

Ran Klein, PhD

Imaging Physicist

The Ottawa Hospital, Department of Nuclear Medicine
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Department/School: Medicine

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Curriculum Vitae

NAME:

KLEIN, Ran

Imaging Physicist, Department of Nuclear Medicine, The Ottawa Hospital, Ottawa, Ontario

DEGREES: designation, institution, department, year

Ph.D., Electrical Engineering, University of Ottawa, 2010

M.A.Sc., Electrical Engineering, University of Ottawa, 2005

B.A.Sc., Computer Engineering, University of Ottawa, 2003

EMPLOYMENT HISTORY:

2016- University	Adjunct Research Professor, Department of Physics, Carleton
2015-	Assistant Professor, Department of Medicine, Faculty of Medicine, University of Ottawa
2014-	Imaging Physicist, Department of Nuclear Medicine, The Ottawa Hospital <ul style="list-style-type: none">• Clinician Investigator in the Clinical Epidemiology Program (CEP) at the Ottawa Hospital Research Institute (OHRI)
2012-15	Adjunct Professor, Department of Medicine, Faculty of Medicine, University of Ottawa
2011-14	Associate Scientist, Cardiac Imaging, University of Ottawa Heart Institute <ul style="list-style-type: none">- Principle Investigator- Manager, Cardiac Imaging Core Lab- Co-director, Cardiac Imaging Fellows Training
2011-	Adjunct Research Professor, Department of Systems and Computer Engineering, Faculty of Engineering, Carleton University
2012	Consultant - Cardiac PET/CT Scientist & System Development FMI Medical Systems, Inc.
2010-11	Research Associate, Cardiac PET Centre University of Ottawa Heart Institute <ul style="list-style-type: none">- Manager, Cardiac Imaging Core Lab
2002-10	Research Assistant, Cardiac PET Centre University of Ottawa Heart Institute
Sep-Dec 2003	Teaching Assistant

Sep-Dec 2004	University of Ottawa
Jan-May 2002	Programmable Logic Controller Application Developer (Co-op) LEAD Controls, Rosh Ha-ayin, Israel
Sept-Dec 2001	Research Assistant, Cardiac PET Centre University of Ottawa Heart Institute
Apr-Aug 2001	Research Assistant (Co-op), Cardiac PET Centre University of Ottawa Heart Institute
Apr-Aug 2000	Field Engineer ADC Teledata, Herzeliya, Israel
1998-99	Field Engineer ADC Teledata, Herzeliya, Israel
1994-98	Commander and Instructor (First-Sergeant) Israeli Air Force
1995-99	Computer Solutions Development and Support Self Employed
1995	Programmer Yani Electrical Engineering, Israel
1994	Development Quality Assurance Dimyon Multimedia, Ramat-Asharon, Israel

ACADEMIC HONOURS:

2019	PhD Scientist Award, Department of Medicine, university of Ottawa.
2019	Certificate of Merit (runner-up), Undergrad, Graduate and Postgrad category, Radiology Research Day, The Ottawa Hospital H Juma*, Zuckier L, Klein R , <i>An integrated software tool for synthesis of lesions in patient PET and CT studies</i>
2019	Clinical Sciences Long Oral Winner Graduate Level & Higher, Department of medicine, University of Ottawa Manwell S*, Klein R , Xu T, deKemp R, <i>Whole-body motion correction in cardiac PET/CT using positron emission tracking: a phantom validation study</i>
2018	Best Technical Imaging Paper in the Journal of Nuclear Cardiology Award, American Society of Nuclear Cardiology Klein R , Ocneanu A*, et al. Consistent tracer administration profile improves test–retest repeatability of myocardial blood flow quantification with 82Rb dynamic PET imaging. <i>J Nuc Cardiol</i> 2018; 25, 1532-6551.
2017	Institute of Electrical and Electronics Engineering (IEEE) Senior Member
2015	Polk Research Award, Best Basic Science Poster Presentation, University of Ottawa Heart Institute Research Day Ocneanu A, deKemp RA, Adler A, Beanlands SB, Klein R , <i>Reproducible Tracer Injection Profile Improves the Test-Retest Repeatability of Myocardial Blood Flow Quantification with 82Rb PET</i>

- 2011-2012 Best Technical Imaging Paper in the Journal of Nuclear Cardiology Award, American Society of Nuclear Cardiology
Katoh C, Yoshinaga K, Klein R, et al. Quantification of Regional Myocardial Blood Flow Estimation with Three-dimensional Dynamic Rubidium-82 PET and modified spillover correction Model. J. Nucl. Cardiol., 2012;19:763-74.
- 2012 Siemens Outstanding Academic Research (SOAR) Award
Coulden R, Klein R, Sonnex, Butler C, Time-resolved quantitative CT myocardial perfusion compared with quantitative 82Rubidium-PET: a pilot study. Soc. Of Cardiovascular Computed Tomography Annual Meeting, Baltimore, MD, 2012
- 2009-2010 Best Technical Imaging Paper in the Journal of Nuclear Cardiology Award, American Society of Nuclear Cardiology
Klein R, Renaud JM, Ziadi MC, et al., Intra- and inter-operator repeatability of myocardial blood flow and myocardial flow reserve measurements using Rubidium-82 PET and a highly automated analysis program. J. Nucl. Cardiol., 2010;17(4):600-616.
- 2009 Polk Research Award, Best Clinical Science Poster Presentation, University of Ottawa Heart Institute Research Day
- 2009 Outstanding Research Award, Molecular Function and Imaging Annual Symposium, \$500
- 2008-2009 Heart and Stroke Doctoral Scholarship, \$21,000/year
- 2008 JSPS Summer in Japan, Research Exchange Program, ~\$10,000
- 2005-2008 NSERC Canadian Graduate Scholarship (CGS-D), \$35,000/year
- 2004-2005 Ontario Graduate Scholarship, \$15 000/year
– declined in favour of NSERC PGS-M
- 2006-2009 University of Ottawa Excellence Scholarship, Full tuition coverage
- 2005-2006 University of Ottawa Admission Scholarship, Full tuition coverage
- 2004-2005 NSERC Postgraduate Scholarship (PGS-M), \$17,300/year
- 2004-2005 University of Ottawa Excellence Scholarship, Full tuition coverage
- 2003-2004 University of Ottawa Admission Scholarship, Full tuition coverage
- 2000-2003 Dean's Honour List, University of Ottawa
- 1999-2003 Nortel Networks Scholarship, \$ 2,500/year
- 1999 University of Ottawa Admission Scholarship, \$1,000

PROFESSIONAL TRAINING:

- 2016, Nov 17-18 Medical Emergency Treatment of Exposure to Radiation (METER), Health Canada (14 hours)

SCHOLARLY AND PROFESSION ACTIVITIES: past 7 years only (eg. executive and editorial positions but not memberships in societies; invited presentations at national or international conferences. Do not list manuscript and grant application reviews)

Executive Committee**International**

- 2019- American Society of Nuclear Cardiology, H. William Strauss Best Technical Research Award Committee Member
 2018 Targeted Alpha Therapy, Conference Clinical Committee Member

National

- 2017- Canadian Organization of Medical Physicists, Scientific Advisory, Member

Local

- 2016- Cancer Care Ontario, Lung PET, Community of Practice Member
 2014- Ottawa Medical Physics Institute, Communications Officer

Editorial Board

- 2017- Annals of Nuclear Cardiology

Reviewer

- 2018- Clinical Oncology
 2018- Journal of Medical Imaging and Radiation Sciences
 2016- Annals of Nuclear Cardiology
 2015- Natural Sciences and Engineering Research Council of Canada (NSERC) grant review
 2013- Medical Physics
 2013- Journal of Cardiology and Vascular Medicine
 2011- International Journal of Cardiovascular Imaging
 2010- Journal of Nuclear Cardiology

Professional Membership

- Institute of Electrical and Electronics Engineers, Senior member (2017)
 Society of Nuclear Medicine (2010)
 Canadian Organization of Medical Physics (2016)

Session Moderator**International**

- 2019 Targeted Alpha Therapy Conference, Clinical Research Day

Local

- 2013 Molecular Function and Imaging Annual Symposium
 2010 Molecular Function and Imaging Annual Symposium

Invited Consultation (academic and industry)

- 2019, Sept 26-27 Kettering Medical Center, Dayton, Ohio, USA – Clinical implementation of myocardial blood flow on MiE HR+ PET.
 2018 Expert Consultant and Medical Device Reviewer, Health Canada

- 2013, May 19-25 Instituto do Coração, Hospital das Clinicas, Faculdade de Medicina, Universidade de Sao Paulo (USP), Sao Paulo, Brazil – Funded by International Atomic Energy Agency (IAEA)
Supporting Human Resource Qualification and Diffusion of Quantitative Emission Tomography to Improve Management of Patients.
- 2012, Dec 13-22 Université de Lausanne, Lausanne, Switzerland
Integration of FlowQuant© into clinical routine.
- 2012-2013 FMI Medical Systems, Akron, OH
Design and development of cardiac image analysis software for cardiac dedicated PET/CT system.
- 2008- DraxImage, Montreal, QC
Design and evaluation of Rubidium Elution System for cardiac PET perfusion imaging.
- 2007 Central Research Institute for Roentgenology and Radiology, St. Petersburg, Russia
Rubidium Elution system for cardiac PET perfusion imaging.

Education Leadership and Administration:

- 2014- Member, Resident Program Committee, Division of Nuclear Medicine, Department of Medicine, University of Ottawa
- 2011-16 Co-director, Cardiac Imaging Fellows Training, Division of Cardiology, Department of Medicine, University of Ottawa

Teaching

- 2013 PHYS 5203 – Medical Radiation Physics, Carleton University
- Tour of UOHI Radiochemistry Lab and Nuclear Cardiology
- 2018 TMM4300B – Translational and Molecular Imaging, University of Ottawa
- Nuclear Medicine - Image acquisition and reconstruction (3 hrs)
- 2018 Nuclear Medicine for Radiology Residents at the Department of Radiology, University of Ottawa (2 hrs).
- 2015- Nuclear Medicine Physics for medical residents at the Nuclear Medicine Residency Program at Division of Nuclear Medicine, University of Ottawa (40 hrs).
- 2014-2018 BIOM5200/BMG5105/SYSC5304/ELG5127 Biomedical Image Processing Graduate Course, Biomedical Engineering, Carleton University & University of Ottawa joint program:
- Computed Tomography Image Reconstruction (1.5 hrs)
- Nuclear Imaging Instrumentation (4.5 hrs).
- 2010-2015 Co-director Cardiac Imaging Training Program for clinical fellows in Nuclear Cardiology and Cardiac CT program at the University of Ottawa Heart Institute.

