SWC SNMMI
CURRENT STATE &
LOOK AT THE FUTURE

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PET Imaging Center
BRF

Assoc. Prof. of Clin. Radiology
Assoc. Director of Research
Dept. of Radiology, LSU Medical School

Shreveport, LA

President, Southwest Chapter SNMMI
Vice-President, CIC, SNMMI

ATAKALKA@BIOMED.ORG
OBJECTIVES

- Review the current State of the Union of the SWC SNMMI
- View to the future of Nuclear Medicine training & practice and its impact on the SWC SNMMI in relation to the advancements in technology and radiopharmaceuticals
About 1100 active members

About 600 belong to Technologist Section.

The Chapter hosts a number of grassroots activities throughout the year, including:

- Continuing education and research activities, including an Annual Meeting
- A professional networking forum for members
- A mechanism for encouraging and enhancing professional leadership
- Monitoring and addressing of nuclear medicine professional issues at the local level
## CURRENT SWC LEADERSHIP

### Southwestern Chapter Leadership

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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</thead>
<tbody>
<tr>
<td>Amol Takalkar, MD</td>
<td>Chapter President</td>
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<tr>
<td>Joanna Fair, MD, PhD</td>
<td>Chapter President-Elect</td>
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<td>Juliet Wendt, MD</td>
<td>Chapter Secretary</td>
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<td>Jeffrey P. Norenberg, PharmD, PhD</td>
<td>Chapter Treasurer</td>
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### Southwestern Chapter Technologist Leadership

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<tr>
<td>Pam Alderman, BSRS, CNMT</td>
<td>National Council Delegate of Technologist Section</td>
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<tr>
<td>Charles Metzger</td>
<td>Chapter Administrator</td>
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Amol M. Takalkar, M.D.
AS OF LAST EVENING!

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<tr>
<td>Amol Takalkar, MD</td>
<td>Chapter Immediate Past President</td>
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<td>Michel-Alexis &quot;Mitch&quot; Courtines, MD</td>
<td>Chapter Treasurer</td>
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<td>TBA</td>
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| Charles Metzger                                       | Chapter Administrator                                  |
CURRENT SWC BOARD OF TRUSTEES

Existing BOT

- Vijay K. Aggarwal, MD
- Lisa Blacklock, MD
- Michael Clemenshaw, MD
- Lorraine De Blanche, MD
- Elizabeth Gallegos, MD
- Nina Gazmen, MD
- M. Leann Smith, MD

Newly Elected Mar 2014

- Penny Vroman, MD
- Mark Strober, MD
- Jan Ryszkowski, MD
- Anshul Agarwal, MD, PhD
- Peeyush Bhargava, MD

Technologist Section Officers on BOT

- David Campbell, CNMT
- Deborah Havens, CNMT
- Tammy Pritchett, CNMT
- Dean Rice, CNMT

5 Past Immediate Presidents

- Twyla Bartel, DO
- Michael Brophey, MD
- Jay Hiller, MD
- Brian Poteet, DVM
- Amol Takalkar, MD

Historian: Michael Brophey, MD
Physicians
ABNM certified only
ABR certified only
ABR + ABNM dual boarded
Others: Nuclear cardiologists

Technologists
CNMTs
Fusion Technologists
Other

Other
Radiopharmacists
Radiochemists
Medical Physicists
Scientists
Vendors, Suppliers
Consultants

Sites
NM Clinics/Departments/Facilities
Radiopharmacies
Cyclotrons & Radiopharmaceutical production facilities
Labs: Basic Science/Translational
Vendors

In Training Members: The future of our field

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NM Teaching programs in SWC

# of Residency/Fellowship Training Programs: 4 (ACGME)

- Little Rock, AR: Univ. of Arkansas for Medical Sciences
- Oklahoma City, OK: Univ. of Oklahoma Health Sciences Ctr
- Dallas, TX: UT Southwestern Medical School
- San Antonio, TX: San Antonio Uniformed Services Health Education Consortium (SAUSHEC) Program

None in NM & LA!!!

