by O'Connell et al. indicating that this method is reproducibile. We conclude that this method is clinically feasible and reproducibile, can be performed serially, and is more quantitiatively precise than alternative contrast radiographic procedures.

Instrumentation and Data Analysis: General

Posterboard No. 1605

A TECHNIQUE FOR AUTOMATIC SCALING AND DISPLAY OF DUAL INTENSITY WHOLE BODY BONE SCANS. B. Rowe, L. Zager, D. Fiers, M. Wilson. UW Hospital & Clinics, Madison, WI.

We have developed an automatic scaling and dual intensity display technique which optimizes the interpretation of whole body bone scans.

We found multiple causes of poorly displayed whole body bone scans: 1) high count areas resulted from metastatic disease, bladder, kidney, and injection site artifacts; 2) manual adjustment of the brightness and contrast was affected by technologist objectivity, ambient lighting, and display monitor adjustment; 3) one intensity was not adequate for film display of the wide contrast range from spine to extremities; and 4) film grey scale and counts were not linear.

Our solution controls these variables with an automatic scaling algorithm which takes about 30 seconds on a GE Starcam 3000 image processing system. An ideal upper threshold (UT) is calculated from a frequency distribution plot (FDP) of the scan, which creates a curve of the number of pixels at each intensity level. Using a cutoff of 1% of the curve maximum establishes an UT which is independent of small areas of high uptake. Larger, non skeletal areas (especially kidneys and bladder) are avoided by confining the analysis to the upper quarter of the scan. A grey scale was developed to compensate for nonlinearities in formatter, film and processor. Two sets of anterior/posterior whole body images are displayed on a single 8 by 10 inch film. The left set is displayed using the UT determined by the FDP analysis. The right set is displayed with the posterior UT increased by 30% for improved spine viewing and an anterior UT that is decreased by 30% for better rib and extremity definition. Film display linearity is checked with densitometric measurements on routine scans and adjusted if necessary.

Using this technique for the past 2 years has enabled us to reproducibly and automatically display scans at optimal contrast and intensity approximately 95% of the time without operator intervention. This has also allowed our staff physicians to better interpret and compare current with previous scans.

Posterboard No. 1606

A COMPUTERIZED HOT LABORATORY USE AND DISPOSAL PROGRAM WRITTEN IN THE dBASE IV LANGUAGE. R. Kappes and A. Strashun. Kings County Hospital Center, Brooklyn, NY.

Commercially available Nuclear Medicine radiopharmaceutical programs are expensive and frequently too generic. Programs based on popular database languages are simple to write and cost no more than the database program itself. There is much appeal in having complete control over all of your parameters and being able to "customize" them to your particular needs.

Some of the highlights of the program are: Time and date record of the receipt and disposal of radioactive material. Built in calculator for determining injection volume. Automatic calculation of "present" activity. Generator elution record including automatic calculation of Mo-99 breakthrough concentrations. (A warning is given if the NRC limit is exceeded). Unit-dose, multi dose vial and capsules. Printout of monthly record of radioactive materials usage. Patient-pharmaceutical archival and retrieval. Contamination surveys. Molybdenum breakthrough records.

The program was written in the dBase 4 language and requires a DOS based computer. In order to make the program as efficient as possible the data is separated into four databases. Two current databases contain the "active", ie unexpired, patients and pharmaceuticals while two "archival" files contain the expired pharmaceuticals and their associated patients. Drugs and patients are linked by lot number. The current files are very small making for rapid access while archival files are necessarily very large and encompass a year's worth of data. The archival files have three indexes: patient name, patient medical record number and drug allowing for rapid searches. Built in routines at startup "purge" the current files of expired records and append them to the archive files. The program is entirely menu driven, requires no knowledge of computers and can be learned in less than an hour.

We have been using the program for almost 3 years and have streamlined it extensively during that time.

Instrumentation and Data Analysis: PET

Posterboard No. 1607

OPTIMIZING PATIENT POSITIONING FOR CARDIAC PET. M. Gaskill, V. McCormick, R. Ponto, D. Hoffman, T. Kehoe, T. Shafer-Kachel, C. Culver, J. Freitas, J. Juni, H. Dworkin, William Beaumont Hospital, Royal Oak, MI.

Careful positioning is necessary to properly center the heart in the 10.4 cm axial field of view of the PET scanner (Siemens ECAT 951). The use of anatomical landmarks and rectilinear transmission scanning has led to mispositioning errors. Alternative methods of positioning were evaluated. Transmission imaging utilized 16 ring sources (5-6 mCi Ge-68). Emission imaging utilized a localization dose of 3-5 mCi N-13 ammonia. Anatomical landmarks (AL), ultrasound (US), static transmission (ST), rectilinear transmission (RT), rectilinear emission (RE), and static emission (SE) were the methods evaluated. The best estimate of position was determined for each method and the bed position noted. The patient was then positioned in what was judged to be the optimal position. A reference bed position was determined with the heart in the center of the field of view. The mispositioning index (MI) was the difference between the reference bed position and the bed position determined for each method. The average performance time (APT) of each method was evaluated on 9 patients.

	AL	US	ST	RT	RE	SE
MI	13.4	10.4	10.4	11.9	5.6	3.6
APT	.5	13	13	7	6	8

The APT included acquisition, processing, and evaluation. Both emission methods using a localization dose were more reliable than the transmission methods. In subsequent use of the SE method, 17/19 patients were successfully positioned with the heart located completely within the field of view. The SE method provided the best patient positioning of the heart in the center of the field of view.

Instrumentation and Data Analysis: SPECT

Posterboard No. 1608

IMPROVED QUALITY TESTING PROTOCOLS FOR PRISM 3000 MULTI-DETECTOR CAMERA SYSTEM. M.A. Ganske, C.M. Culver, J.E. Juni, R.A. Ponto, William Beaumont Hospital, Royal Oak, Michigan

The purpose of this study was to evaluate the following performance parameters of the Prism multi-detector system: (1) use of a refillable Tc-99m flood source vs. a Co-57 flood source for uniformity correction, and (2) proper photopeak alignment for energy correction. Multiple Tc-99m refillable and Co-57 flood sources were evaluated for integral and differential uniformity with 60 million count acquisitions. Results of energy correction with the photopeaks centered and off-centered in the energy windows were evaluated by comparison of phantom counts between detector heads. The worst integral uniformity calculated in the center of the field of view was 4.82% for one of the refillable flood sources vs. 1.80% for the Co-57 flood source. Visible non-uniformity was noted when the refillable flood was rotated 180 degrees. Off centering the photopeak during energy correction resulted in count differences of 10 percent between detector heads and caused artifacts on SPECT images. No count differences were noted between detector heads when the photopeaks were centered in the energy windows. Improved quality testing protocols are suggested to optimize SPECT imaging with the Prism multi-detector camera system.

Posterboard No. 1609

FACTORS INFLUENCING 3-D REPROJECTION DISPLAY. W. Brostek, N. Habbab, H. Abdel-Dayem. St. Vincent's Hospital & Medical Center, New York, NY

The purpose of this presentation is to evaluate the various variables in the processing of the reprojection technique (Volume rendered as opposed to surface rendered).

SPECT studies of various organs were performed using a three-headed and two-headed rotating gamma camera (Triad/Biad; Trionix Research Laboratory, Twinsburg, Ohio) with various collimator systems. The cine display of the reprojection data is obtained by a simulated acquisition of processed transverse data. Using different values to process the reprojection data will influence the outcome of the final 3-dimensional data.

Values studied in this project included number of views in the reprojection data, filters used during initial reconstruction, various organs and other acquisition and processing parameters.

In conclusion we feel the use of optimized values when processing the reprojection data can enhance the 3-dimensional perception. This newly introduced display mode has much to offer and the nuclear medicine staff should be made aware of these factors.

Posterboard No. 1610

AN EVALUATION OF SPECT ACQUISITION MODES FOR BONE IMAGING. T.Cox, J.Curry, C.Schutz-Ferino, C.Johnson, M.Kelly, C. Lacy, M.Middendorf, M.Nepolello. Saint Francis Medical Center, Peoria,Il. J.A. Bieszk, Siemens Gammasonics, Inc. Hoffman Estates, Il.

SPECT imaging in bone scintigraphy permits a three dimensional visualization of skeletal structure and presents this information without the reduction in contrast due to the summation of overlying and/or underlying tissue. In the current study, the effects of different acquisition parameters on the image quality of SPECT bone reconstructions are evaluated using phantom studies and clinical data. Previous work (ref.1) has shown that improved image quality and reduced artifacts can be obtained with improved angular sampling, even if the total number of counts in a scan is reduced. In addition, continuous acquisition offers a higher counting efficiency than traditional step and shoot options. The effects on image quality of continuous acquisition and a large number of angular views was compared to a number of standard acquisition options. Preliminary results show that scans with continuous acquisition can have image quality comparable to scans with significantly longer scan times.

(Ref.1) J.A.Bieszk and E.G.Hawman,
Evaluation of SPECT Angular Sampling Effects:
Continuous Versus Step-and-Shoot Acquisition,
JNM 28, 1308, 1987.

Neurology Clinical

Posterboard No. 1611

CAN SEQUENTIAL CEREBRAL BLOOD FLOW STUDIES BE USED TO DETERMINE BRAIN DEATH? M. Ganske, H.J. Dworkin, and J. Juni. William Beaumont Hospital, Royal Oak, MI

Brain death is a dynamic process; early studies may be negative, but several hours later can become positive. 99m-Tc-hexamethylopropylene amine oxime (HMPAO) images have been useful in identification of brain death, but residual HMPAO activity precludes early (12-24 hours) repeat scanning. We compared radionuclide angiograms obtained during injection of HMPAO and subsequent injection of 99m-Tc diethylenetriaminepentaacetic acid (DTPA) using a subtraction technique.

