

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Helen Ruth Nadel

eRA COMMONS USER NAME (credential, e.g., agency login):NADEL.HELEN

POSITION TITLE: Director of Pediatric Nuclear Medicine

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Manitoba, Winnipeg, Manitoba, Canada	Medical School	05/1977	Medicine
Rotating Internship, Toronto General Hospital, University of Toronto, Toronto, Ontario, Canada	Intern	06/1978	
Residency in Diagnostic Radiology, University of Toronto, Toronto, Ontario, Canada	Resident	06/1982	Radiology
Pediatric Radiology Fellowship, Hospital for Sick Children, University of Toronto, Toronto, Ontario	Fellow	06/1983	Pediatric Radiology
Residency in Nuclear Medicine, University of British Columbia, Vancouver, British Columbia, Canada	Resident	12/1989	Nuclear Medicine

NOTE: The Biographical Sketch may not exceed five pages. Follow the formats and instructions below.

A. Personal Statement

Dr. Nadel is a dual board certified Pediatric Radiologist and Nuclear Medicine Physician in both USA and Canada. I hold certification of the Royal College of Physicians and Surgeons of Canada in Diagnostic Radiology and Nuclear Medicine, The American Board of Radiology (ABR) with certificate of added qualification in Pediatric Radiology and the American Board of Nuclear Medicine. (ABNM). Dr. Nadel has been practicing as a pediatric radiologist and pediatric nuclear medicine physician and has been performing the entire breadth of nuclear medicine studies in children in a fully integrated department of Pediatric Radiology for her entire career.

Dr. Nadel has been involved with Children's Oncology Group (COG) since 1991 and has been the recipient of sub-award grants for contributions to research of children with Cancer, particularly in children with bone tumors. She is a past Vice-Chair of the Diagnostic Imaging Committee for COG.

Dr. Nadel has been the PI of a research consultancy with IAEA on Pediatric Lymphoma. She has also been the chair of a project to create a Pediatric Nuclear Medicine practical text for IAEA that will be published shortly. She has held administrative positions as Committee Chairs for British Columbia Children's Hospital, and for National and International Radiology and Nuclear Medicine organizations. She has contributed to the development of Appropriate Use Criteria for indications for imaging children in pediatric radiology and nuclear medicine, and including PET/CT and PET/MR under the auspices of ACR, SNMMI, SPR, and CANM. She has global outreach involvement with the International Atomic Energy Agency (IAEA) and has been a consultant for teaching pediatric nuclear medicine in a global outreach program in Asia-Oceania. Dr. Nadel is the current President-Elect of the Society of Nuclear Medicine and Molecular Imaging.

Dr. Nadel has been involved in multiple equipment requests for proposal for all equipment in nuclear medicine, for multi-detector CT in pediatric radiology and design and set-up of a radionuclide therapy room. She has

been involved in the set-up and running of a therapy program for treatment of benign and malignant thyroid disease in children mIBG for treatment of neuroblastoma. Dr. Nadel participated in the Second International Workshop on PET/MR Imaging held in Tübingen, Germany in 2013 and with publication of a white paper in 2014. Dr. Nadel currently uses PET/MR exclusively for PET imaging at Lucile Packard Children's Hospital at Stanford University.

B. Positions and Honors

Positions and Employment

1983-1986	Clinical Instructor, Department of Radiology, Faculty of Medicine, University of British Columbia, Vancouver, British Columbia
1986-1990	Clinical Assistant Professor, Department of Radiology, Faculty of Medicine, University of British Columbia, Vancouver, British Columbia
1990-1998	Assistant Professor, Department of Radiology, Faculty of Medicine, University of British Columbia, Vancouver, British Columbia
1983-2018	Head, Division of Nuclear Medicine, Department of Radiology, Faculty of Medicine, University of British Columbia, Vancouver, British Columbia
1998-2018	Associate Professor, Department of Radiology, Faculty of Medicine, University of British Columbia, Vancouver, British Columbia
2018-	Clinical Professor of Radiology, Stanford University School of Medicine, Stanford, California
2018-	Director of Pediatric Nuclear Medicine, Lucile Packard Children's Hospital at Stanford, Stanford University School of Medicine, Stanford, California