From [http://www.acgme.org](http://www.acgme.org) accessed on Feb 07, 2014
NM Teaching programs in SWC

# of Technologist Training Programs: 9 (JRCNMT)

- Little Rock, AR:
  - Univ. of Arkansas for Medical Sciences
  - Baptists Health Schools Little Rock
- New Orleans, LA: Delgado Community College
- Oklahoma City, OK: Univ. of Oklahoma Health Sciences Ctr

From http://www.jrcnmt.org accessed on Feb 07, 2014
NM Teaching programs in SWC

TEXAS =>

• Amarillo: Amarillo College
• Corpus Christi: Del Mar College
• Galveston: Galveston College
• Houston: Houston Community College
• San Antonio: Univ. of the Incarnate World
19 cyclotrons

10 in TX: Houston (4), Dallas (3), Brownsville (1), Lubbock (1), San Antonio (1)

3 in LA: Baton Rouge, Covington, Shreveport

2 in AR: Little Rock (2)

2 in OK: Oklahoma City (1), Tulsa (1)

2 in NM: Albuquerque (2)
70 Nuclear Pharmacies:

- 38 in TX
- 18 in LA
- 6 in OK
- 5 in AR
- 3 in NM

From http://nuclear.pharmacy.perdue.edu accessed on Feb 07, 2014
Southwestern Chapter

Total members: 1101

As of 2.12.14

Residents: 678
Students: 205
Affiliate: 15
Associate: 3
Emeritus: 103
Full: 25
Workplace Environment

- Nuclear Medicine: 389 members
- Combined Nuclear Medicine/Radiology: 149 members
- Radiology: 58 members
- Physics: 19 members
- Education in Classroom Setting: 17 members
- Pharmacy: 13 members
- Pediatrics: 7 members
- Internal Medicine: 7 members
- Clinical Research: 4 members
- Neurology: 1 member
- Geriatrics: 1 member
- Family Practice: 1 member
- Emergency Medicine: 1 member
- Other: 108 members
- Unknown: 326 members

From SNMMI
NUCLEAR MEDICINE

DIAGNOSTIC NUCLEAR MEDICINE

General Nuclear Medicine

Bone Scans, V/Q Scans, Renal Scans, GI Bleed Scans, Thyroid Scans, Octreoscan, Brain Death Scan, Brain SPECT, CSF Leak Scan, Shunt Studies, Lymphoscintigraphy, Sentinel Node Studies, Prostascint, Salivary Gland Scan, VCUG, Milk Scan, Salivagram, & many other

Nuclear Cardiology

• Oncology
• Neurology
• Cardiology

P.E.T.

• Perfusion SPECT
• MUGA
• Viability

THERAPEUTIC NUCLEAR MEDICINE

• I-131 Rx for Hyperthyroidism & Thyroid Ca
• Strontium & Samarium Rx for bone metastases
• Bexxar & Zevalin for Non-Hodgkin’s Lymphoma
• Xofigo for CRPC with bone metastases

RESEARCH

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GENERAL DIAGNOSTIC NUCLEAR MEDICINE

Rectilinear Scanning => Planar (2D) Scintigraphy => SPECT (3D)

PET Images: 3-D tomographic images that use positron emitting radioisotopes (instead of photon emitting radioisotopes)

**Hybrid Imaging**: SPECT/CT, PET/CT and PET/MRI where a nuclear medicine technique is combined with a conventional radiology imaging tool to produce fused imaging that can show anatomy as well as function/metabolism!

Game changer => At forefront of development of **Molecular Imaging**.
NUCLEAR MEDICINE
1940s – 1950s

I-131: 1st radioisotope to be used in medicine (1946) – for therapy of Thyroid Ca

1952: Dr. Benedict Cassen introduced 1st rectilinear scanner

http://media.cns-snc.ca/history/fifty_years/fedoruk.html
IMAGE OF THE YEAR
FDG: MOLECULE OF THE (20TH) CENTURY!!!
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CLINICAL PET APPLICATIONS

**ONCOLOGY**
- FDG (most common)
  - For initial & subsq Rx strategy of most malignancies (except prostate cancer)
- F-18 NaF bone PET/CT
- C-11 Choline (Prostate Ca)