We studied seven patients (pts)/volunteers referred for routine brain scans. Each pt was injected with 20 mCi 99m-Tc HMPAO and flow images were acquired. 1.5 hours later after routine brain SPECT imaging, the pts were re-injected with 20 mCi 99m-Tc DTPA. Flow images were acquired at 1 sec/frame in the anterior projection for both tracers. The data was reframed at 2 sec/frame for viewing. The first image of the DTPA flow sequence was subtracted from each subsequent image in that series to correct for retained 99m-Tc HMPAO. Dynamic HMPAO and DTPA subtraction flow studies were compared.

Carotid and cerebral blood flow (CBF) appeared comparable. On DTPA flow, mild diminished resolution of middle cerebral arteries and better definition of venous structures were noted. We have shown that subtraction flow technique provides suitable quality images for determination of brain death despite residual HMPAO activity.

Posterboard No. 1612

FASTING IS NOT NECESSARY PRIOR TO HMPAO BRAIN SPECT. P. Nuechterlein, M. Ganske, R. Chava, J. Juni. William Beaumont Hospital, Royal Oak, MI

Standard practice requires fasting prior to HMPAO brain SPECT imaging. This poses a significant hardship to our elderly patients. This study was performed to determine whether NPO status improves brain uptake in patients having SPECT brain

scans. 23 patients injected with 99mTc-HMPAO after resting in a quiet dimly lit room for 30 minutes were scanned using a Picker Prism at one hour minimum post injection. 15 patients were NPO greater than 12 hours and 8 had eaten within 4 hours. Brain and liver uptake was defined as average cts/pixel and measured from anterior projection planar images. The brain uptake was corrected for patient dose, scan time after injection and binding efficiency of the radiopharmaceutical. The two patient groups were then compared.

The patients who were NPO had a brain/liver ratio of 1.85 ± 0.47 (1std.dev) and the group that had eaten had a ratio of 1.87 ± 0.19. The adjusted average cts/pixel from the brain in the NPO group was 11.0 ± 1.78 and 12.6 ± 2.24 in the group that had eaten. The brain/liver ratio and the brain uptake comparisons were non significant ($p > .05$). Brain uptake results were then adjusted for patient body weight and the uptake values were 1656 ± 370 for the NPO group and 1842 ± 390 for the group that had eaten. This was also non significant ($p > .05$).

Our findings assured us that we could allow our patients to eat prior to SPECT brain scanning and not see a significant decrease in the count rate of the HMPAO images.

Oncology/Antibody

Posterboard No. 1613

TECHNICAL ASPECTS OF MONOCLONAL ANTIBODY INDIUM-111 IMAGING. V. Cronin, D. Erb, H. Abdel-Nabi, Department of Nuclear Medicine, State University of New York at Buffalo, Buffalo, NY.

The purpose of this study was to determine the optimum acquisition parameters for both planar and SPECT images in patients infused with In-111 monoclonal antibodies labeled against colorectal carcinomas. Our goal was also to assess how digital images can supplement analog images, and how to obtain and process SPECT images alone and in conjunction with technetium for dual isotope SPECT imaging.

Planar images obtained on days 3 and 5 allow for clearance of blood pool activity and increase of tumor background ratio. Liver SPECT should be acquired (acq) on day 3 and pelvis SPECT on day 5. Planar images in 50% of the cases (100) were acq for time vs. time and/or counts. Digital images acq in a 256 x 256 matrix offer more information for clearer liver and pelvic evaluation. Anterior abdomen image at varying intensities also accomplishes this in an area most suspect for lesions. SPECT is acq using a Butterworth filter with a cutoff of .35 and order of 5, in a 64 x 64 matrix, in 64 steps. Liver SPECT should be acq 20 secs/step and pelvis SPECT for 40 secs/step. SPECT images using these parameters showed that the Butterworth produced better images with regard to smoothness, noise and edge definition. SPECT images are group added by 2 to allow for easier detection of abnormalities. When dual isotope SPECT is needed, planars were acq first, then patient was injected with Tc based compound.

Our data verifies that optimal imaging was acq on day 3 (liver SPECT) and day 5 (pelivs SPECT). Planar images should be acq for time and the use of digital images is important. SPECT images are processed with a Butterworth filter .35, 5, utilizing two peaks of In-111 and in the case of dual isotope imaging with Tc, the first window should be set at 247 keV (20%) and 172 keV (5%), and the second window at 140 keV (10%).

Pediatrics

Posterboard No. 1614

TUMOR IMAGING WITH TL-201 OR Tc-99m MIBI IN CHILDREN: PATIENT PREPARATION AND TECHNICAL ASPECTS. F.Laliberté, T.Barry, S.Gagnon, R.Lambert. The Montreal Children's Hospital, Montreal, Canada.

Recent literature showed very promising results for tumor imaging using Tl-201 or Tc-99m MIBI especially for lymphoma, soft tissue and brain tumors. However, there are very important technical aspects that should be respected to yield good results. Patient dose is calculated from body surface (3.0 mCi Tl-201/1.73 m^2 and 20 mCi Tc-99m MIBI/1.73 m^2 with a minimum dose of 1.0 mCi for Tl-201 and 8.0 mCi for Tc-99m MIBI). Tl-201 and Tc-99m MIBI are rapidly taken up by the tumor and washout with time. The exam should be started few minutes post injection and completed within an hour. When abdominal views are required, they should be acquired first and moreover, our experience has shown that the patient should be kept fasting at least 4 hours prior which markedly reduces the bowel activity, otherwise within 20 minutes bowel activity will be present. Planar images are acquired for 5 min/view and SPECT images are acquired for 15 sec/view (128 views). SPECT acquisition is very useful especially for brain tumors. Tc-99m MIBI is picked up by choroid plexus which does not appear to be due to the presence of free Tc-99m and seems not to be altered by patient medication. Unfortunately, our present experience does not allow us to conclude on the effect of chemotherapy or radiotherapy on the tumor uptake. Further study is needed and may reveal new rules for patient's preparation. Cases will be presented to demonstrate the importance of such preparation.

Posterboard No. 1615

RADIONUCLIDE VOIDING CYSTOGRAM: TECHNICAL ASPECTS. F.Laliberté, S.Gagnon, T.Barry, R.Lambert. The Montreal Children's Hospital (MCH), Montreal, Canada.

The radionuclide voiding cystogram is used for evaluation of suspected vesicoureteral reflux, an important cause of urinary tract infection in children. Literature suggests many protocols, all of which describe important technical details. This presentation discusses the protocol used at the MCH. It includes: patient preparation, required material, imaging technique, filling technique, voiding phase, particular cinical situations and analysis. The vesical capacity is evaluated with the formula (A+2)x30= __cc where A=age of patient (years). A burette containing 1 mCi of pertechnetate (99mTc04) and 0.9% NaCl solution is suspended 1 meter above the examination table and connected to the patient's catheter (supine). The catheter we use is a nasogastric feeding tube, size 5 or 8. The bladder is filled until maximum capacity is reached as previously calculated or if the child shows signs of discomfort or begins voiding spontaneously. Usually, the voiding phase will begin once the bladder contains the maximum capacity. Depending on the child's age, they may be able to void when asked (usually in supine position), otherwise dynamic imaging continues until the child voids on his own. Obviously, the child's cooperation is very important and therefore requires that we occasionally change our technical and psychological approach to obtain a satisfactory study. This exam has special considerations, therefore thorough knowledge of all aspects of the procedure will greatly help the technologist obtain an optimal study.

Pulmonary

Posterboard No. 1616

^{67}Ga dynamic acquisition, index of delayed uptake in interstitial lung diseases.

Fazzi P., Solfanelli S., Miniati M., *Cristofani R., Di Mauro M, Molesti D., and Giuntini C.
CNR Institute of Clinical Physiology and 2nd Medical Clinic University of Pisa -*Department of Public Health and Biostatistics, Pisa Italy

To assess the degree of alveolitis a semiquantitative measure (^{67}Ga index) was created by Line; ^{67}Ga lung scans are considered "positive" if they are found to have an uptake equivalent to more than 50 ^{67}Ga index units. Considering the binding of ^{67}Ga citrate, after

injection, to the serum transferrin, the vascular permeability of ^{67}Ga transferrin complex (^{67}Ga-TF) has been evaluated in 45 patients in order to verify if a delayed positive ^{67}Ga scan agrees with an abnormal index of ^{67}Ga-TF. Five minutes were waited, after injection of radiotracer, before to start with dynamic acquisition to allow an adequate vascular mixing. Curves activity-time for a period of 60' were registered with gamma camera collimated on the anterior thorax. Six linear functions resulted from the counts collected on pulmonary areas of interest. Each area was normalized by the background and by the counts registered on cardiac area. Of 45 patients, 16 (39%) had ^{67}Ga index of 47±11 units and a ^{67}Ga-TF value of 0,69±0,36; both index correlated significantly (r 0,49 p<0,05). In the other 25 patients (61%), ^{67}Ga index resulted 171±120 units and ^{67}Ga-TF 1,17±0,62. Even in these patients the two index correlated significantly (r 0,65 p<0,001). These preliminary data suggest that the vascular permeability of ^{67}Ga (67Ga-TF) very likely predict the delayed uptake (120 hrs) of ^{67}Ga (67Ga index)

conventional device for radio chromatography measurement. The table summarized the results obtained for the principal radio pharmaceuticals used in the Dpt. The results emphasize that the radiochemical purity varies from 23% to 100%

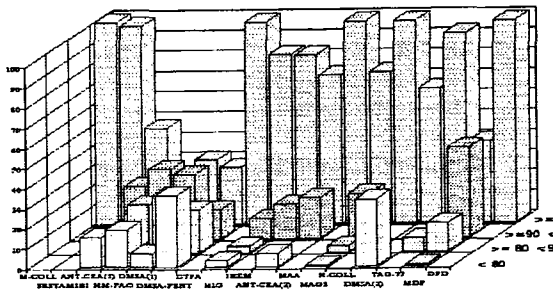

Table: Histogram for bound distribution in the radio pharmaceutical. Conclusion: the relatively high numbers of preparations that exceed the 5% of free fraction (40.5%) make mandatory the radiochemical control for radio pharmaceuticals. In some preparation the controls emphasize a very small number of outliers but for other preparations (DMSA, HM-PAO, HIG, monoclonal antibodies and other) the control before injection is mandatory.