Other Experience and Professional Memberships

1988-	Conference organizer and moderator for sessions for Society of Nuclear Medicine and Molecular Imaging mid-winter and annual meetings
1988-	Multiple positions held for chapters, councils and centers and committees for Society of Nuclear Medicine and Molecular Imaging
2011-2017	Director Member, American Board of Nuclear Medicine
2012-2017	Vice Chair, Educational Exhibits for Society of Nuclear Medicine and Molecular Imaging
2012-	Consultant and Expert Teaching Consultant for the International Atomic Energy Agency for various multi-center projects
2013-2016	Member, Board of Directors of the Society of Nuclear Medicine and Molecular Imaging
2015-	Chair, Nuclear Medicine Committee Society for Pediatric Radiology
2015-	Member, Radiographics Nuclear Medicine and Molecular Imaging Panel for RSNA
2017-	Member, Nuclear Medicine Committee, RSNA
1978-	Member, Radiological Society of North America
1978-	Member, Canadian Association of Radiologists
1982-	Member, College of Physicians and Surgeons of Ontario
1983-	Member, College of Physician and Surgeons of British Columbia
1983-	Member, Canadian Medical Protective Association
1983-	Member, Doctors of British Columbia
1983-	Member, Society for Pediatric Radiology
1983-	Member, Society of Nuclear Medicine and Molecular Imaging
1982-	Member, Royal College of Physicians & Surgeons of Canada
1987-	Member, Pacific Coast Pediatric Radiology Association
1988-	Conference organizer and moderator for sessions for Society of Nuclear Medicine and Molecular Imaging mid-winter and annual meetings
1988-	Multiple Officer Positions held for chapters, councils and centers and committees for Society of Nuclear Medicine and Molecular Imaging
1990-	Member, Canadian Association of Nuclear Medicine
1990-	Member, American Roentgen Ray Society
1995-	Member, European Association of Nuclear Medicine
1995-1998	Member, Editorial Board, European Journal of Nuclear Medicine and Molecular Imaging
1997-	Member, International Society for Clinical Densitometry
2011-2017	Director Member, American Board of Nuclear Medicine

2012-2017 Vice Chair, Educational Exhibits for Society of Nuclear Medicine and Molecular Imaging
 2012- Consultant and Expert Teaching Consultant for the International Atomic Energy Agency for various multi-center projects
 2013- Member, American College of Radiology
 2013- Member, Society for Radiologists in Ultrasound
 2013-2016 Member, Board of Directors of the Society of Nuclear Medicine and Molecular Imaging
 2015- Chair, Nuclear Medicine Committee Society for Pediatric Radiology
 2015- Member, Radiographics Nuclear Medicine and Molecular Imaging Panel for RSNA
 2015- Member, American Society of Nuclear Cardiology
 2016- Member, American College of Nuclear Medicine
 2017- Member, International Society for Magnetic Resonance in Medicine
 2017- Member, Editorial Board, Journal of Nuclear Medicine
 2017- Member, Nuclear Medicine Committee RSNA
 2021 Vice President-Elect, Society of Nuclear Medicine and Molecular Imaging (SNMMI)
 2022 President-Elect, SNMMI

Honors

1986 "Most Significant" 14 articles on chest diseases published 1985: (Radiographics 5: p813, 1985)
 1993-1994 Teaching Excellence Award, University of British Columbia Nuclear Medicine Residency Training Program
 1997 Jewish Women of Valour Award
 1999-2000 Co-Recipient, Radiology Residency Award for Excellence in Teaching, British Columbia Children's Hospital
 2001 Co-Recipient, Excellence in Teaching Award, British Columbia Children's Hospital
 2008 Best poster at the 6th European Association of Pediatric Nuclear Medicine, Platja d'Aro, Spain
 2014 Mickey (Cardiff) Williams Distinguished Service Award Western Regional Society of Nuclear Medicine and Molecular Imaging
 2016 First Place Educational Exhibit: Authors: N Shatani, H Bray, H Nadel, J Potts, Canadian Association of Radiologists
 2016 Fifth Annual Dr. Massoud Majd Lectureship, Department of Radiology, Children's National Health System, Washington, DC
 2019 First place poster- General Clinical Specialties, Society of Nuclear Medicine and Molecular Imaging
 2019 Lifetime Achievement Award for contributions to EOSPNM for 20 years, European Society of Pediatric Nuclear Medicine (EOSPNM)
 2020 Honorable Mention Top Ten Poster Award Finalist-Authors Young, Khalsa, Balboni, Nadel, Society of Nuclear Medicine and Molecular Imaging
 2021 2021 Conway-Treves Senior Investigator Award, Pediatric Imaging Council, Society of Nuclear Medicine and Molecular Imaging
 2021 Fellow (FSNMMI), Society of Nuclear Medicine and Molecular Imaging
 2022 Fellow (FACNM), American College of Nuclear Medicine