Lectures

International

1. **Klein R**, Comparison of Myocardial Blood Flow Quantification using PET with ^{82}Rb and ^{15}O -water – Summary. Nuclear Rounds, University of Hokkaido School of Medicine, 2008-08-18
2. **Klein R**, Comparison of Myocardial Blood Flow Quantification using PET with ^{82}Rb and ^{15}O -water. Nuclear Rounds, University of Hokkaido School of Medicine, 2008-07-07
3. **Klein R**, ^{82}Rb – *From Lab to Clinic – Introduction*. Nuclear Rounds, University of Hokkaido School of Medicine, 2008-06-30

Local

4. Klein R, Quantitative lung
5. **Klein R**, Squeezing medical insight out of photons – Quality Control in the Nuclear Medicine Department, OMPI Symposium, 2018-05-24
6. **Klein R**, Thibeau A, Sutherland J, *Emerging Technologies - Panel Discussion*, CAMRT Game Changers Annual Symposium, 2018-05-16
7. **Klein R**, The rise of artificial intelligence in medical imaging. And we thought an isotope shortage was disruptive? O and D Section of the OAMRS, 2018-04-19.
8. **Klein R**, *Myocardial Blood Flow Quantification with PET: Making it more available*, Multi-modality Education Day: Emerging Technologies, CAMRT & OAMRS, 2017-04-28
9. **Klein R**, *Squeezing Insight out of Photons: Emerging technologies and PET/CT and SPECT/CT*, Multi-modality Education Day: Emerging Technologies, TOH & OAMRS O&D Section, 2016-10-05
10. **Klein R**, *Myocardial Blood Flow Imaging and Quantification*. Molecular Function and Imaging Rounds, UOHI, 2012-02-06
11. **Klein R**, *PET Basics*. Nuclear Cardiac Imaging Rounds, UOHI, 2011-11-24
12. **Klein R**, *Basic CT Physics – Part 1*. Cardiac CT Imaging Rounds, UOHI, 2011-11-21
13. **Klein R**, *SPECT and PET Cardiac Tracers*. Nuclear Cardiac Imaging Rounds, UOHI, 2011-01-26
14. **Klein R**, Mackasey K, *Myocardial Blood Flow Imaging and Quantification*. Molecular Function and Imaging Rounds, UOHI, 2011-02-15
15. **Klein R**, *PET Basics*. Nuclear Cardiac Imaging Rounds, UOHI, 2010-11-18
16. **Klein R**, *SPECT and PET Cardiac Tracers*. Nuclear Cardiac Imaging Rounds, UOHI, 2010-01-26
17. **Klein R**, *Validation of Myocardial PET Images*. Research Methods Rounds, UOHI, 2010-03-01
18. **Klein R**, *Concepts in Digital Images*. Molecular Function and Imaging Rounds, UOHI, 2009-11-23
19. **Klein R**, Pursuit of physiologically accurate factor analysis to improve quantification of perfusion. Research in Progress Rounds, UOHI, 2008-04-07
20. **Klein R**, *Volumetric cardiac PET images and pretty pictures*. Molecular Function and Imaging Rounds, UOHI, 2006-11-12
21. **Klein R**, Renaud J, Lortie M, deKemp R *FlowTrace–RBTM Rubidium-82 Generator Manufacturing, Tracer Delivery, and Kinetic Modeling*. Ottawa Nuclear Imaging City Wide Rounds, 2006-09-26

GRADUATE SUPERVISIONS: career numbers; masters, doctoral, postdoctoral - completed/in progress; please distinguish between supervisor, co-supervisor and supervisory committee member

Completed: 3 M.A.Sc.

In Progress: 0 M.A.Sc., 2 Ph.D.

Graduate Supervision

1. Odai Salman (PhD Systems and Computer Engineering), *Computer aided diagnosis of lesions in FDG PET-CT imaging*, Co-supervised with A. Adler, Sept 2017-Ongoing (Carleton University)
2. Hanif Gabrani-Juma (M.A.Sc Biomedical Engineering), *Lesion synthesis in PET-CT*, Co-supervised with A. Adler, Jan 2017- Ongoing (Carleton University)
3. Colin Jones (M.A.Sc Biomedical Engineering), *Correction for patient motion in PET reconstruction*, Co-supervisor with A. Adler and R. deKemp, Jan 2015-Aug 2017
4. Spencer Manwell, (Ph.D. Physics), *Data driven motion correction in dynamic cardiac PET*, Co-supervised with T. Xu and R. deKemp, Sept 2015 – Ongoing (Carleton University)
5. Adrian Ocneanu (Ph.D. Electrical Engineering), *Right Ventricle Myocardial Blood Flow and Metabolic Quantification Using Dynamic PET*, Co-supervisor with A. Adler, Jan 2014-Sept 2017 (Carleton University)
6. Anbhu Sritharan (M.A.Sc. Biomedical Engineering), *Gross Patient Motion Correction in Dynamic Cardiac Positron Emission Tomography*, Co-supervisor with A. Adler, Sept 2013- Dec 2015 (Carleton University)
7. Simisani Takobana (M.A.Sc. Biomedical Engineering), *Quantification of Right Ventricular Function in Pulmonary Hypertension using Cardiac PET Images*, Co-supervisor with A. Adler Sept 2010-Dec 2012 (Carleton University)

Honour's Project Supervision

- 2015-Sep – 2016 Apr - Hanif Gabrani-Juma, Tyler Holmwood, Erik Zakher, BSc Biomed Eng candidates, “*Dynamic contrast-enhanced phantom flow quantification software – Quantify*”.

Internship Supervision

- 2017 – Doaa Nadouri, BSc Candidate, Biopharmaceutical Science (Genetics), University of Ottawa, “*Diastolic dysfunction can precede systolic dysfunction on MUGA in cancer patients receiving trastuzumab based therapy.*”
- 2017 – Erin Osler, BSc Candidate, “*Fiducial marker motion tracking in dynamic PET*”.
- 2016 – Erin Osler, BSc Candidate, “*Quality assurance tracking in nuclear medicine*”.
- 2015 – Simin Razavi, MSc, “*Synthesis of artificial lesions in nuclear images*”.
- 2015 – Rayhan Memon, “*Quality assurance management software in nuclear medicine*”.
- 2015 – Andrew Coathup, BSc, “*Synthesis of artificial lesions in nuclear images*”.
- 2014 – Brittany Reiche, BAsC, “*Coronary Contrast Opacification as an Indicator of Myocardial Perfusion*”.

- 2013-2016 – Hanif Gabrani-Juma, BEng Candidate, “*Dynamic splash viewer for FlowQuant*”, “*CT Angiography Dose Reduction Impact on Image Quality*”, “*Dynamic imaging phantom*”

Undergraduate Co-op Students

- 2010 - Trevor Burn, Physics Department, University of Ottawa, “*Optimizing execution speed of factor analysis of dynamic PET*”.
- 2009 - Charles Malo, School of Information Technology and Engineering, University of Ottawa, “*Heart left ventricle function analysis using gated PET*”.

Volunteers

- 2018 – Ahmed Rezk, BSc Candidate, Physics, University of Ottawa, “*Improved differential kidney function measurements using attenuation correction of planar scintigraphy*”
- 2016-2018 – Doaa Nadouri, BSc Candidate, Biopharmaceutical Science (Genetics), University of Ottawa, “*Diagnostic value of diastolic dysfunction and right ventricular function parameters for cardiotoxicity during chemotherapy*”
- 2016-2017 – Pia Kristensen, MSc, Health Sciences, University of Copenhagen, Denmark, “*Quality control of region of interest area in bone mineral densitometry with DEXA*”
- 2015 – Doaa Nadouri, BSc Candidate, Biopharmaceutical Science (Genetics), University of Ottawa, “*Evaluation of brown fat exclusion tool in FDG PET*”.
- 2013-2014 – Bachar Almazloum, B.A.Sc Candidate, “*Changes in CTA image quality with CT dose reduction strategies*”.
- 2013 – Hisham Turkistani, M.A.Sc. candidate, Biomedical Engineering, Carleton University, “*Generating myocardial images from dynamic water PET*”.
- 2013 – Ryan Gotfrit, B.Sc. candidate, Biomedical Science, University of Ottawa, “*Scoring myocardial perfusion ^{82}Rb -PET images for ARMI trial*”.
- 2013 - Hanif Juma, B.A.Sc. candidate, Biomedical Engineering, Carleton University, “*Left ventricle short axis display of dynamic PET*”.
- 2013 – Inas Morsy, M.Sc., “*Automated localization of coronary vascular obstructions using myocardial blood flow gradients*”

GRADUATE COURSES: past 7 years, by year

- 2010 – Nuclear Cardiology Imaging Physics Lectures, University of Ottawa Heart Institute
- PET basics
 - CT basics
 - Quantification of myocardial blood flow
 - Isotope and tracer production and development

EXTERNAL RESEARCH FUNDING: past 7 years only, by year, indicating source (granting councils, industry, government, foundations, other); amount; principal investigator; purpose (operating, equipment, travel, publications, etc...) (Include information on principal- or co-investigator)

Principle Investigator

YEAR	SOURCE	AMOUNT
2017-2018	Natural Sciences and Engineering Research Council (NSERC) Engage <i>“Integration of Human and Machine Observers for the Interpretation of Medical Images”</i> P.I.: R. Klein	\$25,000
2016-2017	Ontario Centres of Excellence (OCE) Voucher for Innovation and Productivity 1 (VIP1) <i>“Quantitative Medical Imaging Validation Flow Phantom”</i> P.I.: R. Klein	\$20,000
2014-2015	Canadian Institutes of Health Research (CIHR) Bridge Funding <i>“The Effects of Psoriatic Arthritis on coronary Flow Reserve and Markers of Inflammation and Evaluation of the Response to Biological Therapy”</i> P.I.: G. Dwivedi (Role: collaborator)	\$100,000
2014-2018	Canadian Institutes of Health Research (CIHR) Operating Grant <i>“Translational Imaging of Coronary Endothelial Function with Positron Tomography”</i> P.I.: R. deKemp (Role: collaborator)	\$534,782
2014-2014	Medical Imaging Trail Network of Canada (MITNEC) Mentorship Exchange Program <i>“Myocardial Blood Flow Quantification with Computed Tomography”</i> P.I. R. Klein	\$5,000
2014-2014	Natural Sciences and Engineering Research Council (NSERC) Engage <i>“Perfusion Flow Phantom using a Peristaltic Pump Flow Source of Multi-Modality Medical Imaging”</i> P.I.: R. Klein	\$22,500
2014-2014	Natural Sciences and Engineering Research Council (NSERC) Engage <i>“Image Data De-identification for Biomedical Research”</i> P.I.: R. Klein	\$24,500
2013-2018	Natural Sciences and Engineering Research Council (NSERC) Discovery Program Grant <i>“Improving the accuracy of cardiac PET with motion-free imaging”</i> P.I.: R. Klein	\$160,000

Under Review

- 2020-2025 Natural Sciences and Engineering Research Council (NSERC) \$528,000
Discovery Program Grant
“*Pushing the limits of detection with PET*”
P.I.: **R. Klein**
- 2019 The Ottawa Hospital Academic Medical Organization (TOHAMO) \$20,000
Quality and Patient Safety Grant
“*Application of clinical photography to improve interdisciplinary communication in lymphoscintigraphy*”
P.I.: **E. Leung**
Role: Investigator

INTERNAL RESEARCH FUNDING:

PUBLICATIONS: Trainees are indicated with an asterisk *

Life-time summary (count) according to the following categories:

- Book Chapters..... 3
- Papers in refereed journals.....58 (+3 submitted)
- Editorials 5
- Papers in refereed conference proceedings 10
- Abstracts 100 (+6 submitted)
- Major invited contributions and/or technical reports 15
- Presentations
 - o International 10 (+6 invited)
 - o National..... 1 (+4 invited)
 - o Local 2 (+4 invited)
- Open source software..... 3

Rankings

Google scholar:

H-index: 21

4 papers cited over 100 times

Published Book Chapters

1. Croteau E, **Klein R**, Renaud JM, Premaratne M, deKemp RA, *Cardiovascular PET-CT, Hybrid Imaging in Cardiovascular Medicine*, Liu YH, Sinusas AJ, 2017:27-56.
2. **Klein R**, deKemp R, *Cardiac PET Imaging: principles and new developments*, Basic Science of PET Imaging, Khalil MM. 2017:451-83.
3. **Klein R**, Pourmoghaddas A, Mc Ardle B, Chow BJW, *Use of radio-labelled compounds and imaging as cardiac biomarkers*, Biomarkers in Disease: Methods, Discoveries and Applications, V. Preedy. 2015:811-40.