Radiopharmaceutical Chemistry: General

Posterboard No. 1617

A BLOOD LABELING SYSTEM (BLS) TO MINIMIZE CROSS CONTAMINATION AND MISADMINISTRATION (MA): D. Walsh, W. Porter, R. Gutkowski, H. Dworkin, P. Hamilton. William Beaumont Hospital, Royal Oak, MI and Henry Ford Hospital, Detroit, MI

MAs have been reported involving radiolabeled WBCs with the risk of AIDS transmission. To avoid MAs involving blood, strict attention is given to: 1. patient (pt) ID when blood is drawn and administered and 2. insuring the integrity of the blood sample during radio-labeling. We have developed policies and a BLS which we believe safeguards pts. A request for a blood labeling syringe for a specific pt procedure is entered into the pharmacy computer. A unique color is assigned to each pt and is not reused that day. Labels are printed which designate the pt and procedure. These labels and color are affixed to: 1. the blood collection syringe, 2. the daily blood labeling log, 3. all supplies which will contact the blood and 4. a pt ID bracelet (IDB). The syringe, IDB, and request are verified by two people. The IDB is placed on the patient when the blood is drawn. During radiolabeling, color coded racks are used to contain all components. Upon completion and prior to reinjection, the rack contents and final product are verified by two people. Upon re-injection, the IDB is verified then removed. This system neither disrupted nor lengthened the labeling procedure and has been used in 184 pts.

Posterboard No. 1618

ROUTINE EVALUATION OF RADIOCHEMICAL PURITY IN A NUCLEAR MEDICINE DEPARTMENT.

S. Marzocchi*, A. Barboni*, R. Baravelli, L. Ferraguti, B. Bagni.
Dept. of Nuclear Medicine, * Dept. of Health Physics, S. Anna Hospital, Ferrara, Italy

The radiochemical purity of the radio pharmaceuticals was tested in 1127 different preparation during a year prior to the administration of the radio pharmaceuticals. The methods routinely used in the department are: paper-chromatography, gel-chromatography, thin-layer chromatography. The radio chromatography was performed using a NaI(Tl) crystal in a

Posterboard No. 1619

SINGLE STRIP CHROMATOGRAPHY FOR RAPID QUALITY CONTROL OF TECHNETIUM 99m EXAMETAZIDE.

S. Marzocchi, A. Barboni, B. Bagni*.
*Dpt. of Nuclear Medicine, Dpt. of Health Physics, S. Anna Hospital, Ferrara, Italy.

Tc 99m hexamethyl-propyleneamine-oxime is a relatively new radiopharmaceutic used for cerebral perfusion and blood cells tagging. This lipophilic radiopharmaceutical is very unstable since the useful life of reconstructions is only 30 min; the conventional method proposed by the manufacturer is time comsuming (nearly 15-20 min for an experienced user). The usefulness of this radiopharmaceutical is strictly connected with the possibility to perform a rapid quality control before injection.

Using the normal paper chromatographic method the radio chromatographic purity varies from 19.7% to 98.8% (MEAN 86.4% SD = 14.4% n = 173); in 17.3% of the preparations the free technetium fraction varies from 20% to 80% and the preparations would be rejected. In many cases the radiopharmaceutical with a bad chromatographic result was injected. In this situation is mandatory to find a new rapid method for Ceretec control. We propose a paper chromatography using Whatman 31ET and Ethyl Acetate. The developing time is 1-2 minute and the deposition quantity is .010 ml. A comparison among 31 different Ceretec preparation using the conventional and rapid method shows a linear correlations between the radio chromatographic purity obtained with two method ranging the bond fraction from 38% to 98% in the preparations (r = .989 p<0.001).

The rapid method present a critical point: the elapsed time from the deposition to the immersion in the solvent is very critical.

The relationship between the elapsed time and percentage of free technetium evaluated with chromatography slow-down with the time.

In conclusion this rapid method is useful and very easy to perform achieving the goal to evaluate the radiopharmaceutical purity before the HM-PAO injection.

Radiopharmaceutical Chemistry: Halogens

Posterboard No. 1620

MODIFIED RADIOLABELING METHOD FOR SODIUM IOTHALAMATE I-125. T.J. Herold and J.C. Hung. Nuclear Medicine, Mayo Clinic, Rochester, MN.

The renal clearance of sodium iothalamate I-125 in human is in good correlation with inulin; therefore, sodium iothalamate I-125 has been a radiopharmaceutical of choice for the evaluation of glomerular filtration. Sodium iothalamate I-125 can be prepared by the isotope-

exchange method. Previous method* used a contrast medium preparation (iothalamate sodium injection, USP, 80%) for the radioiodination of sodium iothalamate I-125. The initial precipitation and purification of sodium iothalamate to form iothalamic acid for radioiodination is tedious and time-consuming (1½ hr for purification and overnight for drying). The goal of this study was to evaluate the feasibility of replacing iothalamate sodium injection with iothalamic acid as a starting material for the preparation of sodium iothalamate I-125. Radioiodination of iothalamic acid with I-125 was performed as stated in the previous method*. Radiochemical purity (RCP) of I-125 iothalamate was determined with the use of an instant thin layer chromatography strip impregnated with silica gel (1.5 cm X 15 cm) as solid phase and butanol: acetic acid: water (120:50:30) as mobile phase. Our results indicates that the RCP of sodium iothalamate I-125 obtained from the new method was 98.9±1.4% (n=15) versus RCP value of 99.2±1.0% (n=25) from the old method* with no significant differences between the two RCP values.

We conclude that our modified method provides a more simplified and rapid way to prepare sodium iothalamate I-125 while still maintaining high RCP values.

*Rao SA et al. Preparation of iodine-125-labeled iothalamate for renal clearance measurement. In: Wahner HW, ed. *Nuclear medicine quantitative procedure.* Boston:Little, Brown and Company; 1983:379-381.

Radiopharmaceutical Chemistry: Technetium

Posterboard No. 1621

A New Method to Radiolabel Gelfoam Using the Ultratag RBC Kit. M.L. Archambault, B.M. Brown, K.T. Cheng, I. Vujic and L. Hartley. Medical University of South Carolina, Charleston, S.C.

This study describes a new method to label Gelfoam absorbable sponge, USP with TC-99m using the Ultratag RBC Kit. Our objectives were to investigate the feasibility of labeling Gelfoam with this new method and compare its labeling efficiency with that of the standard Tc-99m sulfur colloid method (Int. J. Appl. Radiat. Isot. Vol. 33, pp. 1415-1421, 1982). The gelfoam was labeled in a 10ml syringe modified with a 3-way stopcock on the hub. Duplicate syringes were set up, and labeling was done using 10 mCi of Tc-99m sulfur colloid or 50ug stannous ion from the Ultratag kit, subsequently labeled with 10 mCi Tc-99m. The syringes were vortexed, then rotated at 12rpm for 45 minutes at room temperature. Following incubation, the gelfoam was washed repeatedly with 0.9% normal saline, USP and percentage binding was calculated. Results (N=4) indicated that the Ultratag kit (44.4 ± 3%) (mean ± s.d.)provided a superior labeling efficiency versus the sulfur colloid (25.7 ± 9.8%). The two-sample t-test showed the difference was significant at $p<0.01$ level. Several patient studies were successfully performed with the Tc-99m labeled gelfoam using this new method for localization of therapeutic emboli.

Posterboard No. 1622

BONE SCAN OR RENAL SCAN. R. Burkholder, E. Pantier, G. Vogt and J. Morgan. Lutheran Medical Center, Wheat Ridge, CO.

A 77-yr-old male with low back, right posterior chest and right shoulder pain was referred for a whole body bone scan. On the first bone scan, abnormally high activity was noted in the kidneys, soft tissues and blood pool, with poor accumulation in the skeleton. Although no evidence of a radiopharmaceutical misadministration was found, a second bone scan was performed three days later. The same distribution of tracer was demonstrated excluding the possibility of a technical error. A medical and drug history were then obtained.

The patient suffered from refractory anemia, requiring 78 blood transfusions within a two year period. Iron overload is a complication of multiple blood transfusions.

The iron overload phenomenon results from excess iron introduced into the body from the transfused blood and low excretion rate of iron. It has been suggested that metal ions such as calcium or iron might facilitate the dissociation of the technetium-99m from the carrier ligand and produce an in vivo technetium-99m form that carries the activity to the kidneys. Finally, high concentrations of iron in the blood when the phosphate compounds are given creates a bonding between the technetium labeled phosphorus compounds and the iron complex resulting in the blood pool labeling, which explains the appearance of the cardiac activity in the anterior image.