C. Contribution to Science

I. Pediatric Nuclear Medicine

Dr. Nadel as a dual-certified diagnostic pediatric radiologist and pediatric nuclear medicine physician is among a small group of physicians that have these multiple subspecialty qualifications. Dr. Nadel has 64 journal publications, is the author or co-author of 22 chapters, and is the editor of a book currently in press through the Human Health Campus of the International Atomic Energy Agency. Dr. Nadel is an internationally recognized expert in her field and has given over 150 national and international presentations and has been an invited

visiting professor on 26 occasions on six continents. She has been involved as a pediatric nuclear medicine representative on guideline and appropriate use committees for national and international organizations.

Dr. Nadel completed a 7 year term in 2017, as the sole Canadian and pediatric director among 12 directors on the American Board of Nuclear Medicine (member board of ABMS).

1. Khalaf A, Dahmouh H, Nadel HR. Simultaneously Acquired MRI Arterial Spin Labeling and Interictal FDG PET Improves Diagnosis of Pediatric Temporal Lobe Epilepsy, *AJNR Am J Neuroradiol.* 2022 Mar;43(3):468-473. doi: 10.3174/ajnr.A7421. Epub 2022 Feb 24. PMID: 35210273

2. Wise-Faberowski L, Irvin M, Lennig M, Long J, **Nadel HR**, Bauser-Heaton H, Asija R, Hanley FL, McElhinney DB. Assessment of the Reconstructed Pulmonary Circulation With Lung Perfusion Scintigraphy After Unifocalization and Repair of Tetralogy of Fallot With Major Aortopulmonary Collaterals. *World J Pediatr Congenit Heart Surg.* 2019 May;10(3):313-320. doi: 10.1177/2150135119836735. PubMed PMID: 31084304.

3. Jadvar H, Colletti PM, Delgado-Bolton R, Esposito G, Krause BJ, Iagaru AH, Nadel H, Quinn DI, Rohren E, Subramaniam RM, Zukotynski K, Kauffman J, Ahuja S, Griffeth L. Appropriate Use Criteria for ¹⁸F-FDG PET/CT in Restaging and Treatment Response Assessment of Malignant Disease. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine.* 2017; 58(12):2026-2037.

4. Bar-Sever Z, Biassoni L, Shulkin B, Kong G, Hofman MS, Lopci E, Manea I, Kozirowski J, Castellani R, Boubaker A, Lambert B, Pfluger T, Nadel H, Sharp S, Giammarile F. Guidelines on nuclear medicine imaging in neuroblastoma. *Eur J Nucl Med Mol Imaging.* 2018 Oct;45(11):2009-2024.

5. Moghbel MC, Mitra E, Gallamini A, Niederkohr R, Chen DL, Zukotynski K, Nadel H, Kostakoglu L. Response Assessment Criteria and Their Applications in Lymphoma: Part 2. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine.* 2017; 58(1):13-22. PubMed [journal] PMID: 27879369
Moghbel MC, Kostakoglu L, Zukotynski K, Chen DL, Nadel H, Niederkohr R, Mitra E. Response Assessment Criteria and Their Applications in Lymphoma: Part 1. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine.* 2016; 57(6):928-35.

6. Meyer JS, Nadel HR, Marina N, Womer RB, Brown KL, Eary JF, Gorlick R, Grier HE, Randall RL, Lawlor ER, Lessnick SL, Schomberg PJ, Kailo MD. Imaging guidelines for children with Ewing sarcoma and osteosarcoma: a report from the Children's Oncology Group Bone Tumor Committee. *Pediatric blood & cancer.* 2008; 51(2):163-70.