Published Papers in Refereed Journals

Reference

PMID

1. Ahmadi A, **Klein R**, Lewin HS, Beanlands RSB, deKemp RA, *Rubidium-82 Generator Yield and Efficiency for PET Perfusion Imaging: Comparison of Two Clinical Systems*, J Nucl Card, [In Press 2020].
2. Manwell S*, **Klein R**, Xu To, deKemp RA, *Clinical comparison of the Positron Emission Tracking (PeTrack) algorithm with the Real-Time Position Management System for respiratory gating in cardiac positron emission tomography*, Med Phys, [In Press 2020].
3. Currie G, Hawk KE, Rohrer E, Vial A, **Klein R**, *Machine Learning and Deep Learning in Medical Imaging: Intelligent Imaging*, J Med Image and Rad Sci, 2019;450(4):477-87. 31601480
4. Thorn S, Barlow S, Feher A, Stacy M, Doviak H, Jacobs J, Zellars K, Renaud J, **Klein R**, deKemp R, Khakoo A, Lee TW, Spinale F, Sinusas A, *Application of Hybrid MMP-Targeted and Dynamic 201Tl SPECT/CT Imaging for Evaluation of Early Post Myocardial Infarction Remodeling*, Circ Cardiovascular Imaging, 12(11):e009055. 31707811
5. **Klein R**, deKemp RA, *⁸²Rb is the best flow tracer for high-volume sites*, Annals of Nuc Cardiol 2019;5(1):53-62.
6. Sriperumbuduri S, Dent R, Malcolm J, Hiremath S, **Klein R**, White CA; Akbari A, *Accurate GFR in obesity – Protocol for a systematic review*, Sys Review, 2019;8:147. 31228953
7. Pfau D, Thorn SL, Zhang J, Mikush N, Renaud JM, **Klein R**, deKemp RA, Wu X, Hu X, Sinusas AJ, Young LH, Tirziu D, *Angiotensin receptor neprilysin inhibitor attenuates myocardial remodeling and improves infarct perfusion in experimental heart failure*. Scientific Reports, 2019;9(1):5791. 30962467
8. Robin P, **Klein R**, Gardner J, Ziebarth B, Bazarjani S, Razavi S*, Zuckier LS, Zeng W, *Quantitative analysis of technetium-99m-sestamibi uptake and washout in parathyroid scintigraphy supports dual mechanisms of lesion conspicuity*. Nuc Med Comm., 2019;40(5):469-76. 30762617
9. Hunter CRRN, **Klein R**, Alessio A, deKemp RA, *Correction for Rigid Patient body motion correction for dynamic cardiac PET-CT by attenuation-emission alignment according to projection consistency conditions*. Med. Phys. 2019;46(4):1697-1706. 30710381
10. **Klein R**, Nadouri D*, Osler E*, Johnson C, Dent S, Dwivedi G, *Diastolic dysfunction can precede systolic dysfunction on MUGA in cancer patients receiving trastuzumab based therapy*. Nuc Med Comm. 2019;40(1):22-29. 30418380
11. **Klein R**, Razavi S*, Memon R*, Zuckier L, *An electronic 99mTc-DTPA Glomerular Filtration Rate spreadsheet with novel embedded quality assurance features*, Nuc Med Comm. 2019;40(1):30-40. 30362986
12. Abele JT, Raubenheimer M, Bain VG, Wandzilak G, AlHulaimi N, Coulden R, deKemp RA, **Klein R**, Williams RG, Warshawski RS, Lalonde LD, *Quantitative blood flow evaluation of vasodilation-stress compared with dobutamine-stress in patients with end-stage liver disease using ⁸²Rb PET/CT*. J Nuc Cardiol. 2018;19(11) [Epub ahead of print]. 30456495
13. **Klein R**, *Initial steps to tracer kinetic modeling and MBF quantification*, Annals of Nuc Cardiol. 2018;4(1):68-73.
14. Pelletier-Galarneau M, Martineau P, **Klein R**, Henderson M, Zuckier LS, 29165912

- Reproducibility of Radioactive Iodine Uptake (RAIU) Measurements*, J Appl Clin Med Phys, 2018;19(1):239-42.
15. Razavi S*, Ziebarth B, Zuckier L, **Klein R**, Zeng W, *Dual time-point quantitative SPECT-CT parathyroid imaging using a single computed tomography: feasibility and operator variability*, Nuc Med Comm. 2018;39:3-9. 29099412
 16. Pelletier-Galarneau M, deKemp RA, Hunter C, **Klein R**, Klein M, Ironstone J, Fisher JA, Ruddy TD, *Effects of hypercapnia on myocardial blood flow in healthy human subjects*, J Nucl Med, 2018;59(1):100-6. 28619736
 17. Ocneanu A*, deKemp R, Renaud JM, Adler A, Beanlands RSB, **Klein R**, *Optimally repeatable kinetic model variant for myocardial blood flow measurements with 82Rb PET. Computational and Mathematical Methods in Nuclear Medicine*, 2017: 6810626, 11 pages. 28293274
 18. Ohira H, Mc Ardle B, Nery P, deKemp RA, Renaud J, **Klein R**, Clarkin O, MacDonald K, Leung E, Beanlands R, Birnie D., *Inter- and intra- observer agreement of FDG-PET/CT image interpretation in patients referred for assessment of cardiac sarcoidosis*, J Nuc Med, 2017;58:1324-9. 28254873
 19. **Klein R**, Ocneanu A*, Renaud JM, Ziadi MC, Beanlands RSB, deKemp RA, *Consistent tracer administration profile improves test-retest repeatability of myocardial blood flow quantification with 82Rb dynamic PET imaging*, J Nucl Cardiol, 2018;25(3):929-41. 27804067
 20. Gabrani-Juma H*, Clarkin OJ, Pourmoghaddas A, Driscoll B, Wells RG, deKemp RA, **Klein R**, *Validation of a multimodality flow phantom and its application for assessment of dynamic SPECT and PET technologies*, IEEE-Trans Med Imag, 2017;36(1):132-41. 28055829
 21. Hunter CRRN, **Klein R**, Beanlands RS, deKemp RA, *Patient Body Motion Effects on the Quantification of Regional Myocardial Blood Flow with Dynamic PET Imaging*, Med Phys, 2016;43(4):1829-40. 27036580
 22. **Klein R**, Ametepe ES*, Yam Y, Dwivedi G, Chow BJ, *Cardiac CT Assessment of Left-Ventricular Mass in Mid-Diastasis and its Prognostic Value*, Eur Heart J Cardiovascular Imaging, 2017;18(1):95-102. 26850628
 23. deKemp RA, Renaud JM, **Klein R**, Beanlands RS, *Radionuclide tracers for myocardial perfusion imaging and blood flow quantification*. Cardiol Clinics, 2016;34(1):37-46. 26590778
 24. Ohira H, Birnie DH, Pena E, Bernick J, Mc Ardle B, Leung E, Wells, GA, Yoshinaga K, Tsujino I, Sato T, Manabe O, Oyama-Manabe N, Nishimura M, Tamaki N, Dick A, Dennie C, **Klein R**, Renaud J, deKemp RA, Ruddy TD, Chow BJW, Davies R, Hessian R, Liu P, Beanlands RSB, Nery PB, *Comparison of ¹⁸F-fluorodeoxyglucose positron emission tomography (FDG PET) and cardiac magnetic resonance (CMR) in corticosteroid-naïve patients with conduction system disease due to cardiac sarcoidosis*. EJNMMI 2016;43(2):259-69. 26359191
 25. Ohira H, deKemp R, Pena E, Davies RA, Stewart DJ, Chandy G, Contreras-Dominguez V, Dennie C, Mc Ardle B, **Klein R**, Renaud J, DaSilva J, Pugliese C, Dunne R, Beanlands R, Mielniczuk LM, *Shifts in myocardial fatty acid and glucose metabolism in pulmonary arterial hypertension: A*

- potential mechanism for a maladaptive right ventricular response*, Eur Heart J Cardiovascular Imaging, 2016;17(12):1424-31.
26. Dunet V, **Klein R**, Allenbach G, Renaud J, deKemp RA, Prior JO, 25995182
Myocardial blood flow quantification by Rb-82 cardiac PET/CT: A detailed reproducibility study between two semi-automatic analysis programs. J Nucl Cardiol, 2016;23:499-510.
27. Timmins R, **Klein R**, Petryk J, Marvin B, Wei L, deKemp RA, Ruddy TD, 26328959
Wells RG, *Reduced dose measurement of absolute myocardial blood flow using dynamic SPECT imaging in a porcine model*. Med Phys, 2015;42(9):5075-83.
28. Arasaratnam P, Ayoub C, **Klein R**, deKemp R, Beanlands RS, Chow BJW, DOI:
Positron emission tomography myocardial perfusion imaging for diagnosis and risk stratification in obese patients. Cur Cardiovascular Imag Rep, 10.1007/
2014;8:9304. /s12410-014-9304-y
25621195
29. Croteau E, Renaud JM, Archer C, **Klein R**, DaSilva JN, Ruddy TD, 25621195
Beanlands RSB, deKemp RA, *Beta2-adrenergic stress for in-vivo assessment of nitric-oxide-mediated coronary endothelial-dependent vasodilator function using micro-PET blood flow imaging in mice*, Eur J Nucl Med Research, 2014;4(1):68
30. **Klein R**, Hung G-U, Wu T-C, Li D, deKemp RA, Hsu B, Feasibility and 25280761
Operator Variability of Myocardial Blood Flow and Reserve Measurements with 99mTc-Sestamibi Quantitative Dynamic SPECT-CT Imaging. J Nucl Cardiol, 2014;21(6):1075-88.
31. Orton EJ, Al Harbi I, **Klein R**, Benalands RSB, deKemp RA, Wells, RG, 25281976
Detection and severity classification of extra-cardiac interference in ⁸²Rb PET myocardial perfusion imaging, Med Phys, 2014;41(10):102501.
32. Nesterov SV, Deshayes E, Sciagrà R, Settimo L, Declerck JM, Pan XB, 25306543
Yoshinaga K, Katoh C, Slomka PJ, Germano G, Han C, Aalto V, Alessio AM, Ficaro EP, Lee BC, Nekolla SG, Gwet KL, deKemp RA, **Klein R**, Dickson J, Case JA, Bateman T, Prior JO, Knuuti JM, *Quantification of Myocardial Blood Flow in Absolute Terms Using 82Rb PET Imaging. Results of the RUBY-10 Study*, J Am Coll Cardiol Img, 2014;7(11):1119-27.
33. Wells RG, Timmins R, **Klein R**, Lockwood J, Marvin B, deKemp RA, Wei 25189340
L, Ruddy TD, *Dynamic SPECT measurement of absolute myocardial blood flow in a porcine model*, J Nucl Med, 2014;55(10):1685-91.
34. Chow BJ, Green RE, Coyle D, Laine M, Hanninen H, Leskinen H, Rajda M, 24369097
Larose E, Hartikainen J, Hedman M, Mielniczuk L, O'Meara E, deKemp RA, **Klein, R**, Paterson I, White JA, Yla-Herttuala S, Leber A, Tandon V, Lee T, Al-Hesayen A, Hessian R, Dowsley T, Kass M, Kelly C, Garrard L, Tardif JC, Knuuti J, Beanlands RS, Wells GA, & IMAGE-HF Investigators, *Computed tomographic coronary angiography for patients with heart failure (CTA-HF): A randomized controlled trial (IMAGE HF project 1-C)*. Trials, 2013;14:443.
35. Tahari AK, Lee A, Rajaram M, Fukushima K, Lodge MA, Lee BC, Ficaro 23982454
EP, Nekolla S, **Klein R**, deKemp RA, Wahl RL, Bengel FM, Bravo PE, *Absolute myocardial blood flow quantification with 82-Rb PET/CT:*