Renal/Electrolyte/Hypertension

Posterboard No. 1623

TECHNETIUM-99M MERCAPTO ACETYL TRIGLYCINE (Tc-99M MAG3) SCANS AND RENAL SCARRING - ARE ANALOG IMAGES NECESSARY? I.W. Jones, A.M. Jones and G.C. Vivian, Derriford Hospital, Plymouth U.K.

44 Tc-99m MAG3 scans (87 kidneys) with a mean age of 5 years 11 months were reviewed to assess renal scarring and the role of parametric images. The scans were performed for the investigation of urinary tract infection using an IGE mobile gamma camera attached to a Nuclear Diagnostics Gamma 11 processing system. In 27 kidneys there was comparison with Tc-99m dimercapto-succinic acid (DMSA) scans and in all cases the Tc-99m DMSA and Tc-99m MAG3 camera "analog" images were in agreement. The Tc-99m MAG3 scan was assessed in 87 kidneys: the parametric images of uptake and uptake rate overestimated the degree of scarring in comparison with the "analog" images with agreement in only 70% (uptake) and 78% (uptake rate). Comparison with ultrasound was also made and was found to be less sensitive than Tc-99m MAG3 or Tc-99m DMSA scans with agreement with the "analog" Tc-99m MAG3 images in 84%. It has been suggested that Tc-99m parametric images are superior to camera "analog" images for assessment of renal scarring in children. Our results show that it is important to continue to produce Tc-99m MAG3 "analog" images as they are more accurate than parametric images alone for the assessment of renal scarring.

Posterboard No. 1624

TC-99M MAG3 ERPF DETERMINATION: A COMPARISON OF TWO CAMERA TECHNIQUES WITH THE TAUXE METHOD. A.J.Arroyo. St.Vincent Medical Center, Toledo, OH.

This study was undertaken to compare two different camera techniques not requiring blood samples, with the Tauxe (1-blood sample) Effective Renal Plasma Flow (ERPF) determination method.

A modified Schlegel camera (MSC) method, by the

introduction of 0.67 as a correction factor was used in one technique (Arroyo A,JNMT.1991;19#3:173-175). In the other, the Renal Clearance (RC) was first determined (Taylor A,et al.JNM.1991;32#5:953.Abstract):

Clearance (ml/min) = 824.2X - 8.04

where X = BKG and attenuation corrected renal counts at 2-3 minutes post injection, divided by the injected dose (cts/min).

and then converted to ERPF, for the purpose of comparison with normal values listed in the literature (Taylor A,et al.Radiology,1989;170:721-725):

ERPF (ml/min) = 1.818 x C + 22.9

where C = Clearance in ml/min.

Fifty patients with varying degrees of renal impairment were studied. Age: 16 to 80yrs., BUN: 7 to 140 mg/dl, Creatinine: 0.7 to 10.7 mg/dl, ERPF: 66 to 695 ml/min, 19 males and 31 females.

The results were then compared to the values obtained with the Tauxe (TX) method.

MSC vs TX : r=0.9673, y=0.986181X + 6.212858
RC vs TX : r=0.9606, y=0.974749X + 25.79511
RC vs MSC : r=0.9688, y=0.964034X + 26.95624

In conclusion, these comparative results support the concept that a camera technique can be applied to determine ERPF with Tc-99m MAG3, with results comparable to those obtained by the Tauxe method ($p<0.01$).

SCIENTIFIC EXHIBITS

The scientific exhibits are listed in numerical order. The number above each title refers to the exhibit location.

Scientific Exhibit Hours

Tuesday	10:00 A.M.–7:00 P.M.	Thursday	7:00 A.M.–7:00 P.M.
Wednesday	7:00 A.M.–7:00 P.M.	Friday	7:00 A.M.–12:00 P.M.

Posterboard No. 1700

PLANAR AND HIGH RESOLUTION SPECT BONE IMAGING IN THE DIAGNOSIS OF FACET SYNDROME. J.L. Machin, L.E. Holder, C.C. Sexton, and P.L. Asdourian, Union Memorial Hospital, Baltimore, MD.

Since there is no reported correlation of symptoms with the radiographic or CT evidence of degeneration of the facet joints, we evaluated 42 patients referred for "facet syndrome" to determine the appearance of potentially symptomatic facet joints on planar radionuclide bone imaging and to relate the sensitivity of planar imaging findings to those of a "high resolution" SPECT technique.

This exhibit will define the facet syndrome and illustrate the radiographic, CT, and MR findings in degeneration of the facet joints. We will describe and illustrate our techniques and provide illustrations of abnormal facet joints with both techniques. The detection sensitivity for planar and SPECT would be compared, and finally the relationship of patient pain symptoms to the abnormal scan determined by selective facet injections of local anesthesia and steroid will be reported.

Posterboard No. 1701

COMPARISON OF ROTATING CHAIR TOMOGRAPHY WITH CONVENTIONAL ROTATING CAMERA TOMOGRAPHY. J. I. Kantor, and W. A. Sharpe. The Michener Institute for Applied Health Sciences, Toronto, Ontario, Canada.

A Jaszczak SPECT phantom was used to compare the performance of the SPECTURN rotating chair used with a stationary Siemens ZLC3700 camera head against the same orbiting Siemens ZLC3700 SPECT system.

The Jaszczak phantom was imaged using identical acquisition and reconstruction parameters. The resulting transaxial slices were compared qualitatively by observing the number of spheres resolved. Quantitative evaluation consisted of comparing the image contrast using the largest sphere in both studies. The rotating chair demonstrated the same number of spheres with the same image quality as the conventional SPECT system. The contrast measurement yielded identical results, Cimage = 0.55, for both the rotating chair and the conventional SPECT system.

Line source measurements were made using a 0.1 ml. capillary tube suspended in a water filled Jaszczak phantom. The acquisition and reconstruction parameters were identical for both studies. The line source profile was determined and the FWHM was calculated from the curve points using a linear interpolation technique. The FWHM was 1.85 cm. for the SPECTURN rotating chair equipped ZLC3700 camera and 1.9 cm. for the conventional orbiting Siemens ZLC3700 SPECT system. It was concluded that the resolution of the stationary camera equipped with a rotating chair was equal to the resolution of the same camera orbiting about the tomographic imaging bed.

CONTINUING EDUCATION

Accreditation Statements

ACCME

The Society of Nuclear Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians.

ACPE

The Society of Nuclear Medicine is approved by the American Council on Pharmaceutical Education (ACPE) as a provider of continuing pharmaceutical education.

AMA/PRA Designation Statement for Category I

The Society of Nuclear Medicine designates this entire continuing medical education activity for a total of 220.25 credit hours in Category 1 of the Physician's Recognition Award of the American Medical Association (AMA).

Courses Approved for Continuing Pharmaceutical Education

Listed below are all courses and seminars in the Technologist Program approved for continuing pharmaceutical education. The number of CEUs appears in parentheses. In the Program/Show Directory, these courses will be marked by CPE.

CAD: Pathophysiology, Treatment, and Imaging Techniques (0.3); Oncology: A Nuclear Medicine Perspective (0.6); Total Quality Management Overview (0.65); Alternative Imaging Techniques (0.3); Alterations in the Biodistribution of Radiopharmaceuticals: Drug Interactions and Kit Preparation (0.35); Abdominal and Genitourinary Imaging (0.65); Implementing Your Neuro-SPECT Skills (0.6); Practicing PET (0.5); Current Topics in Pediatric Nuclear Medicine (0.325).

Reporting forms for pharmacists will be available in the registration packet. Complete the Certification of Continuing Pharmaceutical Education Participation and deposit the top portion in the receptacle located in the Continuing Education Office at the Metro Toronto Convention Centre or mail it to the address indicated on the form. Retain the lower portion for your records. ACPE certificates will be mailed after the meeting.

CME and VOICE Credit

Once again, the Technologist Section of the SNM is offering continuing medical education (CME) credits for its continuing education sessions. All physicians are invited to participate.

Physicians please note: You must complete the Annual Meeting General Evaluation Form enclosed in your registration packet, along with the individual evaluation forms for the sessions you attend, in order to receive CME credit. Please return completed continuing education packets to the SNM Continuing Education office, located across from Rooms 103-104 in the Metro Toronto Convention Centre and return the individual evaluation forms to the appropriate course organizers.

All Technologist Section continuing education courses are approved for verification of involvement in continuing education (VOICE) credit.

MONDAY, JUNE 7, 1993

MANAGING QUALITY SERVICE

Time: 8:00–2:30 **VOICE: 0.66** **CME: 5.50**
Room: 202B

Moderator: Katherine L. Richmond-Cox, CNMT

Educational Objective

At the end of this session, you will:

1. Understand the importance of service for your organization.
2. Have an understanding of the needs of the multiple clients you serve.
3. See the value of having a service strategy and be able to work with your staff and colleagues in developing a strategy for your unit.
4. Be able to develop quality service skills in yourself and your staff.
5. Be able to build a service team.
6. Have identified the key barriers to quality service in your unit.
7. Have developed an action plan for improving service.

Summary: This session is designed to assist you in promoting a service orientation in your own unit by developing a service strategy, building a service team, and working to eliminate any barriers to quality service. Marlene Potter, of Marlene Potter & Associates is a well-regarded, Toronto-based consultant with experience as a facilitator, trainer, and strategic planner on quality service issues for both profit and not-for-profit organizations. You will find this session informative, practical and challenging.

8:00–2:30 **Managing Quality Service.** Marlene C. Potter, BA, Marlene Potter and Associates, Toronto, Canada.

TEACHING AND EVALUATING STUDENTS IN THE AFFECTIVE DOMAIN

Time: 8:00–3:00 **VOICE: 0.72** **CME: 0.00**
Room: 205B

Moderator: Kathy Thompson, CNMT

Educational Objective

Upon completion of this workshop, participants should be able to perform the following:

1. Utilize content and process to develop a handbook on evaluation of affective behavior of students.
2. Recognize and implement the decision points in clinical evaluation.