**CARDIOLOGY**
- Cardiac Stress Perfusion PET: Rb-82 Cl, N-13 NH₃
- Myocardial Viability: FDG Met + SPECT/PET Rest Perfusion
- Perfusion + CCTA (PET w/ 64 slice CT)

**NEUROLOGY**
- Dementia (FDG, Amyvid, Flutemetamol)
- FDG: Seizure Localization, Brain Tumors (esp. post XRT), HIV pts: differentiate Toxo vs CNS Lymphoma

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Lymphoma

Initial Staging Scan  After 2 courses of ABVD  Rx changed
D’se Progression  After 2 courses of MOPP

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PET: Future Applications

- Inflammation Imaging: FUO, Prosthesis Infection, Diabetic Foot, Fibrosing Mediastinitis, Sarcoidosis, TB, etc.
- F-DOPA scans: Brain scans for Neuro-muscular disorders, Body scans for congenital hyperinsulinism, neuro-endocrine tumors
- FLT/F-Choline scans for assessing treatment response
- C-11 acetate scans for other neoplasms (prostate cancer, etc)
- Receptor Imaging Studies
- Gene Therapy Assessment (non-invasive)
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18F-AV133
Parkinson’s Disease

BRF PET Img Ctr @ Shreveport
Focal CHI on F-DOPA PET

Neonate with CHI FDOPA Pet showed focal lesion in pancreatic head.

Pt. stable post surgery.

Congenital Hyperinsulinism Center @ Cook Children’s in Ft. Worth

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68Ga-DOTA-NOC PET/CT in a patient with multiple NETs of the ileum and colon showing the multiple primary tumors and peritoneal carcinomatosis.

New Orleans: Ochsner

Houston: Excel Diagnostics & M D Anderson Cancer Center
Orphan Drug Status by FDA

- Nov 2013: Ga-68 DOTATOC (SNMMI CTN)
- Jan 2014: Ga-68 DOTATATE (GalioMedix™, Excel Diagnostics, Houston, TX)
- Mar 2014: Ga-68 DOTATATE (Advanced Accelerator Applications; also by EMA)
PRACTICE GUIDELINES FOR FOLLICULAR LYMPHOMA

Initial Therapy

Stage I, II
• RT ± Chemo
• Ext field RT or
• Observe

Additional Therapy

Without transformation
• Clinical trial or
• Chemotherapy or
• Antibody-based therapy (including RIT) or
• RT

Transformed to DLBCL
• Chemotherapy† ± RT
• Stem cell transplant‡
• Clinical trial or
• RIT or
• Palliative or BSC

Stage II*
• Clinical trial or
• RT (palliation) or
• Chemotherapy or
• Rituximab ± chemotherapy

Stage III, IV


* Bulky, abdominal disease; † if minimal or no prior therapy; ‡ if responsive disease

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PROSTATE CA: TREATMENT OPTIONS

Hormone Sensitive

Asymptomatic mCRPC (failed ADT)

Mildly Symptomatic mCRPC

Symptomatic mCRPC Pre-Chemo

Chemo

mCRPC Post-Chemo

Hormone therapy

Radium 223†

Abiraterone

Sipuleucel-T

Docetaxel

Radium 223†

Abiraterone

Enzalutamide

Cabazitaxel

Supportive Care (denosumab/bisphosphonates/β-emitters/EBRT)

*Treatment paradigm based on FDA approved indication of each agent; †For patients with symptomatic bone metastases; Solid bars=approved with OS benefit. Striped bar=no OS benefit. Distance is not proportional to time.


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NEUROBLASTOMA

After Rx with $^{131}$I-MIBG X 3 three (cumulative dose: 400 mCi) & hyperbaric oxygen: a significant reduction in tumor sites.

Scan at initial $^{131}$I-MIBG treatment showing extensive bone metastases of neuroblastoma.