- Comparison of different software packages and methods.* Eur J of Nucl Med and Mol Imaging, 2014;41(1):126-135.
36. McArdle BA, Birnie DH, **Klein R**, deKemp RA, Leung E, Renaud J, DaSilva J, Wells GA, Beanlands RS, Nery PB, Is There an Association Between *Clinical Presentation and the Location and Extent of Myocardial Involvement of Cardiac Sarcoidosis as Assessed by 18F- Fluorodeoxyglucose Positron Emission Tomography?* Circ Cardiovasc Imagin, 2013;6(5):617-26. 23884290
37. Giordano C, Thorn SL, Renaud JM, Al-Atassi T, Boodhwani M, **Klein R**, Kuraitis D, Dwivedi G, Zhang P, Dasilva JN, Ascah KJ, Dekemp RA, Suuronen EJ, Beanlands RS, Ruel M. *Preclinical evaluation of biopolymer-delivered circulating angiogenic cells in a swine model of hibernating myocardium.* Circ Cardiovasc Imaging. 2013 Nov;6(6):982-91. 24089461
38. Thackeray JT, Renaud JM, Kordos M, **Klein R**, deKemp RA, Beanlands RS, DaSilva JN, *Test-Retest repeatability of quantitative measurements of cardiac [¹¹c]meta-hydroxyephedrine in rats by small animal positron emission tomography.* Nuc Med Biol, 2013;40(5):676-681. 23664690
39. Paterson I, Wells GA, Ezekowitz JA, White JA, Friedrich MG, Mielniczuk LM, O'Meara E, Chow B, deKemp RA, Klein R, Dennie C, Dick A, Coyle D, Dwivedi G, Rajda M, Wright GA, Laine M, Hanninen H, Larose E, Connelly K, Leung-Poi H, Howarth A, Davies RA, Duchesne L, Yla-Herttuala S, Saraste A, Farand P, Garrard L, Tardif J-C, Arnold M, Knuuti J, Beanlands R, Chan KL, *Routine versus selective cardiac magnetic resonance in non-ischemic heart failure - OUTSMART-HF: study protocol for a randomized controlled trial (IMAGE-HF (heart failure) project 1-B).* Trials, 2013;14:332. 24119686
40. Thorn SL, deKemp R, Dumouchel T, **Klein R**, Renaud JM, Wells G, Gollob M, Beanlands RS, DaSilva JN, *Repeatable Non-Invasive Imaging of FDG PET in the mouse myocardium: Evaluation of tracer kinetics in a Type 1 Diabetes model.* J Nucl Med, 2013;54(9):1637-44. 23940301
41. Pourmoghaddas A, **Klein R**, deKemp RA, Wells, RG, Respiratory phase alignment improves blood-flow quantification in Rb82 PET myocardial perfusion imaging. Med Phys, 2013;40(2):022503. 23387770
42. deKemp R, Declerck J, **Klein R**, Nakazato R, Pan X-B, Nakazato R, Tonge C, Aumugam P, Berman DS, Germano G, Beanlands RS, Slomka PJ, *Multisoftware reproducibility study of stress and rest myocardial blood flow assessed with 3D dynamic PET/CT and a 1-tissue-compartment model of ⁸²Rb kinetics.* J Nucl Med 2013;54(4):571-7. 23447656
43. Dwivedi G, AlShehri H, deKemp RA, Ali I, Alghamdi AA, **Klein R**, Scullion A, Ruddy TD, Beanlands RS, Chow BJW, *Scar Imaging using multislice computed tomography versus metabolic imaging by F-18 FDG positron emission tomography: A pilot study.* Int J Cardiol, 2013;168(2):739-745. 23102604
44. O'Meara E, Mielniczuk LM, Wells G, deKemp R, **Klein R**, Coyle D, McArdle B, Patterson I, White JA, Arnold M, Friedrich M, Larose E, Dick A, Chow B, Dennie C, Haddad H, Ruddy T, Ukkonen H, Wisenberg G, Cantin B, Pibarot P, Freeman M, Turcotte E, Connelly K, Clarke J, Williams K, Racine N, Garrard L, Tardif JC, DaSilva J, Knuuti J, Beanlands R, *Alternative imaging modalities in ischemic heart failure (AIMI-HF): Study* 23866673

- protocol for a randomized controlled trial. IMAGE HF Project I-A, Trials, 2013;14:218.*
45. Efseaff M, **Klein R**, Beanlands RSB, deKemp RA, *Short-term repeatability of resting myocardial blood flow measurements using rubidium-82 PET imaging. J Nucl Cardiol, 2012;19(5):997-1006.* 22826134
 46. Lamoureux M, Thorn S, Dumouchel T, **Klein R**, Renaud JM, Mason S, Lortie M, DaSilva JN, Beanlands RS, deKemp RA, *Uniformity and repeatability of normal resting myocardial blood flow in rats with [13N]-ammonia and small animal PET. Nucl Med Comm, 2012;33:917-25.* 22692581
 47. Katoh C, Yoshinaga K, **Klein R**, Kasai K, Manabe O, deKemp RA, Tamaki N, *Quantification of regional myocardial blood flow estimation with three-dimensional dynamic rubidium-82 PET and modified spillover correction model. J Nucl Cardiol, 2012;19:763-74.* 22527800
 48. Ziadi MC, deKemp RA, Williams K, Guo A, Renaud JM, Chow BJ, **Klein R**, Ruddy TD, Aung M, Garrard L, Beanlands RS, *Does quantification of myocardial flow reserve using rubidium-82 positron emission tomography facilitate detection of multivessel coronary artery disease? J Nucl Cardiol, 2012;19(4):670-80.* 22415819
 49. Yoshinaga K, Katoh C, Manabe O, **Klein R**, Naya M, Sakakibara M, Yamada S, deKemp RA, Tsutsui H, Tamaki N, *Incremental diagnostic value of regional myocardial blood flow quantification over relative perfusion imaging with generator-produced rubidium-82 PET. Circ J, 2011;75(11):2628-34.* 22527800
 50. Yoshinaga K, Manabe O, Katoh C, Chen L, **Klein R**, Naya M, deKemp RA, Williams K, Beanlands RSB, Tamaki N, *Quantitative analysis of coronary endothelial function with generator-produced 82Rb PET: comparison with 15O-labelled water PET. Eur J Nucl Med Mol Imaging, 2010;37(12):2233-41.* 20625721
 51. **Klein R**, Beanlands RS, Wassenaar RW, Thorn S, Lamoureux M, DaSilva JN, Adler A, deKemp RA, *Kinetic model based factor analysis of dynamic sequences of cardiac positron emission tomography. Med Phys, 2010;37(8):3995-4010.* 20879561
 52. **Klein R**, Beanlands RS, deKemp RA, *Quantification of myocardial blood flow and flow reserve - Technical aspects. J Nucl Cardiol, 2010;17(4):555-570.* 20596841
 53. **Klein R**, Renaud JM, Ziadi MC, Thorn SL, Adler A, Beanlands RS, deKemp RA, *Intra- and inter-operator repeatability of myocardial blood flow and myocardial flow reserve measurements using Rubidium-82 PET and a highly automated analysis program. J Nucl Cardiol, 2010;17(4):600-616.* 20387135
 54. Yoshinaga K, **Klein R**, Tamaki N, *Generator produced rubidium-82 positron emission tomography myocardial perfusion imaging – From basic aspects to clinical applications. J of Cardiol, 2010;55(2):163-173.* 20206068
 55. Lekx KS, deKemp RA, Beanlands RSB, Wisenberg G, Wells RG, Stodilka RZ, Lortie M, **Klein R**, Zabel P, Kovacs MS, Sykes J, Prato FS, *Quantification of regional myocardial blood flow in a canine model of stunned and infarcted myocardium: comparison of rubidium-82 positron* 19823095

- emission tomography with microspheres.* Nuc Med Comm, 2010;31(1):67-74.
56. Lekx KS, deKemp RA, Beanlands RSB, Wisenberg G, Wells G, Stodilka RZ, 19838136
Lortie M, **Klein R**, Zabel P, Kovacs MS, Sykes J, Prato FS, *3D versus 2D
dynamic ⁸²Rb myocardial blood flow imaging in a canine model of stunned
and infarcted myocardium.* Nucl Med Comm, 2010;31(1):75-81.
57. Lortie M, Beanlands RS, Yoshinaga K, **Klein R**, DaSilva JN, deKemp RA, 17619189
Quantification of myocardial blood flow with ⁸²Rb dynamic PET imaging.
Eur J Nucl Med and Mol Imaging, 2007;34(11):1765-74.
58. **Klein R**, Adler A, Beanlands RS, deKemp RA, *Precision-controlled elution 17228112
of a ⁸²Sr/⁸²Rb generator for cardiac perfusion imaging with positron
emission tomography.* Phys Med Biol, 2007;52(3):659-673.

Submitted Papers to Refereed Journals

1. **Klein R**, Oliver M, La Russa D, Agapito J, Gaede S, Bisonnette JP, Rahmim A, Uribe C,
*Technical Quality Control Guidelines for use of Positron Emission Tomography –
Computed Tomography (PET/CT) in Radiation Treatment Planning*, Canadian
Partnership for Quality Radiotherapy, 2019, [http://www.cpqr.ca/wp-
content/uploads/2019/09/PET-2019-09-01-DRAFT.docx](http://www.cpqr.ca/wp-content/uploads/2019/09/PET-2019-09-01-DRAFT.docx)
2. Salman O*, **Klein R**, *Anatomical Region Identification in Medical x-ray Computed
Tomography (CT) Scans: Development and Comparison of Alternative Data-Analysis and
Vision-Based Methods*, Int J of Computer Vision, Submitted Sept 2019.
3. Gabrani-Juma H*, Zuckier LS, **Klein R**, *Development and validation of the Lesion
Synthesis Toolbox and the Perception Study Tool for quantifying observer limits-of-
detection of lesions in positron emission tomography*, J Med Imaging, Revisions
submitted Mar 2020.
4. Ahmadi A, Renaud JM, Promislow S, Burwash IG, Dwivedi G, **Klein R**, Zelt JGE,
deKemp RA, Beanlands RS, Mielniczuk LM, *Increased myocardial oxygen consumption
rates are associated with maladaptive right ventricular remodelling and decreased event-
free survival in heart failure patients*, J Nucl Card, Submitted Feb 2020.
5. Manabe O; Yoshinaga K, Katoh C, Magota K, Klein R, deKemp RA, Naya M, Oyama-
Manabe N, Tamaki N, *Validation of regional myocardial blood flow quantification using
3D PET with rubidium-82 –repeatability and comparison with 2D PET data acquisition.*
Nuc Med Comm, Submitted Jan 2020.

Manuscripts in Preparation

1. Hunter CRRN, Presotto L, Klein R, Pelletier-Galareneau M, Ruddy T, deKemp RA,
Respiratory Phase-Matched Attenuation Correction using Maximum Likelihood
Reconstruction of Activity and Attenuation (MLAA) for CO₂ Stress PET-CT.
2. Robin P, Klein R, Kotbi O, Zeng W, Zuckier LS, Range of uptake of 99mTc-Sestamibi in
the normal pituitary gland by quantitative SPECT-CT analysis. EJNMMI Research,
Submitted Sept 2018.
3. Razavi S*, Zuckier L, **Klein R**, Accuracy and precision of quantitative SPECT in a
clinical setting. Nuc Med Comm.
4. Osler, E*, Sritharan A*, Hunter C, deKemp RA, Beanlands RS, Adler A, **Klein R**,
Positron emitting fiducial marker-based patient motion in dynamic cardiac pet images, J

Nucl Cardiol.