Summary: While many educators are able to teach and evaluate students in the cognitive and psychomotor aspects of nuclear medicine technology with relative ease, problems often arise in teaching or promoting certain affective behaviors. Students themselves tend to concentrate on those kinds of behaviors that are easily learned and controlled. Yet the affective behavior of students is crucial to their success in the program and subsequent ability to find the job of their choice upon graduation. The TIPS workshop will focus on reviewing affective objectives and defining affective characteristics and related psychomotor components. The evaluation process and instruments will be discussed followed by suggested means of implementing the process and assessing its effectiveness on the affective behavior of students.

9:00–3:00 **Teaching and Evaluating Students in the Affective Domain.** Sister Madeleine Smith, Gwynedd Mercy College, Gwynedd Valley, PA.

TUESDAY, JUNE 8, 1993

SPECT I: ESTABLISHING A SPECT PRACTICE

Time: 10:30–12:00 **VOICE: 0.18** **CME: 1.50**
Room: 206B

Moderators: Daniel W. Koller, CNMT and Sue Beecher, CNMT

Educational Objective
After attending this session, the participant will be able to:
1. Describe the evolution of SPECT systems and techniques.
2. Recognize the criteria for selection of equipment and vendors.
3. Employ marketing techniques that would aid in establishing a productive practice.

Summary: This session reviews the evolution of SPECT from modified stationary cameras (remember seven pinhole thallium) to integrated and dedicated SPECT systems. Consideration in the purchase of a SPECT system and manufacturer will be discussed. What are the benefits of a single, dual, and multiple detector system? Which one is right for you? Too often, the return on the investment of a new SPECT system diminishes after the initial enthusiasm. Develop techniques to market your SPECT/nuclear service.

10:30–11:00 **The History of SPECT.** Ronald J. Jaszczak, PhD, Duke University Medical Center, Durham, NC.
11:00–11:30 **Equipment Selection in the 1990s: The Practical Issues.** David L. Lilien, MD, Newport Metabolic Imaging Center, Newport Beach, CA.
11:30–12:00 **Marketing of the SPECT/Nuclear Service.** Robert F. Carretta, MD, Roseville Hospital, Roseville, CA.

SPECT II: INTRODUCTION TO SPECT

Time: 1:00–3:00 **VOICE: 0.18** **CME: 1.50**
Room: 206B

Moderator: Donald B. Faulkner, CNMT

Educational Objective
After attending this session, the participant will be able to:
1. Recall the basic terminology related to SPECT imaging.
2. Identify artifacts associated with nonuniformity, center of rotation, and patient motion.
3. Contrast between filtering in the spatial and frequency domain.
4. Recognize the effect of filtering on image quality.
5. Analyze the performance of a SPECT system, evaluating the uniformity, resolution, and contrast.

Summary: The introduction to SPECT imaging will review the basic terminology and technique utilized in SPECT imaging. What are the trade-offs in collimator selection? When is attenuation correction appropriate? The role of filtering in SPECT imaging will be explained, including the difference between convolution and FFT. How do you select the correct filter? SPECT imaging requires stringent attention to detector performance for artifact free images. What test should you be performing and how often?

1:00–1:40 **Introduction to SPECT.** Beth A. Harkness, MS, Bowman Gray School of Medicine, Winston-Salem, NC.
1:40–2:20 **Principles of SPECT Filtering.** Ernest V. Garcia, PhD, Emory University Hosptial, Atlanta, GA.
2:20–3:00 **Performance Testing of SPECT Systems.** L. Stephen Graham, PhD, VAMC/UCLA, Sepulveda, CA.

SPECT III: ADVANCED SPECT

Time: 3:30–5:00 **VOICE: 0.18** **CME: 1.50**
Room: 206B

Educational Objective
After attending this session, the participant will be able to:
1. Review the benefits of a dedicated SPECT instrument.
2. Explain advanced scatter and attenuation corrections.
3. Differentiate between filter backprojection and iterative reconstruction methods.
4. List the advantages of specialized collimators.
5. Differentiate between maximum intensity projection and surface shaded displays.

Summary: This session discusses advanced SPECT techniques. Dedicated multiple detector and ring systems are reviewed. Recent improvements in computer performance permit elaborate reconstruction techniques to be practical. Improved scatter and attenuation correction are also discussed. The benefits of three-dimensional display are explained. What are the differences between MIP routines and surface shaded displays and when do you utilize them?

3:30–4:00 **Modeling the Physical Processes of Image Detection in SPECT.** Grant T. Gullberg, PhD, University of Utah, Salt Lake City, UT.
4:00–4:30 **Dedicated Cameras for SPECT Imaging.** Frederick H. Fahey, DSc, Bowman Gray School of Medicine, Winston-Salem, NC.
4:30–5:00 **Three-Dimensional Display in Nuclear Medicine: Principles, Uses, and Pitfalls.** Jerold W. Wallis, MD, Washington University School of Medicine, St. Louis, MO.

ORTHOPEDIC IMAGING IN THE EVALUATION OF BENIGN BONE DISEASE, INFECTION, AND METASTASES

Time: 10:30–5:10 **VOICE: 0.70** **CME: 5.75**
Room: 206D

Moderators: Nellie L. Kelty, MA, CNMT, Victoria A. Walton, CNMT, Ann M. Voslar, CNMT, Lisa Trembath, CNMT, and Denis Gravelle, CNMT

Educational Objective
This course is designed for nuclear medicine technologists, physicians, residents, and students involved in orthopedic imaging. At the completion of this session, the attendee should be able to:
1. List the various radiopharmaceuticals used in diagnosing infection in bone. Compare the use of ^{67}Ga, In-WBC, and Tc-Ceretec noting the advantages and disadvantages of each for various clinical presentations.
2. Describe the usefulness of bone SPECT, in particular, as it aids in the evaluation of bone disorders of the spine. Describe the acquisition and processing parameters for a representative bone SPECT study of the spine.
3. Differentiate the scan pattern in sports medicine injuries of the lower leg, i.e., stress fractures versus shin splints.
4. Recognize the sensitivity of bone imaging in the acute fractures specifically with negative X-rays.
5. Compare MRI with bone scan for avascular necrosis (AVN) of the femoral head; which one is more sensitive?; more specific?
6. Define RSD and describe the clinical and scintigraphic criteria for its diagnosis. Characteristic scan pattern in three-phase bone imaging. Which phase is the most sensitive?
7. List at least two radiopharmaceuticals used for metastatic disease treatment; describe the action of each on bone metastases.

Summary: This continuing education session will provide the attendee with the basic information necessary for the numerous facets of orthopedic imaging. The course will include information on bone imaging acquisition protocols, including SPECT, as well as demonstrating the usefulness and value of bone scans for a variety of benign bone disorders. Various scan patterns to be discussed will allow us to recognize stress related injuries, as well as acute healing processes. Correlative imaging modalities will be used for comparison or correlation. Information gained from this session will educate us on the most sensitive radiopharmaceutical and procedure to use for infection imaging. In addition an update on bone imaging and treatment for metastases will be provided.

10:30–11:20	**Orthopedic Imaging—Foot and Ankle.** Lawrence E. Holder MD, FACR and Patricia A. Sheehan, MAS, CNMT, The Children's Hospital & Center for Reconstructive Surgery, Baltimore, MD.
11:20–12:10	**Orthopedic Imaging: Scintigraphy of the Hand and Wrist.** Alan H. Maurer, MD, Temple University Hospital, Philadelphia, PA.
1:30–2:20	**Imaging the Spine with Bone Scanning, X-Ray, CT, and MRI.** B. David Collier, MD, Medical College of Wisconsin, Milwaukee, WI.
2:20–3:10	**Imaging of Pelvis, Hips, Knees, and Legs.** Robert F. Carretta, MD, Roseville Hospital, Roseville, CA.
3:30–4:20	**Orthopedic Infection Imaging.** Sue H. Abreu, MD, Womack Army Medical Center, Raeford, NC.
4:20–5:10	**Evaluation of Metastatic Bone Disease.** John E. Powe, MD, FRCP (C) and Suzanne Quirk, RTNM, Victoria Hospital, London, Ontario, Canada.

CURRENT ISSUES IN QUALITY ASSURANCE: MEETING THE REGULATIONS

Time: 10:30–5:00 **VOICE: 0.66** **CME: 5.50**
Room: 205D

Moderators: Susan Gilbert, CNMT and Brenda B. Woods, CNMT

Educational Objective
After attending this session, participants should be able to:
1. Discuss current issues in quality assurance.
2. Evaluate current quality assurance practices at their home institution and suggest improvements.
3. Describe instrument quality control procedures and radiopharmaceutical quality control procedures.
4. Identify when technologists receive their highest radiation exposure and apply principles of radiation safety in order to keep their exposure ALARA.
5. Identify when technologists are at risk of exposure to bloodborne pathogens and apply the principles of universal precautions in order to reduce their risk of exposure in the workplace.

Summary: Key issues of quality management will be presented by field experts. Each will cover detailed information on several prescribed regulations and the methods of fulfilling those regulations. The program is summarized with a panel of technologist managers, who have recently experienced a JCAHO audit. These panelists will bring copies of their QA programs to share with the participants.