II. Optimized Hybrid Imaging

Within the last 10 years with the advent of PET/CT and SPECT/CT, Dr Nadel has championed the use performing hybrid studies with both PET/CT and SPECT/CT routinely utilizing optimized CT acquisitions with the use of intravenous contrast to provide optimized diagnostic studies. These studies then do not require additional stand-alone CT imaging for either PET attenuation correction, or additional CT diagnostic evaluation for use with SPECT/CT particularly for mIBG imaging. In addition, she has pioneered the use of low dose CT techniques for both these modalities.

1. Bailey DL, Barthel H, Beuthin-Baumann B, Beyer T, Bisdas S, Boellaard R,

Czernin J, Drzezga A, Ernemann U, Franzius C, Gückel B, Handgretinger R, Hartenbach M, Hellwig D, Nadel H, Nekolla SG, Pfluger T, Pichler BJ, Quick HH, Sabri O, Sattler B, Schäfer J, Schick F, Siegel BA, Schlemmer HP, Schwenger NF, van den Hoff J, Veit-Haibach P, Wehrl HF. Combined PET/MR: Where are we now? Summary report of the second international workshop on PET/MR imaging April 8-12, 2013, Tubingen, Germany. *Mol Imaging Biol.* 2014 Jun;16(3):295-310. doi: 10.1007/s11307-014-0725-4. Review.

2. Nadel HR. SPECT/CT in pediatric patient management. *European journal of nuclear medicine and molecular imaging.* 2014; 41 Suppl 1:S104-14.

3. Nadel HR, Shulkin B. Pediatric positron emission tomography-computed tomography protocol considerations. *Seminars in ultrasound, CT, and MR.* 2008; 29(4):271-6.

4. Murphy JJ, Tawfeeq M, Chang B, Nadel H. Early experience with PET/CT scan in the evaluation of pediatric abdominal neoplasms. *J Pediatr Surg.* 2008 Dec;43(12):2186-92.

III. Oncologic Pediatric Nuclear Medicine

Dr. Nadel is currently the PI of a research consultancy with IAEA (International Atomic Energy Agency) as a multicenter prospective study in pediatric patients with lymphoma, HL and NHL, to validate the use of interim treatment PET/CT to predict response. This project has two presentations accepted for oral presentation at European Association of Nuclear Medicine Congress in Dusseldorf, Germany in October 2018. One of the presentations from the study has been accepted for inclusion in the highlights lecture for this congress. Two manuscripts are being submitted for publication from this project (Sept 2018).

1. Oh J, Gutkin P, Wang YP, Sandhu N, Majzner RG, Nadel H, Shimada H, Lansinger O, von Eyben R, Donaldson S, Bruzoni M, Sodji QH, Hiniker SM. Time to resolution of iodine-123 metaiodobenzylguanidine (¹²³I-MIBG) avidity and local control outcomes for high-risk neuroblastoma following radiation therapy. *J Med Imaging Radiat Oncol.* 2022 Oct 27. doi: 10.1111/1754-9485.13487. Epub ahead of print. PMID: 36300562.

2. Cederberg KB, Iyer RS, Chaturvedi A, McCarville MB, McDaniel JD, Sandberg JK, Shammass A, Sharp SE, Nadel HR. Imaging of pediatric bone tumors: A COG Diagnostic Imaging Committee/SPR Oncology Committee White Paper. *Pediatr Blood Cancer.* 2022 Oct 17:e30000. doi: 10.1002/pbc.30000. Epub ahead of print. PMID: 36250990.

3. Mhlanga J, Alazraki A, Cho SY, Lai H, Nadel H, Pandit-Taskar N, Qi J, Rajderkar D, Voss S, Watal P, McCarten K. Imaging recommendations in pediatric lymphoma: A COG Diagnostic Imaging Committee/SPR Oncology Committee White Paper. *Pediatr Blood Cancer.* 2022 Sep 16:e29968. doi: 10.1002/pbc.29968. Epub ahead of print. PMID: 36114654.