5. Kristensen P*, Sivasambu J, Zuckier LS, Bryanton M, **Klein R**, Quality assurance of repeated bone mineral density Scans on DEXA.
6. Ahmadi A, **Klein R**, Beanlands RSB, deKemp RA, *Rubidium-82 Activity Calibration and Elution for PET Perfusion Imaging: Comparison of Two Commercial Systems.*

Non-Refereed Editorials

1. Wells RG, **Klein R**, *Dynamic Phantoms – Making the right tool for the job*, J Nucl Card, [In Press 2020].
2. **Klein R**, Ocneanu A*, deKemp R, *Time-frame sampling for ^{82}Rb PET flow quantification – towards standardization of clinical protocols.* J Nucl Cardiol, 2017; 24(5), 1530-4. 28687966
3. deKemp RA, **Klein R**, Beanlands RSB, *^{82}Rb PET imaging of myocardial blood flow—have we achieved the 4 “R”s to support routine use?* EJNMMI Research, 2016;6:69. 27650281
4. Jones C*, **Klein R**, *Can PET be performed without an attenuation scan?* J Nucl Cardiol, 2016;25(5):1098-101. 26338426
5. **Klein R**, *Editorial: Derivation of respiratory gating signals from ECG signals.* J Nucl Cardiol, 2016;23(1):84-6. 26082393
6. Thorn SL, deKemp R, Dumouchel T, **Klein R**, Renaud JN, Wells RG, Gollob M, Beanlands RS, DaSilva JN. *Reply: Noninvasive measurement of mouse myocardial glucose uptake with ^{18}F -FDG.* J Nucl Med. 2014;55(5):866-7. 24652829

Papers in Refereed Conference Proceedings

1. Manwell S*, Chamberland MJP, **Klein R**, Xu T, deKemp R, *Evaluation of the clinical efficacy of the PeTrack motion tracking system for respiratory gating in cardiac PET imaging*, Proc. SPIE 10132, Medical Imaging 2017: Physics of Medical Imaging, 2017;1013251.
2. Takobana S*, **Klein R**, Adler A, deKemp R, Beanlands, R, Mielniczuk L, *A spline model for RV myocardium sampling from cardiac PET images.* Canadian Medical and Biological Engineering Society Annual Meeting Abstracts, 2013.
3. Kenk M, Thorn S, Thomas AJ, Renaud JM, **Klein R**, Lortie M, deKemp R, Beanlands RS, DaSaliva JN, *In vivo [R]-[^{11}C]Rolipram positron emission tomography imaging detects increased phosphodiesterase-4 in normally-perfused rat myocardial regions 8–12 weeks following myocardial infarction.* Circ., 2010;122:A20262.
4. **Klein R**, Beanlands RS, Adler A, deKemp RA, *Model-based factor analysis of dynamic sequences of cardiac positron emission tomography.* IEEE-Nucl. Sc. Symp. Conf. Record, October 2008:5198-202.
5. deKemp RA, **Klein R**, Renaud J, Alghamdi A, Lortie M, DaSilva JN, Beanlands RS, *3D list-mode cardiac PET for simultaneous quantification of myocardial blood flow and ventricular function.* IEEE-Nucl. Sc. Symp. Conf. Record, October 2008;(10):5215-8.
6. **Klein R**, Bentourkia M, Beanlands RS, Adler A, deKemp RA, *A Minimal factor overlap method for resolving ambiguity in factor analysis of dynamic cardiac PET.* IEEE-Med. Imag. Conf Record, 2007;5(10):3268-72.
7. **Klein R**, Lortie M, Adler A, Beanlands RS, deKemp RA, *Fully Automated Software for*

- Polar-Map Registration and Sampling from PET images.* Nucl. Sci. Symp. & Med. Imag. Conf. Record, 2006:3185-88.
8. deKemp RA, **Klein R**, Lortie M, Beanlands R, *constant-activity-rate infusions for myocardial blood flow quantification with ^{82}Rb and 3D PET.* Nucl. Sci. Symp. & Med. Imag. Conf. Record, 2006:3519-21.
 9. Lecomte R, deKemp R, **Klein R**, Cadorette J, Lepage MD, Robert G, Selivanov V, Bélanger F, Semmaoui H, Tétrault M-A, Viscogliosi N, Bergeron M, Lemieux F, Lemonde M-A, Fontaine R, *LabPETTM: A Second-Generation APD-Based digital scanner for high-resolution small animal PET imaging.* Med Phys, 2006;33(7):2671.
 10. **Klein R**, Adler A, Beanlands RS, deKemp RA, *Precision control of eluted activity from a Sr/Rb generator for cardiac positron emission tomography.* Proceedings of the IEEE-EMBS 26th Annual International Conference, 2004;2:1393-96.

Papers Submitted to Refereed Conference Proceedings

1. None

Abstracts

1. Klein R, Rezk A, Kotbi OK, Abdulrahman A, Leung E, Ziebarth B, Zeng W, *Practical attenuation correction in renal scintigraphy for precise split renal function measurements,* Eur Assoc Nucl Med, EP-0278, 2019.
2. AL Bimani Z, Whinfield K, **Klein R**, Zeng W, *Does prone myocardial perfusion imaging improve inferior and anterior perfusion defects?* Eur Assoc Nucl Med, EP-0196, 2019.
3. Manwell S*, **Klein R**, deKemp R, Xu T, *Whole-body motion correction in ^{13}N -ammonia myocardial perfusion imaging using positron emission tracking.* IEEE MIC 2019.
4. Khan O, Pyatibrat S, Gardner J, **Klein R**, Zuckier L, Zeng W, *Ki-67 expression and FDG uptake in colorectal adenoma and adenocarcinoma,* USCAP 2019.
5. Gabrani-Juma H*, Zuckier LS, Ahn S, Wangerin K, **Klein R**, *Validation of An Integrated Workflow for Simultaneous Lesion Synthesis in Both PET and CT Patient Scans,* MIPS 2019.
6. Gabrani-Juma H*, La Russa DJ, **Klein R**, *Influence of PET image reconstruction and segmentation methods on target volume estimation,* SNMMI 2019.
7. Manwell S*, **Klein R**, Xu T, deKemp RA, *'Bad-Breath' Rejection: quality control metrics for respiratory gating in PET/CT.* SNMMI 2019.
8. Salman O*, **Klein R**, *Whole-Body CT Plane Classification: Development & Comparison of Alternative Methods,* SNMMI 2019.
9. Hunter CRRN, Pressotto L, **Klein R**, Pelletier-Galarneau M, Ruddy T, deKemp R, *Maximum-likelihood reconstruction of attenuation and activity (MLAA) for CO₂ stress in Rb-82 PET/CT respiratory gated imaging.* Int Conf Nucl Cardiol 2019.
10. Al Bimani ZKS, **Klein R**, Zeng W, *Disappearance of Myocardial Perfusion Defects on Prone SPECT Imaging.* CANM 2019.
11. Thorn SL, Tirziu D, Pfau D, Mikush N, Zhang J, Renaud JM, **Klein R**, deKemp RA, Wu X, Hu X, Young LH, Sinusas AJ, *Angiotensin Receptor Neprilysin Inhibitor Therapy Promotes Early Angiogenesis and Improves Myocardial Perfusion Inhibiting Post-Infarct Remodeling.* ACC 2018.

12. Gabrani-Juma H*, Daniel La Russa D, **Klein R**, Influence of image reconstruction parameters for target volume estimation with PET for intensity-modulated radiotherapy patients. IEEE MIC 2018.
13. Manwell S*, **Klein R**, deKemp R, Xu T, Whole-body motion correction in cardiac PET/CT using Positron Emission Tracking: A phantom validation study. IEEE MIC 2018
14. Hunter CRRN, **Klein R**, Pressotto L, deKemp R, Maximum-likelihood reconstruction of attenuation and activity (MLAA) improves uniformity of hypercapnia-stress PET perfusion imaging. Am Soc Nucl Cardiol 2018.
15. Thorn SL, Heerdt PM, Mikush N, Sikanderkhel S, Hawley C, Orozco D, Renaud JM, **Klein R**, deKemp RA, Chun HJ, Sinusas AJ, Assessment of right and left ventricle blood flow, function and hemodynamics in a novel porcine model of chronic right ventricle pressure overload, AHA 2018.
16. Khan O, Pyatibrat S, Gardner J, **Klein R**, Zuckier L, Zeng W, *Ki-67 expression and FDG uptake in colorectal adenoma and adenocarcinoma*, Eur Assoc Nucl Med, 2018.
17. Albatly A, Almubarak H, Kotbi O, Bakkari A, Bazarjani S, **Klein R**, Zeng W, *Quantification of sternal and spine uptake with Tc-99m MDP SPECT/CT*, Eur Assoc Nucl Med 2018.
18. Kotbi O, Miglietta A, **Klein R**, Nadouri D*, Zeng W, *Is the Second Octreotide SPECT/CT Needed?* Eur Assoc Nucl Med 2018.
19. Albatly A, **Klein R**, Ziebarth B, Leung E, Zeng W, *Evaluation of Renal Split Function by Scintigraphy and Geometric Mean Calculation*, Eur Assoc Nucl Med, 2018.
20. Thorn SL, Heerdt PM, Mikush N, Sikanderkhel S, Hawley C, Orozco D, Renaud JM, **Klein R**, deKemp RA, Chun HJ, Sinusas AJ, *SPECT/CT Evaluation of Right Ventricle Blood Flow and Function in A Novel Porcine Model of Right Ventricular Heart Failure*, Am Soc Nucl Cardiol 2018.
21. Gardner J, Ziebarth B, Bazarjani S, Razavi S*, Robin P, **Klein R**, Zuckier LS, Zeng W, *Washout Rate of 99mTc-Sestamibi in Parathyroid and Thyroid Tissues Assessed Using Quantitative SPECT-CT*. Eur Assoc Nucl Med, 2017.
22. Manwell S*, **Klein R**, deKemp R, Xu T, Patient motion management using the positron emission tracking (PeTrack) algorithm in cardiac PET without time-of-flight. COMP Ann. Sci Meeting, 2017.
23. Razavi S*, Zuckier L, **Klein R**, Optimization of quantitative ^{99m}Tc SPECT in a phantom and clinical environment. COMP Ann. Sci Meeting, 2017
24. **Klein R**, Nadouri D*, Osler E*, Johnson C, Aseyev O, Zuckier LS, Dent S, Dwivedi G, *Persistent LV diastolic dysfunction abnormalities in breast cancer patients following chemotherapy*, S. Nucl. Med. Annual Meeting, 2017.
25. Razavi S*, Zuckier L, **Klein R**, Optimization of image acquisition and reconstruction parameters for quantitative 99mTc SPECTCT in phantom and patients. S. Nucl. Med. Annual Meeting, 2017.
26. Majtenyi N, Gabrani-Juma H*, **Klein R**, deKemp RA, Cron G, Nguyen TB, Cameron I, *Comparing arterial input function measurements in DCE-MRI using MOLLI and phase*, Med. Phys. 2016;43:3644.
27. Gabrani-Juma H*, Holmwood T*, Zakher E*, deKemp R, **Klein R**, *Dynamic contrast-enhanced CT dose optimization using a perfusion phantom*, RSNA Annual Meeting, 2016.
28. **Klein R**, Razavi S*, Zeng W, Martineau P, Dinning S, Bryanton M, Zuckier LS,