10:30–12:00	**Instrumentation QC Program—Gamma Camera.** Paul Bohdiewicz, MD, William Beaumont Hospital, Royal Oak, MI.
1:30–2:15	**Radiopharmaceutical QC Program.** Stephen Karesh, PhD, Loyola University Medical Center, Maywood, IL.
2:15–3:00	**Radiation Safety Program.** Tom Dickinson, CNMT, NMA Medical Physics Consultation, St. Louis, MO.
3:30–4:30	**Infection Control Program.** Marta Garcia, RN, BSN, CIG, Toronto General Hospital, Toronto, Canada.
4:30–5:00	**Panelists.** Katherine Richmond-Cox, CNMT, Toronto General Hospital, Toronto, Ontario, Canada. Sheila Rosenfeld, MA, CNMT, St. Louis University, St. Louis, MO. Kathleen Mercatante, CNMT, St. Vincent Hospital & Medical Center, Portland, OR.

STUDENT DAY

Time: 10:30–1:30 **VOICE: 0.12** **CME: 0.00**
Room: 205B

Moderators: Deborah Scollard, CNMT and Angela Macci, CNMT

10:30–10:40	**Welcome and Introduction**
10:40–12:00	**Student Papers and Posters**
12:00–12:15	**Lunch:** Box lunches will be available for purchase.
12:15–12:35	**President, Society of Nuclear Medicine—Technologist Section:** Paul Hanson, CNMT
12:35–1:15	**Your Future in Nuclear Medicine**
1:15–1:30	**Student Paper and Poster Awards**

NMTCB: ITEM WRITERS WORKSHOP

Time: 1:30–5:00 **VOICE: 0.36** **CME: 0.00**
Room: 205B

Moderator: Miriam Miller, CNMT

Educational Objective
Upon completion of this workshop, participants should be able to perform the following:
1. Develop multiple choice questions following the principles and conventions of multiple choice item writing.
2. Recognize common problems associated with multiple choice questions.
3. Apply skills learned in the workshop to the classroom or to writing items for the NMTCB.

Summary: This presentation is made by members of the Board of Directors of the NMTCB and is intended to provide educators and NMTCB item writers guidance for improving multiple choice item writing. Following an overview of the NMTCB examination development, including a discussion on task analysis, the strengths and limitations of multiple choice questions will be discussed along with the "how tos" for actually writing a question. Participants will have an opportunity to practice writing items for the NMTCB. The workshop format will allow hands on participation for those who attend. Handouts will include (1) examples of both good and poor multiple choice questions, (2) a review sheet of common problems associated with this type of question, (3) the Components of Preparedness (COP) statements of the new exam matrix as guidelines for writing items for the NMTCB, and (4) actual test questions used on recent exams. Educators who use multiple choice questions on examinations will find this workshop particularly useful.

1:30–4:30	**Item Writers Workshop.** Nancy S. Sawyer, CNMT, William Beaumont Hospital, Royal Oak, MI.

Wednesday, June 9, 1993

CARDIAC I: PATHOPHYSIOLOGY, TREATMENT, AND IMAGING TECHNIQUES FOR CAD

Time: 8:30–12:00 **VOICE: 0.36** **CME: 3.00**
Room: 206B

Moderators: Julia S. Blust, BS, CNMT and Jennifer A. Mattera, BS, CNMT

Educational Objective
After attending this session, the technologist will be able to:
1. Describe the pathophysiology of coronary artery disease including plaque and thrombus formation and the role of cholesterol.
2. Compare thrombolysis, PTCA, and CABG and explain the indications for each.
3. Identify common arrhythmias and the drugs used to treat them.
4. Discuss the specialized imaging techniques applied to imaging in the intensive care unit.

Summary: To develop an understanding of coronary artery disease, the session begins with outlining the progressive process of arteriosclerosis and describes the process of plaque and thrombus formation and the role of cholesterol. Myocardial ischemia and acute infarction will be reviewed. The session continues with the invasive treatments available for coronary artery disease including thrombolysis, PTCA, and CABG. The discussion of common cardiac arrhythmias and the drugs used to treat them will follow. The session will end with specialized imaging techniques used in the intensive care unit. Imaging the transplanted heart, patients on ventricular assist devices, special IV lines, and disposal of radioactive waste will be discussed.

8:30–9:20 **The Pathophysiology of Coronary Artery Disease.** Albert Sinusas, MD, Yale University School of Medicine, New Haven, CT.

9:20–10:10 **Reperfusion and Revascularization.** Bernard Villegas, MD, University of Massachusetts Medical Center, Worcester, MA.

10:30–11:20 **Cardiac Rhythms—Effects and Treatments.** Greg Kelly, PA-C, University of Iowa Hospitals and Clinics, Iowa City, IA.

11:20–12:10 **Imaging in the Intensive Care Unit.** Julia Spinn Blust, BS, CNMT, St. Luke's Episcopal Hospital, Houston, TX.

CARDIAC II: ALTERNATIVE IMAGING TECHNIQUES

Time: 1:30–5:00 **VOICE: 0.35** **CME: 3.00**
Room: 206B

Moderators: Brenda McSherry, BS, CNMT and Janice S. Preslar, BA, CNMT

Educational Objective
After attending this session, the technologist will be able to:
1. Identify potential problems and imaging considerations for the assessment of right ventricular function.
2. Describe three-dimensional imaging and its applications in myocardial perfusion imaging and ventricular function assessment.
3. Explain how myocardial metabolism and myocardial blood flow are determined utilizing PET techniques.
4. Describe the technical considerations involved in performing cardiac PET studies.

Summary: The session begins with an overview of right ventricular abnormalities and techniques for the assessment function. Next, an update on the newest development in cardiac SPECT, three-dimensional imaging. The principles of three-dimensional SPECT and applications will be discussed. The last session reviews cardiac PET imaging. The agents used to assess myocardial blood flow and myocardial metabolism will be discussed and how they compare with single-photon agents such as thallium-201 and technetium-99m myocardial perfusion agents. Finally, a discussion of the technical considerations of cardiac PET imaging will be given.

1:30–2:20 **Right Ventricular Function Assessment.** Janice S. Preslar, BS, CNMT, University of Iowa Hospital and Clinics, Iowa City, IA.

2:20–3:10 **Three-Dimensional Cardiac SPECT.** Tracy Faber, PhD, Emory University Hospital, Atlanta, GA.

3:30–4:10 **Correlative Imaging: Cardiac PET.** Jamshid Maddahi, MD, Clinical PET Center, UCLA School of Medicine, Los Angeles, CA.

4:10–4:45 **Cardiac PET: Technical Considerations.** Dayton Rich, BS, CNMT, Yale University School of Medicine/VA PET Center, Newington, CT.

ONCOLOGY: A NUCLEAR MEDICINE PERSPECTIVE

Time: 8:30–5.00 **VOICE: 0.72** **CME: 6.00**
Room: 206D

Moderators: Kathy S. Thomas, CNMT and Frances L. Neagley, CNMT

Educational Objective
Upon completing this course, the participant will be able to:
1. Describe the evolution of radiopharmaceuticals, instrumentation, and imaging techniques for oncological imaging in nuclear medicine.
2. Discuss current applications of at least three radiopharmaceuticals utilized to diagnose or evaluate the progression of disease.
3. Explain the current and future technical and clinical applications of monoclonal antibodies.
4. Describe therapeutic applications of at least two radiopharmaceuticals utilized in nuclear medicine today.
5. Discuss current and future applications of PET imaging for diagnosis and treatment evaluation for oncologic disease.

Summary: The evolution of radiopharmaceuticals and instrumentation in nuclear medicine has made a significant impact in the evaluation of oncological diseases. An in-depth study of current procedures and future applications will provide participants with an improved understanding of the role that nuclear medicine plays in oncological medicine today.

8:30–9:15 **Oncological Nuclear Medicine: The Evolutionary Process.** Frances L. Neagley, CNMT, Davies Medical Center, San Francisco, CA.

9:15–10:00 **Radionuclide Imaging of Lymphoma with Gallium-67 and Thallium-201.** William D. Kaplan, MD, Dana-Faber Cancer Institute, Boston, MA.

10:30–11:15 **Advances in Single-Photon Oncological Imaging.** Alan D. Waxman, MD, Cedars-Sinai Medical Center, Los Angeles, CA.

11:15–12:00 **Strontium-89 Therapy of Skeletal Metastasis.** Robert F. Carretta, MD, Roseville Hospital, Roseville, CA.

1:30–2:15 **Monoclonal Antibody Imaging: The Technologist's Perspective.** Lisa Ann Trembath, BA, CNMT, Medical College of Wisconsin, Milwaukee, WI.

2:15–3:00 **Current Status of Monoclonal Antibody Imaging.** Robert S. Hellman, MD, Medical College of Wisconsin, Milwaukee, WI.

3:30–4:15 **Radioimmunotherapy of Cancer.** Samuel E. Halpern, MD, V.A. Medical Center, San Diego, CA.

4:15–5:00 **Oncology Through the Eye of PET.** Jamshid Maddahi, MD, UCLA School of Medicine, Center for Health Science, Los Angeles, CA.

TOTAL QUALITY MANAGEMENT OVERVIEW

Time: 8:30–5:00 **VOICE: 0.78** **CME: 6.50**
Room: 205D

Moderator: Marcia Boyd, MS, CNMT

Educational Objective
After attending this seminar, the participant should be able to:
1. Define total quality (TQ) management and illustrate how it can be implemented in a service organization such as healthcare.
2. Differentiate QC, QA, and CQI.
3. Identify expectations of managers and aspects of a TQ culture.
4. Relate involvement of employees in training, team development, and communication.
5. Recognize the conditions necessary for empowerment.
6. Identify methods of rewards and recognition for teams and individuals.
7. Measure the cost of quality.
8. Apply problem solving tools (brainstorming, flow charts, pareto, fishbone diagrams) to a specific management question.
9. Apply management tools to problem solving and planning.
10. Determine appropriate measurement using basic statistical process control (SPC).
11. Apply benchmarking to improve operations.
12. Review JCAHO requirements.
13. Identify internal and external customers; measure their satisfaction, and determine expectations.
14. Develop service (customer/supplier) agreements, set quality indicators, and write action plans.