New Orleans: Ochsner
Lu-177: The other new kid on the block

Tumour responses in patients with NETs treated with different radiolabelled somatostatin analogues

<table>
<thead>
<tr>
<th>Reference</th>
<th>Ligand</th>
<th>Number of patients</th>
<th>Tumour response</th>
</tr>
</thead>
<tbody>
<tr>
<td>[31]</td>
<td>$^{90}$Y-DOTATOC</td>
<td>21</td>
<td>○ 6 (29%) NA 11 (52%) 4 (19%)</td>
</tr>
<tr>
<td>[37, 38]</td>
<td>$^{90}$Y-DOTATOC</td>
<td>74</td>
<td>3 (4%) 15 (20%) NA 48 (65%) 8 (11%)</td>
</tr>
<tr>
<td>[39]</td>
<td>$^{90}$Y-DOTATOC</td>
<td>33</td>
<td>2 (6%) 9 (27%) NA 19 (57%) 3 (9%)</td>
</tr>
<tr>
<td>[40]</td>
<td>$^{90}$Y-DOTATOC</td>
<td>58</td>
<td>○ 5 (9%) 7 (12%) 33 (61%) 10 (19%)</td>
</tr>
<tr>
<td>[13]</td>
<td>$^{177}$Lu-DOTATATE</td>
<td>310</td>
<td>5 (2%) 86 (28%) 51 (16%) 107 (35%) 61 (20%)</td>
</tr>
<tr>
<td>[20]</td>
<td>$^{177}$Lu-DOTATATE</td>
<td>12</td>
<td>○ 2 (17%) 3 (25%) 5 (42%) 2 (17%)</td>
</tr>
<tr>
<td>[23]</td>
<td>$^{177}$Lu-DOTATATE</td>
<td>51</td>
<td>1 (2%) 14 (27%) 13 (26%) 14 (27%) 9 (18%)</td>
</tr>
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Houston: Excel Diagnostics & MD Anderson Cancer Center

PEM: POSITRON EMISSION MAMMOGRAPHY

Naviscan PEM scanner
Optimized for metabolic visualization of small body parts – breasts, hands, feet
WBC Infection Imaging

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SPECT clearly localizes it as bleeding at the anastomotic site!
Siemens Biograph mMR
Simultaneous PET & MR acquisition
FDA approved in June 2011

Philips Ingenuity TF PET/MRI
Sequential PET & MR acquisition
FDA approved in November 2011

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Simultaneous PET/MRI study in epilepsy patient. From left to right are shown axial FDG PET (60–75 min after injection), high-resolution MRI scan, and fusion image. Distinct hypometabolism is visible in polar region of left temporal lobe, typically corresponding to epileptogenic focus. Data were acquired on Biograph mMR scanner at Nuklearmedizinische Klinik und Poliklinik der Technischen Universität München.
NUCLEAR MEDICINE

UNCLEAR MEDICINE

NEW & CLEAR MEDICINE

MOLECULAR IMAGING

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MOLECULAR IMAGING (MI)

- Molecular imaging is the visualization, characterization, and measurement of biological processes at the molecular and cellular levels in humans and other living systems.

- Typically includes 2- or 3-dimensional imaging as well as quantification over time.

- Techniques used include radiotracer imaging/nuclear medicine, MR imaging, MR spectroscopy, optical imaging (bioluminescence and fluorescence), ultrasound, and others.
Molecular Imaging & Therapy (MIT)

- Not just imaging & probes/biomarkers.

- Actively involved in treatment decisions by providing high quality consults with the newer tools (technology & radiopharmaceuticals) as well as providing unique targeted therapies.

- Create a niche such that others will seek you out.

- Partner with industry, government organizations, other professional societies, colleagues in other medical specialties, hospital administration.

The future of Nuclear Medicine as a field is great, including in the Southwest Chapter. The professionals involved in this field need to transition appropriately to take advantage of the newer developments and position themselves as champions of Molecular Imaging & Therapy in the 21st century!!!

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Acknowledgements

Anil Ramachandran, MD
Chief of Nuclear Medicine @ OBVAMC

Charles Metzger @ SWC SNMMI

Joanna Spahr @ SNMMI

Google & the WWW!!! 😊

THANK YOU!