- Validation and optimization of quantitative SPECT-CT*, Eur Assoc Nucl Med 2016.
29. Bazarjani S, Razavi S*, **Klein R**, Zuckier L, Zeng W, Quantification of Normal Sacroiliac Joint to Sacrum Ratio with Tc-99m MDP SPECT/CT in Women, Eur Assoc Nucl Med 2016.
 30. Razavi S*, **Klein R**, Vu DC, Zuckier L, Zeng W, *Quantification of facet joint activity with Tc-99m MDP SPECT-CT*, Eur Assoc Nucl Med 2016.
 31. Razavi S*, Ziebarth B, Zuckier L, **Klein R**, Zeng W, Accuracy, precision and operator-variability of co-registered early CT with delayed SPECT in quantitative parathyroid scans, Eur Assoc Nucl Med 2016.
 32. **Klein R**, Memon R*, Zuckier LS, Quality control of plasma sample ^{99m}Tc-DTPA glomerular filtration rate studies, S. Nucl. Med. Annual Meeting 2016.
 33. Sritharan A*, deKemp RA, Hunter C, Adler A, **Klein R**, *Image decomposition-based heart motion detection for dynamic cardiac PET*, S. Nucl. Med. Annual Meeting, 2016.
 34. Gabrani-Juma H*, Clarkin OJ, DeKemp R, **Klein R**, Optimized ⁸²Rb infusion profile for flow quantification with low count-rate PET system using a physical flow phantom, S. Nucl. Med. Annual Meeting, 2016.
 35. Jones C*, Hunter C, Ruddy TD, **Klein R**, DeKemp, Respiratory gating and phase-matched attenuation correction improves uniformity of regional myocardial blood flow estimates during hypercapnea-induced stress imaging with dynamic rubidium-82 PET, S. Nucl. Med. Annual Meeting, 2016.
 36. Wells RG, Marvin B, Poirier M, DeKemp RA, **Klein R**, Ruddy TD, *Myocardial blood flow measured with a multi-pinhole SPECT camera: in vivo comparison to Rb-82 PET*, S. Nucl. Med. Annual Meeting, 2016.
 37. Chepelev L, **Klein R**, Reiche B*, Chow B, Rybicki FR, Correlating corrected coronary opacification gradients to PET myocardial perfusion: ct angiography in functional assessment of coronary lesions, RSNA Annual Meeting, 2015.
 38. Raubenheimer M, Abele JT, Bain V, Lalonde L, Coulden RA, Al Hulaimi N, Warshawski R, Williams R, deKemp R, Beanlands R, **Klein R**, *Assessment of vasodilatory response to dipyridamole in patients with liver failure undergoing ⁸²Rb-PET/CT myocardial perfusion imaging studies*, RSNA Annual Meeting, 2015.
 39. Ocneanu A*, Adler A, Renaud JM, Beanlands R, deKemp R, **Klein R**, Reproducible tracer injection profile improves the test-retest repeatability of myocardial blood flow quantification with ⁸²Rb PET. S. Nucl. Med. Annual Meeting, 2015.
 40. Brunt N, Arasaratnam P, Renaud J, **Klein R**, Chow B, Beanlands R, deKemp R, *Contrast recovery correction for adverse effects of residual blood-background activity in FDG PET*. S. Nucl. Med. Annual Meeting, 2015.
 41. Gabrani-Juma H*, Clarkin OJ, Pourmoghaddas A, deKemp R, Wells G, **Klein R**, *A novel multi-modality perfusion phantom for nuclear imaging studies*. S. Nucl. Med. Annual Meeting, 2015.
 42. Sritharan A*, deKemp R, Beanlands R, Adler A, **Klein R**, *automatic detection of patient motion using fiducial markers in dynamic cardiac PET images*. S. Nucl. Med. Annual Meeting, 2015.
 43. Ohira H, Beanlands R, McArdle B, deKemp R, Renaud J, **Klein R**, Davies R, Hadizad T, Chandy G, Dominguez VC, Stewart D, Pugliese C, Dunn R, Mielniczuk L, *Evaluation of lung glucose uptake with fluorine-18 fluorodeoxyglucose positron emission tomography/ct in patients with pulmonary artery hypertension and pulmonary*

- hypertension due to left heart disease. JACC, 2015;65(10S):A1150.*
44. H. Ohira, B Mc Ardle, **R. Klein**, R. Davies, R deKemp, E. Pena, J. DaSilva, D. Stewart, G. Chandry, V. Contreras-Dominguez, R. Dunne, R. Beanlands, L. Mielniczuk, *Evaluation of right ventricular metabolism in right heart failure associated with pulmonary arterial hypertension, Can J Cardiol, 2014;30(10):S196*
 45. Dwivedi G, Liu Y, Inacio J, Chong A, **Klein R**, Chow BJ, Incremental prognostic value of quantified vulnerable plaque by cardiac CT: A pilot study, Can J Cardiol, 2014;30(10):S224
 46. Ohira H, Beanlands R, McArdle B, deKemp R, Renaud J, **Klein R**, Davies R, Hadizad T, Chandry G, Contreras Dominiguez V, Stewart D, Pugliese C, Dunne R, Mielniczuk L, *Evaluation of pulmonary glucose metabolism with FDG-PET/CT in patients with pulmonary artery hypertension and pulmonary hypertension due to left heart disease, Can J Cardiol, 2014;30(10):S268*
 47. Sritharan A*, Adler A, deKemp R, Beanlands R, **Klein R**, *Agreement between patient and heart motion during dynamic cardiac PET imaging. S. Nucl. Med. Annual Meeting Abstracts 2014*
 48. Ocneanu A*, Renaud JM, Adler A, Beanlands R, deKemp R, **Klein R**, *Model complexity affects test-retest repeatability of myocardial blood flow measurements with 82Rb PET. S. Nucl. Med. Annual Meeting Abstracts 2014*
 49. Timmins R, **Klein Ran**, Lockwood J, Marvin B, Wei L, deKemp R, Ruddy TD, Wells RG, *Dose reduction for dynamic SPECT imaging of absolute myocardial blood flow. S. Nucl. Med. Annual Meeting Abstracts 2014*
 50. Hunter C, **Klein R**, deKemp R, *Correction for patient body motion in Rb-82 PET-CT: an NCAT simulation study. S. Nucl. Med. Annual Meeting Abstracts 2014*
 51. Renaud JM, Gotfrit R*, Kaster T, Mylonas I, **Klein R**, Beanlands R, deKemp R, *Rubidium-82 PET versus Thallium-201 SPECT for detection of coronary artery disease in the Alternative Radiopharmaceutical for Myocardial Imaging (ARMI) trial. S. Nucl. Med. Annual Meeting Abstracts 2014*
 52. Ohira H, McArdle B, **Klein R**, Davies RA, deKemp R, DaSilva JN, Stewart D, Dunne, R, Beanlands R, Mielniczuk L, *Myocardial fatty acid and glucose metabolism in patients with pulmonary arterial hypertension. S. Nucl. Med. Annual Meeting Abstracts 2014*
 53. deKemp R, **Klein R**, Renaud JM, Garrard L, Wells G, Beanlands R, *Patient age, gender and hemodynamics are independent predictors of myocardial flow reserve as measured with dipyridamole stress PET perfusion imaging. S. Nucl. Med. Annual Meeting Abstracts 2014*
 54. Dwivedi G, Haddad T, Abo-Shasha R, Wells RG, McArdle BA, **Klein R**, Aljizeeri A, Mielniczuk L, Lalonde L, Ruddy T, Beanlands R, Green M, Chow B, Haddad H, *The assessment of mechanical RV dyssynchrony using phase analysis of RNV imaging in subjects with normal and severely reduced LV function, JACC, 2013;61(10S)*
 55. K. Drozd, Y. Deng, B. Jiang, J. Lockwood, S.L. Thorn, R. Klein, D.J. Stewart, R.S. Beanlands, R.A. deKemp, J.N. DaSilva, L.M. Mielniczuk, *Elevated Fatty Acid and Glucose Uptake in Right Ventricle in a Sugen 5416/Hypoxia Rat Model of Severe Pulmonary Artery Hypertension, Can J Cardiol, 2013;29(10):S249*
 56. Chen F, Hou B, Hung G, **Klein R**, deKemp R, Hsu B, *Quantification of myocardial blood flow and coronary flow reserve with an innovative Tc-99m sestamibi dynamic SPECT/CT method: Validation with coronary angiography in a pilot study. RSNA 2013.*

57. Deshayes E, Silva Monteiro M, **Klein R**, DeKemp R, Prior JO, Is one single CT enough for attenuation correction of both rest and stress studies for Rb-82 cardiac pet myocardial blood flow quantitation? EANM 2013.
58. Ohira H, Birnie D, Mc Ardle B, Leung E, Yoshinaga K, Tsujino I, Sato T, Bernick J, Wells G, **Klein R**, Guo A, Garrard L, Ruddy T, Chow B, Davies R, Hessian R, Kingsbury K, Beanlands RSB, Nery P, *Different characteristics of disease detection between 18F-Fluorodeoxyglucose-Positron Emission Tomography (FDG-PET) and Cardiac Magnetic Resonance (CMR) in Patients with Conduction Disease due to Cardiac Sarcoidosis*, Can Cardiovascular Soc, 2013.
59. **Klein R**, Hung G-U, Li D, deKemp R, Hsu B. *Myocardial blood flow (MBF) and coronary flow reserve (CFR) measurement with dynamic SPECT: Operator variability*. S. Nucl. Med. Annual Meeting Abstracts 2013;54(Supplement 2):406.
60. Takobana S*, **Klein R**, Adler A, deKemp R, Beanlands, R, Mielniczuk L, *A spline model for RV myocardium sampling from cardiac PET images*. S. Nucl. Med. Annual Meeting Abstracts 2013;54(Supplement 2):1646.
61. Hunter CR, **Klein R**, deKemp R; Wells RG; Pourmoghaddas A, *Patient body motion affects myocardial blood flow quantification with rubidium-82 PET imaging*. S. Nucl. Med. Annual Meeting Abstracts 2013;54(Supplement 2):541.
62. Croteau E, Archer C; Renaud JM, **Klein R**, DaSilva JN, Beanlands R, deKemp R, *Characterizing coronary endothelial function with C-11-acetate microPET*. S. Nucl. Med. Annual Meeting Abstracts 2013;54(Supplement 2):1656.
63. Orton EJ, Al-Harbi I, **Klein R**; Beanlands R, deKemp R, Wells RG, *Prevalence of extra-cardiac interference in 82Rb PET myocardial perfusion imaging*. S. Nucl. Med. Annual Meeting Abstracts 2013;54(Supplement 2):1689.
64. Renaud, JM, Beanlands R, **Klein R**, deKemp R, *Reproducibility of left ventricular ejection fractions using PET blood flow and metabolism tracers: Rb-82, N-13-ammonia and F-18-FDG*. S. Nucl. Med. Annual Meeting Abstracts 2013;54(Supplement 2):1716.
65. Hung G-U Ljungberg M, **Klein R**, deKemp R, Hsu B, *The Accuracy of Fast Dynamic Cardiac SPECT Acquisition: A Monte Carlo Evaluation*. S. Nucl. Med. Annual Meeting Abstracts 2013;54(Supplement 2):316.
66. Takobana S*, **Klein R**, Adler A, deKemp R, Beanlands, R, Mielniczuk L, *A spline model for RV myocardium sampling from cardiac PET images*. Proceedings of the 11th Annual Imaging Network Ontario Symposium, 2013.
67. Coulden R, **Klein R**, Sonnex, Butler C, *Time-resolved quantitative CT myocardial perfusion compared with quantitative 82Rubidium-PET: a pilot study*. Soc. Of Cardiovascular Computed Tomography Annual Meeting, Baltimore, MD, 2012.
68. Dwivedi G, Al-Shehri H, deKemp RA, Ali I, Alghamdi AA, **Klein R**, Scullion A, Ruddy TD, Beanlands RS, Chow BJW, *Quantitative Scar Imaging using Multislice Computed Tomography versus Metabolic Imaging by F-18 FDG Positron Emission Tomography: A Proof of Concept Study*, Canadian Cardiovascular Society Annual Meeting 2012, Toronto, ON, Canada.
69. Dwivedi G, Al-Shehri H, deKemp RA, Ali I, Alghamdi AA, **Klein R**, Scullion A, Ruddy TD, Beanlands RS, Chow BJW, *Quantitative Scar Imaging using multislice computed tomography versus metabolic imaging by F-18 FDG positron emission tomography: A proof of concept study*, Euro Echo 2012, Athens, Greece.
70. Croteau E, Kordos M, Renaud J, **Klein R**, DaSilva J, Beanlands R, deKemp R,