4. Etchebehere E, Andrade R, Camacho M, Lima M, Brink A, Cerci JJ, Nadel H, Bal C, Rangarajan V, Pfluger T, Kagna O, Alonso O, Begum FK, Mir KB, Magboo VP, Menezes LJ, Paez D Dr, Pascual T Dr. Validation Of Convolutional Neural Network For Fast Determination Of Whole-Body Metabolic Tumor Burden In Pediatric Lymphoma *J Nucl Med Technol.* 2022 Apr 19:jnmt.121.262900. doi: 10.2967/jnmt.121.262900. Online ahead of print. PMID: 35440476 Apr 19:jnmt.121.262900. doi: 10.2967/jnmt.121.262900. Epub ahead of print. PMID: 35440476

5. Yanik GA, Parisi MT, Naranjo A, Nadel H, Gelfand MJ, Park JR, Ladenstein RL, Poetschger U, Boubaker A, Valteau-Couanet D, Lambert B, Castellani MR, Bar-Sever Z, Oudoux A, Kaminska A, Kreissman SG, Shulkin BL, Matthay KK. Validation of Postinduction Curie Scores in High-Risk Neuroblastoma: A Children's Oncology Group and SIOPEN Group Report on SIOPEN/HR-NBL1. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine.* 2018; 59(3):502-508.

6. Ladenstein R, Lambert B, Pötschger U, Castellani MR, Lewington V, Bar-Sever Z, Oudoux A, Śliwińska A, Taborska K, Biassoni L, Yanik GA, Naranjo A, Parisi MT, Shulkin BL, Nadel H, Gelfand MJ, Matthay KK, Park JR, Kreissman SG, Valteau-Couanet D, Boubaker A. Validation of the mIBG skeletal SIOOPEN scoring method in two independent high-risk neuroblastoma populations: the SIOOPEN/HR-NBL1 and COG-A3973 trials. *European journal of nuclear medicine and molecular imaging*. 2018; 45(2):292-305.

7. Foran AE, Nadel HR, Lee AF, Savage KJ, Deyell RJ. Nivolumab in the Treatment of Refractory Pediatric Hodgkin Lymphoma. *Journal of pediatric hematology/oncology*. 2017; 39(5):e263-e266.

8. Whelan JS, Bielack SS, Marina N, Smeland S, Jovic G, Hook JM, Krailo M, Anninga J, Butterfass-Bahloul T, Böhling T, Calaminus G, Capra M, Deffenbaugh C, Dhooge C, Eriksson M, Flanagan AM, Gelderblom H, Goorin A, Gorlick R, Gosheger G, Grimer RJ, Hall KS, Helmke K, Hogendoorn PC, Jundt G, Kager L, Kuehne T, Lau CC, Letson GD, Meyer J, Meyers PA, Morris C, Mottl H, Nadel H, Nagarajan R, Randall RL, Schomberg P, Schwarz R, Teot LA, Sydes MR, Bernstein M; EURAMOS collaborators. EURAMOS-1, an international randomised study for osteosarcoma: results from pre-randomisation treatment. *Ann Oncol*. 2015 Feb;26(2):407-14. doi: 10.1093/annonc/mdu526. Epub 2014 Nov 24.

Complete List of Published Work in My Bibliography:

: <https://www.ncbi.nlm.nih.gov/myncbi/helen.nadel.1/bibliography/public/>

D. Research Support

2013-2018

Funder: BCCH Telethon

Title: Using Imaging to Reduce Chemotherapy Side-Effects in Children & Adolescents with Cancer

Role: Co-Investigator (PI: R. Deyell)

2013-2018

Funder: Children's Oncology Group (COG)

Title: Travel Grant to provide Central review of 360 paired studies at St . Anna Children's Hospital for SIOOPEN high risk neuroblastoma for CURIE scoring resulting in 2 major publications

Role: Co-Investigator (PI: J. Park)

2015-2018

Funder: Children's Oncology Group (COG)

Title: Subaward for conducting and participating in COG clinical trials

Role: Co-Investigator (PI: C. Strahlendorf)

2016

Funder: Rare Disease Foundation and BC Children's Hospital Foundation)

Title: Role of [18F] FDG PET/CT in the Staging of Pediatric Malignant Germ Cell Tumours

Role: Co-Investigator (PI: K. Darras)