Summary: Total quality management (TQM), a method used in Japan for several years, affects quality and productivity through continuous improvement. The fast-paced presentation will provide an overview of TQM in healthcare and how it is currently being implemented. Areas of concentration will be employee involvement, measurement, and customer relations. The commitment by management to successfully create a culture change will be discussed. The importance of employee involvement will include training, empowerment, communication, implementing a suggestion system, team development, and methods of rewards and recognition. The cost of quality in healthcare will be evaluated. The participants will use problem solving techniques, statistical process control (SPC), and benchmarking to evaluate appropriate measurements for planning and executing change. JCAHO changes will be included. The importance of assessing the customer's needs and exceeding them will be addressed and appropriate action plans will be determined. The impact of service lines, care paths, and managed care on healthcare in the future will be discussed.

8:30–5:00 **Total Quality Management Overview.** Marcia Boyd, MS, CNMT, Baptist Memorial Hospital, Memphis, TN.

ETHICS SEMINAR: A CASE STUDY APPROACH TO TEACHING NUCLEAR MEDICINE TECHNOLOGY STUDENTS

Time: 8:30–10:00 **VOICE: 0.18** **CME: 0.0**
Room: 205B

Moderators: Patricia Wells, CNMT and Shirley Ledbetter, CNMT

Educational Objective
Upon completion of this seminar, participants should be able to perform the following:
1. Provide students with educational exercises in ethics that stimulate students' interest and are applicable to the actual practice of nuclear medicine technology.
2. Discuss methods for evaluating a student's understanding of ethics in the didactic and clinical setting.

Summary: Although as educators we must not impose our own values upon our students, we are entrusted to impress upon them the value of professional ethics. At the simplest level, we are required to provide students with the theory and methods of application of ethics. On a higher level, our goal is to encourage students to integrate these ethics into their professional behavior. The purpose of this seminar is to discuss lesson plans and educational tools, including case studies, which will help educators teach ethics in a way that will stimulate the students to analyze the principles, problems, and applications of professional ethics. The methods discussed are intended to make ethics an interesting and personal subject for students rather than just dry theory. Methods for evaluating the students' comprehension and ability to apply ethics will also be discussed. Workbooks with cases and questions will be supplied to participants, who are encouraged to bring copies of any cases or other educational tools used in teaching ethics.

8:30–10:00 **A Case Study Approach to Teaching Ethics to Nuclear Medicine Technology Students.** Patricia Wells, CNMT, Overlook Hospital, Summit, NJ. Shirley Ledbetter, CNMT, Overton Brooks VA Medical Center, Shreveport, LA.

CURRENT ISSUES IN EDUCATING NUCLEAR MEDICINE TECHNOLOGISTS

Time: 10:30–12:00 **VOICE 0.18** **CME: 0.00**
Room: 205B

Moderators: Martha Pickett, CNMT and Anthony Knight, CNMT

Educational Objective
By the completion of this forum, participants should be able to perform the following:
1. Interpret the Americans with Disabilities Act and its effects on nuclear medicine technology programs and plan how to incorporate the intent of the Act into program standards.
2. Describe the copyright laws as they apply to educational programs and the development of educational materials.
3. Compare recruitment tools and techniques from various programs and evaluate effectiveness in improving the applicant pool.
4. Discuss various models and scholarships for minority students or those with special educational needs in improving recruitment and retention in nuclear medicine technology programs.

Summary: The Educator's Forum is designed as an open forum for educators to share their experiences on a variety of topics. The subject matter described in the objectives are expressed areas of concern for educators, and many of the topics are part of the agenda for the Academic Affairs Committee. Participants are invited to bring any materials they might wish to share with others and are encouraged to contribute their experiences and ideas.

10:30–12:00 **Current Issues in Educating Nuclear Medicine Technologists.** Martha Pickett, CNMT, University of Arkansas for Medical Sciences, Little Rock, AR.

JRC FORUM

Time: 12:00–1:30 **VOICE: 018** **CME: 0.00**
Room: 205B

Moderators: James Langan, CNMT and Anthony Knight, CNMT

Summary: Elaine Cuklanz, the Executive Director of the Joint Review Committee for Nuclear Medicine Technology, will be present to discuss issues related to the Essentials and the accreditation process of nuclear medicine technology programs.

12:00–1:30 **JRC Forum.** Elaine Cuklanz, MT, (ASCP)NM, JRCNMT, Salt Lake City, UT.

EDUCATOR'S FORUM: PARTNERSHIPS MAKE HIGH TECH/LOW ENROLLMENT PROGRAMS POSSIBLE

Time: 1:30–3:00 **VOICE: 0.18** **CME: 0.00**
Room: 205B

Moderators: Martha Pickett, CNMT and Anthony Knight, CNMT

Summary: Recruitment and retention of nuclear medicine technologists for the Orlando Regional Healthcare System (ORHS) are ongoing corporate goals. Through a partnership with Valencia Community College (VCC), a cost-efficient associate of science core curriculum trains 6 critical allied health professions with a total of 110 students, justifying a low enrollment NMT program with 10 students. This presentation explains the integration of common curriculum components and shared staff and equipment resources. Another feature of this educational partnership is the accelerated tract being developed under a three year, $365,800, Department of Health and Human Services grant so that graduates of the core curriculum can obtain proficiency in a second modality (e.g., radiography then nuclear medicine technology).

1:30–3:00 **Partnerships Make High Tech/Low Enrollment Programs Possible.** Karen Blondeau, CNMT, Orlando Regional Medical Center, Orlando, FL.

LEGISLATION AND REGULATION IN THE NINETIES

Time: 3:30–5:30 **VOICE: 0.24** **CME: 2.00**
Room: 205B

Moderator: Sharon Surrel, CNMT

Educational Objective
After completing this session, participants will be able to:
1. Explain to SNM-TS members how they can become involved in the legislative and regulatory processes.
2. Discuss updates on current issues in government relations affecting the nuclear medicine technologist.
3. Dispense information about the SNM-TS Legislative Network and instruct SNM-TS members on how they can become involved in local, state, and national issues.
4. Create a forum for the exchange of ideas among the members of the Network, SNM-TS officers, and representatives of legislative and regulatory agencies.

Summary: This session will focus attention on the key role that technologists play in the legislative and regulatory process. This broad-range program will emphasize the need for participation by technologists in the Legislative Network. An update on the current issues confronting the profession will be provided.

3:30–5:00 **Change and Reform in the NRC; FDA Review of Mabs; and Allied Health Professionals and Health Reform.**

Thursday, June 10, 1993

IMPLEMENTING YOUR NEURO-SPECT SKILLS

Time: 8:30–5:00 **VOICE: 0.72** **CME: 6.00**
Room: 206B

Moderators: Colleen A. Buchanan, CNMT, Lorie A. Overby, CNMT, and Eileen O. Smith, CNMT

Educational Objective
After attending this course, the participant should be able to:
1. Perform the appropriate quality control on neuroimaging radiopharmaceuticals.
2. Discuss acquisition parameters for neuro-SPECT scanning.
3. Describe optimal reconstruction algorithms and image display techniques.
4. Identify new neuro-SPECT radiopharmaceuticals currently under investigation.
5. List four clinical examples of disease in which SPECT brain scans may be useful.

Summary: The participant will be given basic information regarding radiopharmaceuticals on the horizon, image acquisition and processing, and current and future clinical applications of the technique. A presentation on functional brain imaging, comparing PET scans with SPECT images, will provide background information for the understanding of new applications of SPECT.

8:30–9:15 **Current Status of ^{99m}Tc Bicisate (ECD) for the Future Clinical Utilization of Spect Brain Imaging.** Richard C. Walovitch, MD, Du Pont Merck, N. Billerica, MA.

9:15–10:00 **Special Techniques Required for Neuro-SPECT Imaging.** Michael D. Devous, Sr., PhD, University of Texas, Southwestern Medical Center, Dallas, TX.

10:30–11:15 **Quantitation and Coregistration of SPECT Images.** I. George Zubal, PhD, Yale University, School of Medicine, New Haven, CT.

11:15–12:00 **Panel Discussion.**

1:30–2:15 **Clinical Application of Functional Brain Imaging: PET/SPECT Comparisons.** Helen S. Mayberg, MD, University of Texas Health Science Center, San Antonio, TX.

2:15–3:00 **Psychiatric Applications of Neuro-SPECT.** John P. Seibyl, MD, Yale University, School of Medicine, New Haven, CT.

3:30–4:15 **Brain Spect Imaging of Head Trauma.** Ronald S. Tikofsky, PhD, Medical College of Wisconsin, Milwaukee, WI.

4:15–5:00 **Regulatory Issues Surrounding Transportation of Radiopharmaceuticals.** Eileen O. Smith, BS, Yale University, School of Medicine, New Haven, CT.

ABDOMINAL AND GENITOURINARY IMAGING

Time: 8:30–5:00 **VOICE: 0.80** **CME: 6.50**
Room: 206D

Moderators: Carol Schutz-Ferino, CNMT, Michele Ganske, CNMT, RoseMarie McGraw, CNMT, and Mickey Clarke, CNMT

Educational Objective
At the completion of this track, the attendee should be able to:

1. Identify and differentiate several abnormal testicular conditions.
2. List the clinical indications necessary to perform a captopril MAG_3 renogram and the criteria for interpreting the results.
3. Discuss gastric emptying meal preparations and indications of abnormal scintigraphic emptying times.
4. Recognize scintigraphic abnormalities in red blood cell studies in gastrointestinal bleeding.
5. Describe new red blood cell labeling techniques and technical considerations regarding gastrointestinal bleeding.
6. Describe techniques utilized to localize tumors and infections in the abdomen and gastrointestinal tract.
7. Discuss morphine utilization and contraindications for hepatobiliary imaging.