- Sympathetic stimulation to evaluate the coronary endothelial function in mice with 11C-acetate. Soc. of Nucl. Med. Annual Meeting Abstracts, 2012;53(Supplement 1):1777.*
71. Efseaff M, **Klein R**, Beanlands RSB, deKemp RA, *Short-term repeatability of absolute myocardial blood flow using rubidium-82 PET. Soc. of Nuc. Med. Annual Meeting Abstracts, 2012;53(Supplement 1):1768.*
 72. **Klein R**, Hunter C, Beanlands R, deKemp R, *Prevalence of patient motion in dynamic PET. S. Nucl. Med. Annual Meeting Abstracts, 2011;52(Supplement 2):2105.*
 73. Mackasey KC, Thorn S, Kordos M, Renaud JM, **Klein R**, deKemp RA, Beanlands RS, DaSilva JN, *Increased Cardiac AT₁R in the post ischemic myocardium in a transient left anterior descending artery ligation/reperfusion rat model. Canadian Journal of Cardiology, 2011; 27(5), S307-8*
 74. S. Thorn, J. DaSilva, R. deKemp, C. Moffat, J. Renaud, **R. Klein**, R. Beanlands, M. Harper, M. Gollob, *Abnormal neonate cardiomyocyte metabolism is associated with alterations in adult cardiac metabolism in a mouse model of the Arg302gln-prkg2 cardiac syndrome. Canadian Journal of Cardiology, 2011; 27(5), S123-4*
 75. Mielniczuk LM, Thorn S, Renaud J, **Klein R**, DaSilva J, deKemp RA, Beanlands RB, Stewart DJ, *Right ventricular metabolic imaging in experimental pulmonary artery hypertension. J. Card. Fail., 2011;17(8):S34-35.*
 76. **Klein R**, Yoshinaga K, Katoh C, Adler A, Beanlands R, Tamaki N, deKemp R, *Improved homogeneity of normal MBF using factor analysis with 82Rb PET. Canadian Cardiovascular Society Annual Meeting 2010, Montreal, QC, Canada*
 77. Kenk M, Thorn S, Thomas A, Renaud J, **Klein R**, Lortie M, Beanlands R, deKemp R, DaSilva J, *Increased cardiac phosphodiesterase-4 levels are observed at 8-10 weeks post-myocardial infarction with (R)-[¹¹C]rolipram PET. S. Nucl. Med. Annual Meeting Abstracts 2010;51(Supplement 2):98.*
 78. Manabe O, Yoshinaga K, Katoh C, Naya M, Chiba S, **Klein R**, deKemp R, Tamaki N, *Repeatability of myocardial blood flow measurements with 3D data acquisition using Rubidium-82 PET. S. Nucl. Med. Annual Meeting Abstracts 2010;51(Supplement 2):101.*
 79. Manabe O, Yoshinaga K, Katoh C, Naya M, Chiba S, **Klein R**, deKemp R, Tamaki N, *Quantification of myocardial blood flow with Rubidium-82 3D-data acquisition - Comparison with O-15 labeled water dynamic PET. S. Nucl. Med. Annual Meeting Abstracts 2010;51(Supplement 2):156.*
 80. Renaud J, **Klein R**, DaSilva J, Beanlands R, deKemp R, *Comparison of 3D versus 2D ¹³N-ammonia PET myocardial perfusion imaging. S. Nucl. Med. Annual Meeting Abstracts 2010;51(Supplement 2):157.*
 81. Thorn S, **Klein R**, Renaud J, Dumouchel T, Kordos M, Beanlands R, Gollob M, DaSilva J, deKemp R, *Normal population variability and test-retest reproducibility of mouse heart FDG uptake and SUV with the Siemens Inveon. S. Nucl. Med. Annual Meeting Abstracts 2010;51(Supplement 2):322.*
 82. Yoshinaga K, Manabe O, Katoh C, Naya M, Sakakibara M, Yamada S, deKemp R, **Klein R**, Tsutsui H, Tamaki N, *Additional diagnostic value of regional myocardial blood flow quantification over relative perfusion imaging with Rubidium-82 PET. S. Nucl. Med. Annual Meeting Abstracts 2010;51(Supplement 2):378.*
 83. Dunet V, Allenbach G, **Klein R**, Camus F, Renaud J, Verdun F, deKemp R, Bischof-Delaloye A, Prior J, *Myocardial blood flow quantification with 82Rb cardiac PET/CT: Impact on detection of microvascular and 3-vessel diseases. S. Nucl. Med. Annual*

- Meeting Abstracts 2010;51(Supplement 2):380.
84. **Klein R**, Yoshinaga K, Katoh C, Adler A, Beanlands R, Tamaki N, deKemp R, *Improved homogeneity of normal MBF using factor analysis with ^{82}Rb PET*. S. Nucl. Med. Annual Meeting Abstracts, 2010;51(Supplement 2):1327.
 85. deKemp R, **Klein R**, Renaud J, Beanlands R, *An imaging performance standard for MBF quantification with 3D PET*. S. Nucl. Med. Annual Meeting Abstracts 2010;51(Supplement 2):1372.
 86. Lamoureux M, Thorn S, Dumouchel T, **Klein R**, Renaud JM, Lortie M, Beanlands RS, DaSilva JN, deKemp RA, *Effects of Age with Serial Imaging on Normal resting myocardial blood flow in rats with ^{13}N -ammonia and small animal PET*. Canadian Cardiovascular Society Annual Meeting 2009, Edmonton, AL, Canada.
 87. **Klein R**, Katoh C, Yoshinaga K, Adler A, Beanlands RS, deKemp R, *Evaluation of myocardium to blood pool spillover correction in quantification myocardial blood flow with ^{82}Rb PET*. WMIC 2009, Montreal, QC, Canada.
 88. Thorn S, Kenk M, Renaud JM, **Klein R**, Kordos M, Lockwood J, Mason S, Collins J, Lamoureux M, Beanlands RSB, DaSilva JN, deKemp RA, *Increased FDG uptake in acute peri-infarct area in post-myocardial infarction rats*. WMIC 2009, Montreal, QC, Canada.
 89. Kenk M, Thorn S, Renaud JM, **Klein R**, Kordos MA, Lockwood J, Mason S, Collins J, Lamoureux M, Beanlands RS, DaSilva J, deKemp RA, *Improved myocardial infarct assessment with ^{13}N -ammonia flow quantification in rats*. WMIC 2009, Montreal, QC, Canada.
 90. Lamoureux M, Kordos M, **Klein R**, Renaud JM, Mason S, Beanlands RS, DaSilva JN, deKemp RA, *Normal variability and test-retest reproducibility of myocardial blood flow measurements in mice using C-11 acetate and small animal PET imaging*. S. Nucl. Med. Annual Meeting Abstracts #649, 2009:169P.
 91. Yoshinaga K, Manabe O, Katoh C, Naya M, **Klein R**, deKemp R, Kohanawa M, *Repeatability of regional and hyperimic myocardial blood flow with rubidium-82 dynamic PET*. S. Nucl. Med. Annual Meeting Abstracts #1168, 2009:217P.
 92. Yoshinaga K, Manabe O, Katoh C, Naya M, deKemp R, **Klein R**, Beanlands R, Tamaki N, *Measurement of coronary endothelial function with Rubidium-82 PET – Comparison with oxygen 15-labeled water PET*. J. Nucl. Med. Meeting Abstracts, 2008;49:75
 93. Lamoureux M, Thorn S, **Klein R**, Lortie M, Renaud J, Beanlands R, DaSilva J, deKemp R, *Quantification of myocardial blood flow in rat myocardium with N-13-ammonia and a new microPET scanner*. J. Nucl. Med. Meeting Abstracts, 2008;49:151
 94. deKemp R, Renaud J, **Klein R**, Lortie M, Beanlands R, *Listmode dynamic-static-gated imaging of myocardial flow reserve, perfusion uniformity, and ejection fraction reserve with Rb-82 PET*. J. Nucl. Med. Meeting Abstracts, 2008;49:190
 95. **Klein R**, Bentourkia M, Adler A, DaSilva J, Wassenaar R, Beanlands RS, deKemp RA, *Anatomical accuracy & variability in factor analysis of dynamic structures (FADS) with cardiac ^{18}F FDG PET imaging*. J. Nucl. Med. Meeting Abstracts, 2007;48:408.
 96. **Klein R**, *Automated Quantification of Myocardial Viability with FDG PET*. Imaging Network Ontario 6th Annual Symposium Proceedings, 2007; pp. 7.
 97. Lecomte R, deKemp R, **Klein R**, Cadorette J, Bergeron M, Lepage M, Selivanov V, Tetrault MA, Viscogliosi N, Fontaine R, *LabPETTM: A high-performance APD-based digital PET scanner for small animal imaging*. J. Nucl. Med. Meeting Abstracts,

2006;47:194

98. **Klein R**, Epstein N, Benelfassi A, Beanlands RS, deKemp RA, *A Rubidium-82 Infusion System for Quantitative Perfusion Imaging with 3D PET*. Proceedings of the 3rd Annual Imaging Network Ontario Symposium, 2004:pp 98.
99. **Klein R**, Beauchesne LM, Ruddy TD, Beanlands RS, deKemp RA, *Direct Paired Comparison of Serial Myocardial perfusion scans in normal volunteers and coronary disease patients*. Proceedings of the Society of Nuclear Medicine 51st Annual Meeting, 2004;45(5):239.
100. deKemp RA, Hart R, **Klein R**, Byck C, Berry M, Beanlands RS, Ruddy TD, *Serial changes in perfusion and wall-thickening with gated-stress SPECT and direct paired comparison (DPC) analysis*. J. Nucl. Med. Meeting Abstracts, 2003;44(5):53.

Abstracts Submitted

Invited Contributions and Technical Reports

1. Salman O*, **Klein R**, *Organ segmentation in whole-body PET-CT*, Project final report to Hermes Medical Solutions, 2018.
2. **Klein R**, Zuckier LS, *Hermes in an evolving multi-site organization –The Ottawa Hospital experience*. White paper, Hermes Medical Solutions, 2018
3. Gabrani-Juma H*, **Klein R**, *QuantifyDCE – Flow Quantification validation procedure and manual (including software and tutorials)*, *Software and Operator's Manual*, Shelley Medical Solutions, 2017
4. **Klein R**, Renaud, J, *FlowQuant™ V.2.4.0 User Manual*, 2014.
5. **Klein R**, Renaud, J, *FlowQuant™ V.2.2.0 User Manual*, 2011.
6. **Klein R**, *VolumeViewer User Manual*, 2007.
7. **Klein R**, Renaud, J, *FlowQuant™ v. 2.0.0 User Manual*, 2007.
8. **Klein R**, *⁸²Rb Elution System User Manual*, 2006.
9. **Klein R**, *⁸²Rb Elution System Software Design Documentation*, Internal documentation, 2005.
10. **Klein R**, *⁸²Rb Elution System Hardware Construction Manual*, Internal documentation, 2005.
11. **Klein R**, *⁸²Rb Elution System Quality Assurance and Testing Manual*, Internal documentation 2005.
12. **Klein R**, *Wall-Thickening Extraction from Smoothed PET Scans*, Internal report to the National Cardiac PET Centre, 2003.
13. **Klein R**, *Control System Implementation for the Tower Semiconductor Fabrication Facility Environment and Production Support Systems*, LEAD Controls Co-op report, 2002.
14. **Klein R**, *Development and Comparison of Various Paired Comparisons Techniques*, Internal report to the National Cardiac PET Centre, 2001.
15. **Klein R**, *Detection of Serial Changes in Absolute Myocardial Perfusion with ⁸²Rb PET*, University of Ottawa Heart Institute Co-op report, 2001.

Technology Transfer, Copyrights and Patents**Patents**

Inventors	Name	Assigned to	Country	Filing Date	Patent Number	Grant Date	Status
Lefort E, Teoli V, deKemp RA, Klein R	<i>Rubidium Elution System</i>	Jubilant Draximage, Montreal, QC	Canada	2017-04-13			Pending
			US	2017-04-14			Pending
			EU	2018-04-16			Pending
			Australia	2018-04-13			Pending
			Argentina	2017-04-14			Pending
			Pakistan	2017-04-14			Pending
			Lebanon	2018-04-13	11403	2018-04-16	Granted
			PCT	2017-04-14			Pending
Lefort E, Teoli V, deKemp RA, Klein R	<i>Rubidium Elution System Control</i>	Jubilant Draximage, Montreal, QC	EU	2012-10-26	2893540	2018-01-10	Granted
			EU	2012-10-26	3309796		Pending
			Australia	2012-09-05	2012389470B2	2017-08-31	Granted
			Australia (divisional)	2012-09-05	2017213596B2	2019-02-28	Granted
			Colombia	2012-09-05	31789	2017-06-05	Granted
			Japan	2012-09-05	6148341	2017-05-26	Granted
			Mexico	2012-09-05	351398	2017-10-13	Granted
			China	2012-09-05	201280075656.9	2017-10-24	Granted
			Singapore	2012-09-05	10201701766P	2017-04-27	Granted
			Australia (divisional)	2012-09-05			Pending
			Brazil	2012-09-05			Pending
			Canada	2012-09-05			Pending
			China (divisional)	2012-09-05			Pending
			Japan (divisional)	2012-09-05			Pending
			US	2012-09-05			Pending
			Singapore (divisional)	2012-09-05			Pending
			India	2012-09-05			Pending
			Mexico (divisional)	2012-09-05			Pending
			South Korea	2012-09-05			Pending
			UAE	2012-09-05			Pending
			Chile	2012-09-05			Pending
			Costa Rica	2012-09-05			Pending
			Dominican Republic	2012-09-05			Pending
Peru	2012-09-05			Pending			
Israel	2012-09-05			Pending			
Malaysia	2012-09-05			Pending			

			Hong Kong	2012-09-05			Pending
			Hong Kong	2017-04-14			Pending
			Hong Kong (divisional)	2012-09-05			Pending
deKemp RA, Klein R	<i>Rubidium Elution System Control</i>	Jubilant Draximage, Montreal, QC	US	2006-03-10	7813841	2010-10-12	Granted
			Canada	2006-03-10	2562453	2014-11-18	Granted
			EU	2007-02-26	1996276	2018-08-15	Granted
			India	2007-02-26			Pending

Copyrights

1. deKemp RA, **Klein R**, Epstein N, *RbES*© – *Rb-82 Elution System*. Canadian Intellectual Property Office, Copyright 2003.
2. deKemp RA, **Klein R**, Renaud J, Lortie M, *FlowQuant*© – *Image Analysis Software for Cardiac Positron Emission Tomography (PET)*. Canadian Intellectual Property Office, Copyright 2008.

Technology Transfer

1. deKemp RA, **Klein R**, Renaud J, Myocardial blood flow quantification – technology transfer to Invia Medical Imaging Solutions, Ann Arbor, MI, 2014.
2. FlowQuant© distribution agreement with Siemens Preclinical Solutions, Knoxville, TN, June 2008
3. FlowQuant© distribution agreement with BIOSCAN Inc., Washington DC, October 2010

Media

1. **Klein R**, Enabling Quality Management in Diagnostic Imaging with QATrack+, CAMRT Webinar Series, https://camrt.force.com/CPBase_item?id=a102L000004BL1xQAG, Dec 2018.

Invited Presentations

International

1. **Klein R**, *Advances in SPECT and SPECT/CT Technologies*, Continued Education Session, Society of Nuclear Medicine and Molecular Imaging, Anaheim, CA, June 15, 2020.
2. **Klein R**, *Deep learning in diagnosis, therapy and clinical applications*, Pre-conference symposium, Australian New-Zealand Society of Nuclear Medicine Annual Meeting, Sydney, Australia, April 24, 2020.
3. **Klein R**, *Virtual reality applications in nuclear medicine*, Australian New-Zealand Society of Nuclear Medicine, Sydney, Australia, April 26, 2020.
4. **Klein R**, *Quantification of Lung Lobar Function*, Australian New-Zealand Society of Nuclear Medicine, Sydney, Australia, April 26, 2020.
5. **Klein R**, *⁸²Rb PET myocardial blood flow quantification*, Australian New-Zealand Society of Nuclear Medicine, Sydney, Australia, April 26, 2020.
6. **Klein R**, *Quantification of V/Q Scans*, Continued Education Session, Society of Nuclear Medicine and Molecular Imaging, Anaheim, CA, June 22, 2019.
7. **Klein R**, *Introduction to Virtual Tele Nuclear Medicine*, Continued Education Session,

- Society of Nuclear Medicine and Molecular Imaging, Anaheim, CA, June 23, 2019.
8. **Klein R**, *Rubidium-82 PET: Bang-for-Buck Technology for Steering Cardiac Care*. University of Sao Paulo, Sao Paulo, Brazil, May 23, 2013.
 9. **Klein R**, *Nuclear cardiology image analysis and software development*. Japanese Society of Nuclear Medicine Annual Meeting, Sapporo, Japan, Oct 12, 2012.
 10. **Klein R**, *Myocardial Blood Flow Quantification with FlowQuant*, General-Electric Medical Imaging, Haifa, Israel, Jan 18, 2012.
 11. **Klein R**, *Clinical Application of ^{82}Rb Positron Emission Tomography*. Meir Hospital Scientific Rounds, Kfar-Saba, Israel, Feb 7, 2010.

National

1. **Klein R**, *Artificial intelligence in Nuclear Medicine*, Canadian Association of Medical Radiation Technologists and Ontario Association of Medical Radiation Sciences - Annual General Conference, Ottawa, Ontario, May 28, 2020.
2. **Klein R**, *Myocardial Blood Flow Quantification with Positron Emission Tomography (PET): Making More Available*, Canadian Association of Medical Radiation Technologists and Ontario Association of Medical Radiation Sciences - Annual General Conference, Ottawa, Ontario, Apr 28, 2017.
3. **Klein R**, *Negotiating a first contract – Basic Research*. CCS annual meeting, Vancouver,
4. **Klein R**, *Myocardial Perfusion Imaging*, Canadian Association of Nuclear Medicine: Image Acquisition and Processing, Montreal, Quebec, Jan 30, 2015.
5. BC, Oct 22, 2011.
6. **Klein R**, *Rb-82 generator production, tracer delivery and modeling*, Canadian Society of Nuclear Medicine annual meeting, Quebec, PQ. Apr 27, 2006.

Local

1. **Klein R**, *Quantification in Lung V/Q Scans*, Ontario Association of Medical Radiation Sciences, Ottawa District, Ottawa, Ontario, November 16, 2019.
2. **Klein R**, *The rise of artificial intelligence in medical imaging. And we thought as isotope shortage was disruptive?* Ontario Association of Medical Radiation Sciences, Ottawa District, Ottawa, Ontario, April 19, 2018.
3. **Klein R**, *Squeezing insight out of photons: Emerging technologies in PET/CT and SPECT/CT*, Ontario Association of Medical Radiation Sciences, Ottawa District, Ottawa, Ontario, Nov 5, 2016.
4. **Klein R**, *Myocardial Blood Flow: ^{82}Rb PET is just the beginning*. Ottawa Medical Physics Institute, Ottawa, April 18, 2013.
5. **Klein R**, *Rubidium-82 PET: Bang-for-Buck Technology for Steering Cardiac Care*. IEEE-EMBS Biomedical Engineering Seminar, Carleton University, Ottawa, ON, Jul 15, 2011.

Presentations

International

1. **Klein R**, Beanlands RSB, deKemp RA, *Myocardial blood flow quantification and imaging with ^{82}Rb PET – more information with less radiation*, CRPA 2019.
2. **Klein R**, Nadouri D*, Osler E*, Johnson C, Aseyev O, Zuckier LS, Dent S, Dwivedi G, *Persistent LV diastolic dysfunction abnormalities in breast cancer patients following chemotherapy*, S. Nucl. Med. Annual Meeting, Denver, Colorado, USA, 10-14 June,

- 2017.
3. **Klein R**, Memon R*, Zuckier LS, *Quality control of plasma sample ^{99m}Tc -DTPA glomerular filtration rate studies*, S. Nucl. Med. Annual Meeting, San Diego, California, USA, 11-15 June, 2016.
 4. **Klein R**, Hung G-U, Li D, deKemp R, Hsu B. *Myocardial blood flow (MBF) and coronary flow reserve (CFR) measurement with dynamic SPECT: Operator variability*. S. Nucl. Med. Annual Meeting Abstracts Vancouver, Canada, 8-12 June, 2013.
 5. **Klein R**, Yoshinaga K, Katoh C, Adler A, Beanlands R, Tamaki N, deKemp R, *Improved homogeneity of normal MBF using factor analysis with ^{82}Rb PET*. S. Nucl. Med. Annual Meeting Abstracts, Salt Lake City, Utah, USA 5-9 June, 2010.
 6. **Klein R**, Katoh C, Yoshinaga K, Adler A, Beanlands RS, deKemp R, *Evaluation of myocardium to blood pool spillover correction in quantification myocardial blood flow with ^{82}Rb PET*. WMIC, Montreal, QC, Canada, 23-29 September, 2009.
 7. **Klein R**, Beanlands RS, Adler A, deKemp RA, *Model-based factor analysis of dynamic sequences of cardiac positron emission tomography*. IEEE-NSS-MIC, Dresden, Germany, 19-25 October, 2008.
 8. **Klein R**, Bentourkia M, Beanlands RS, Adler A, deKemp RA, *A Minimal factor overlap method for resolving ambiguity in factor analysis of dynamic cardiac PET*. IEEE-NSS-MIC, Honolulu, Hawaii, USA, 27 Oct- 3 Nov, 2007.
 9. **Klein R**, Bentourkia M, Adler A, DaSilva J, Wassenaar R, Beanlands RS, deKemp RA, *Anatomical accuracy & variability in factor analysis of dynamic structures (FADS) with cardiac ^{18}F FDG PET imaging*. S. Nucl. Med. Annual Meeting Abstracts, Washington DC, USA 2-7 June, 2007.
 10. **Klein R**, Lortie M, Adler A, Beanlands RS, deKemp RA, *Fully Automated Software for Polar-Map Registration and Sampling from PET images*. IEEE-NSS-MIC, San Diego, CA, USA, 29 Oct – 4 Nov, 2006.
 11. **Klein R**, Adler A, Beanlands RS, deKemp RA, *Precision control of eluted activity from a Sr/Rb generator for cardiac positron emission tomography*. IEEE-EMBS, San Francisco, California, USA, 1-4 September, 2004.

National

12. **Klein R**, Yoshinaga K, Katoh C, Adler A, Beanlands R, Tamaki N, deKemp R, *Improved homogeneity of normal MBF using factor analysis with ^{82}Rb PET*. Canadian Cardiovascular Conference, Montreal, QC, Canada, 23-27 October, 2010.

Local

13. **Klein R**, *Automated Quantification of Myocardial Viability with FDG PET*. Imaging Network Ontario Annual Symposium, Toronto, ON, Canada, March, 2007.
14. **Klein R**, Epstein N, Benelfassi A, Beanlands RS, deKemp RA, *A Rubidium-82 Infusion System for Quantitative Perfusion Imaging with 3D PET*. Annual Imaging Network Ontario Symposium, Toronto, ON, Canada, March, 2004.

Open Source Software

1. **Klein R**, *View4D* – 3D and 4D data visualization tool for Matlab, 2013.
2. **Klein R**, *Bland-Altman and Correlation Plot* – Generates correlation and Bland-Altman figures and parameters of grouped data for Matlab, 2014.
3. **Klein R**, *VolViewer* – 3D and 4D data visualization tool for Matlab, 2014.

SIGNATURE

A handwritten signature in black ink, appearing to read 'R. Klein', with a long horizontal flourish extending to the right.

DATE: March 2, 2020