Summary: The intent of this continuing education track is to introduce the technologist to enhanced techniques on fundamental scintigraphic imaging. By discussing red blood cell labeling, the participant will learn techniques in RBC labeling that aid in gastrointestinal bleeding localization. Testicular imaging will be reviewed describing patient position, imaging techniques, and interpretation. Other gastrointestinal studies in this session will address gastric emptying evaluations and morphine effects on hepatobiliary imaging. Current trends for tumor imaging and radionuclide detection of occult infections will be included in this course. An overview of captopril MAG_3 renogram imaging will conclude this track.

8:30–9:20	**Scrotal Imaging.** Conrad E. Nagle, MD, William Beaumont Hospital, Troy, MI.
9:30–10:20	**Clinical Indications for MAG_3, Captopril, et al. in Renal Imaging.** Eva Dubovsky, MD, University of Alabama, Birmingham, AL.
10:30–11:20	**Meal Preparation and Interpretation of Gastric Emptying Studies.** Alan H. Maurer, MD, Temple University Hospital, Philadelphia, PA.
11:30–12:20	**GI Bleed: Noninvasive Localization Imaging.** David H. Lewis, MD, University of Washington, Seattle, WA.
1:30–2:20	**RBC Labeling Techniques for Abdominal Imaging.** Ronald J. Callahan, PhD, Massachusetts General Hospital, Boston, MA.
2:30–3:20	**Colorectal Tumor Imaging with Monoclonal Antibodies.** B. David Collier, MD, Medical College of Wisconsin, Milwaukee, WI.
3:30–4:20	**Nuclear Medicine Techniques in Occult Infection Detection.** Gary L. Dillehay, MD, Loyola University Medical Center, Maywood IL.
4:30–5:20	**Morphine Augmented Hepatobiliary Imaging.** Darlene Fink-Bennett, MD, William Beaumont Hospital, Royal Oak, MI.

PRACTICING PET

Time: 10:30–5:00 **VOICE: 0.60** **CME: 5.00**
Room: 206F

Moderators: Jennifer Keppler, CNMT and Anita Palant, CNMT

Educational Objective
After completing this session, the participant will be able to:
1. Identify specific actions that can be taken to improve the financial productivity of a PET program in the areas of (a) increased referrals and (b) maximized revenues and funding.
2. List the key mechanisms that can be implemented in a PET program to facilitate operational efficiency.
3. Recognize common technical problems encountered in PET technology and list trouble shooting or quality assurance activities that can be implemented to enable resolution.
4. Discuss the principles and applications of quantitative measurements in clinical and research PET studies.

Summary: This tract will provide insight into various operational, financial, and technical issues faced by technologists and chief technologists in the operation of a PET program. Practical knowledge and solutions will be featured in this session to assist new or soon-to-be practicing PET technologists in enhancing the scientific and financial success of their own PET centers.

11:00–12:00	**Making $ense out of PET.** David G. Jensen, MSc, Crump Institute, UCLA School of Medicine, Los Angeles, CA.
1:30–2:20	**Enhancing the Operating Efficiency of Your PET Facility.** G. Todd Collins, CNMT, Methodist Medical Center, Peoria, IL.
2:20–3:00	**Quality Assurance in PET Imaging.** James R. Bading, PhD, University of Southern California, Los Angeles, CA.
3:30–4:20	**Quantification and Kinetic Modeling in PET.** Robert Koeppe, PhD, University of Michigan, Ann Arbor, MI.
4:20–5:00	**Panel Discussion.**

THE "HOW TO"S OF REIMBURSEMENT: MEDICARE PART A AND PART B

Time: 8:30–5:00 **VOICE: 0.78** **CME: 6.50**
Room: 205D

Moderators: Lynne Fulk, CNMT and Becky M. Cacciatore, CNMT

Educational Objective
At the completion of this course, participants should be able to:
1. Recall terms for CPT4/ICO9-M/A/CPCS Coding.
2. Interpret a sample communication from third party payers.
3. Differentiate between Part A and Part B of Medicare.
4. Comprehend a billing cycle and A/R days.
5. Using Medicare as an example, explain the steps involved in the reimbursement process.
6. Apply coding to procedures performed.

Summary: The participants in this workshop will be taken through a billing cycle to learn how a billing cycle functions and where the pitfalls are. Terms will be presented so that course participants will understand the process involved. Examples used in this workshop will be CPT coding and ICD9M coding; HCPCS coding will also be reviewed.

8:00–9:30	**Overview of Medicare Parts A and B Coding: Fraud and Abuse.** Becky M. Cacciatore, CNMT, Tampa, FL.
9:45–12:00	**Medicare Part A: Hands-On Workshop.** Cynthia Wharton, CNMT, Spartanburg Regional Medical Center, Spartanburg, SC.
1:00–2:30	**Medicare Part B: Hands-On Workshop.** Becky M. Cacciatore, CNMT, Tampa, FL.
2:45–3:30	**Collections Made Easy.** James Greco, BS, MBR & Associates, Inc., Tampa, FL.
3:30–4:15	**Reimbursement as It Relates to Commercial Enterprise.** Carol Bonanno, BS, CNMT, Immuno-Medic Inc., St. Petersburg, FL.
4:15–5:00	**Panel Discussion.**

ALTERATIONS IN THE BIODISTRIBUTION OF RADIOPHARMACEUTICALS: DRUG INTERACTIONS AND KIT PREPARATION

Time: 8:30–12:00 **VOICE: 0.42** **CME: 3.50**
Room: 205B

Moderator: Karen Ramberg, RPh, MS

Educational Objective

After attending this session, the participant should be able to:

1. Explain how drugs interact with radiopharmaceuticals.
2. Identify the most significant interactions and be able to review medication histories, to either prevent the interactions or recognize that a drug interaction has occurred.
3. Define how the biodistribution of radiopharmaceuticals can be changed by altering the preparation.

Summary: The initial presentation will review the basic physiology of drugs that affect the cardiovascular system and interfere with myocardial perfusion imaging or pharmacologic stress. The process by which red blood cells are labeled and how drugs interfere with this procedure will also be reviewed. The second presentation will review drug interactions that alter the distribution of noncardiac radiopharmaceuticals. Emphasis will be placed on interactions which are common or highly significant. The third presentation will review how changes in radiopharmaceutical kit preparation can alter the distribution of the agent. The preparation variables for the newest radiopharmaceuticals will be stressed.

8:30–9:30 **Drug Interactions in Nuclear Cardiology.** Ronald J. Callahan, RPh, PhD, Massachusetts General Hospital, Boston, MA.

9:30–11:00 **Alterations in the Biodistribution of Radiopharmaceuticals from Drug Interactions.** Stanley Shaw, RPh, PhD, College of Pharmacy, Purdue University, West Lafayette, IN.

11:00–12:00 **Radiopharmaceutical Preparation Factors That Alter Biodistribution.** James Ponto, RPh, MS, University of Iowa Hospitals and Clinics, Iowa City, IA.

CURRENT TOPICS IN PEDIATRIC NUCLEAR MEDICINE

Time: 1:30–5:00 **VOICE: 0.40** **CME: 3.25** **Room: 205B**

Moderators: Sue Weiss, CNMT and Charles A. Nortmann, CNMT

Educational Objective

After attending this course, the participant should be able to:

1. Identify the appropriate preparation, sedation, and recovery procedure for pediatric patients.
2. Recognize the indications and choose appropriate imaging parameters for bone and brain SPECT imaging in pediatrics.
3. Utilize the appropriate imaging parameters for thallium tumor imaging in the pediatric patient.
4. Select the appropriate protocols for imaging spina bifida patients.
5. Recognize the indications and choose the appropriate imaging parameters for the evaluation of urinary tract infection.

Summary: This session is designed to enhance pediatric nuclear medicine technology skills, specifically by presentation of state-of-the-art current topics related to imaging of the child. Technical parameters as well as clinical indications for each study will be presented. A discussion of the pitfalls unique to performing these procedures for the pediatric patient will be included in each presentation.

1:30–1:50 **American Academy of Pediatrics Guidelines for Sedation and Monitoring of Pediatric Patients.** Sue Weiss, CNMT, Children's Memorial Hospital, Chicago, IL.

1:50–2:20 **Pediatric Brain Spect Imaging.** Royal Davis, CNMT, and S. Ted Treves, MD, Children's Hospital Medical Center, Boston, MA.

2:20–3:05 **Bone Spect Imaging for Back Pain.** Terri Oudinot, CNMT, and David C. Gregg, MD, Children's Hospital of Wisconsin, Wauwatosa, WI.

3:15–3:45 **Thallium Tumor Imaging.** Kim Maas, CNMT, and Gerald Mandell, MD, E. I. Du Pont, Institute, Wilmington, DE.

3:45–4:15 **Imaging the Pediatric Spina Bifida Patient.** Barbara Reid, MD, and Charles A. Nortmann, CNMT, Primary Children's Medical Center, Salt Lake City, UT.

4:15–5:00 **Nuclear Investigation of Urinary Tract Infection in Children.** Maria Green, CNMT, and David Gilday, MD, Hospital for Sick Children, Toronto, Ontario, Canada.

Author Index: Scientific Papers, Posters, and Exhibits