

**BIOGRAPHICAL SKETCH**

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**NAME:** Carr, John Jeffrey**eRA COMMONS USER NAME (agency login):** JEFFCARR**POSITION TITLE:** Cornelius Vanderbilt Professor in Radiological Sciences, Cardiovascular Medicine and Biomedical Informatics**EDUCATION/TRAINING** (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Vanderbilt University, Nashville, TN	AB	05/1985	Biology & Chemistry, Magna Cum Laude
Vanderbilt University, Nashville, TN	MD	05/1989	Medicine, Dean's Award
Wake Forest University, Winston-Salem, NC	MS	05/1998	Clinical Epidemiology
Wake Forest Baptist Medical Center, Winston-Salem, NC	Resident	06/1993	Diagnostic Radiology
Hospital of the University of Pennsylvania, Philadelphia, PA	Fellow	08/1994	Body & Cardiovascular MRI

**A. Personal Statement**

I am a cardiovascular clinician-scientist with a research focus on developing and implementing imaging biomarkers to improve health. I have training in diagnostic radiology and clinical epidemiology. Current projects include using near-isotropic CT scans to measure coronary plaque, vascular remodeling and perivascular adipose tissue as novel predictors of coronary heart disease. I have been the principal investigator/leader of core laboratories that have utilized CT, MRI and ultrasound for several NIH support population and genetic studies including: CARDIA, TOBAGO, Jackson Heart Study, Family Heart Study and Diabetes Heart Study. Relevant to this proposal I have extensive clinical and research experience relative to subclinical markers of disease. These include imaging biomarkers such as calcified plaque, vascular inflammation (vessel remodeling) as well as measures of body composition (lean, fat and bone mass). I have formal training and experience in both research methods and analysis as relates to population based datasets as proposed.

1. Freedman BI, Divers J, Whitlow CT, Bowden DW, Palmer ND, Smith SC, Xu J, Register TC, Carr JJ, Wagner BC, Williamson JD, Sink KM, Maldjian JA. Subclinical Atherosclerosis Is Inversely Associated With Gray Matter Volume in African Americans With Type 2 Diabetes. *Diabetes Care*. 2015 Nov;38(11):2158-65. PubMed PMID: [26370382](#); PubMed Central PMCID: [PMC4613911](#).
2. Criqui MH, Denenberg JO, Ix JH, McClelland RL, Wassel CL, Rifkin DE, Carr JJ, Budoff MJ, Allison MA. Calcium density of coronary artery plaque and risk of incident cardiovascular events. *JAMA*. 2014 Jan 15;311(3):271-8. PubMed PMID: [24247483](#); PubMed Central PMCID: [PMC4091626](#).
3. Yeboah J, McClelland RL, Polonsky TS, Burke GL, Sibley CT, O'Leary D, Carr JJ, Goff DC, Greenland P, Herrington DM. Comparison of novel risk markers for improvement in cardiovascular risk assessment in intermediate-risk individuals. *JAMA*. 2012 Aug

22;308(8):788-95. PubMed PMID: [22910756](#); PubMed Central PMCID: [PMC4141475](#).

4. Detrano R, Guerci AD, Carr JJ, Bild DE, Burke G, Folsom AR, Liu K, Shea S, Szklo M, Bluemke DA, O'Leary DH, Tracy R, Watson K, Wong ND, Kronmal RA. Coronary calcium as a predictor of coronary events in four racial or ethnic groups. *N Engl J Med*. 2008 Mar 27;358(13):1336-45. PubMed PMID: [18367736](#).

## **B. Positions and Honors**

### **Positions and Employment**

- 1985 - 1987 Research Assistant - PI: Lynda J. Van Eldik, PhD, Howard Hughes Medical Institute (Vanderbilt), Nashville, TN
- 1993 - 1994 Instructor in Radiology, University of Pennsylvania School of Medicine, Philadelphia, PA
- 1994 - 2001 Assistant Professor of Radiology, Wake Forest University Health Sciences, Winston Salem, NC
- 2001 - 2006 Associate Professor of Radiology and Public Health Sciences, Wake Forest University Health Sciences, Winston Salem, NC
- 2004 - 2010 Vice Chair Clinical Research, Radiology, Wake Forest University Health Science, Winston Salem, NC
- 2006 - 2013 Professor of Radiology, Cardiology and Public Health Sciences, , Wake Forest University Health Science, Winston Salem, NC
- 2008 - 2013 Affiliate, Maya Angelou Center for Health Equity, Wake Forest University Health Science, Winston Salem, NC
- 2009 - 2012 Director, Center for Biomedical Informatics, Wake Forest University Health Science, Translational Science Institute, Winston Salem, NC
- 2013 - Cornelius Vanderbilt Professor in Radiological Sciences, Cardiovascular Medicine and Biomedical Informatics, Vanderbilt University, Nashville, TN

### **Other Experience and Professional Memberships**

- 1986 - Member, Radiological Society of North America
- 1991 - Member, American Roentgen Ray Society
- 1994 - Fellow, American College of Radiology
- 1999 - Fellow, American Heart Association
- 2005 - Fellow, Society of Cardiovascular Computed Tomography
- 2005 - Fellow, American College of Cardiology
- 2012 - Member, American Medical Informatics Association
- 2013 - 2014 President, Society of Cardiovascular Computed Tomography(SCCT)
- 2015 - Member, Medicare Evidence Development & Coverage Advisory Committee (MEDCAC), Center for Medicare & Medicaid Services (CMS)

### **Honors**

- 1985 BA, Magnum Cum Laude, Vanderbilt University
- 1989 Dean's Award, Vanderbilt School of Medicine
- 1991 Gold Medal Award , 91st Annual Meeting American Roentgen Ray Society
- 2015 Distinguished Investigator Award, Academy of Radiology Research

## **C. Contribution to Science**

1. Conventional chest radiographs are the most common radiographic exam world-wide. This research changed practice by showing: (1)that digital radiographs have equal or greater diagnostic accuracy than analog film radiographs for pneumothorax; and (2)the lateral

decubitus view is superior to the upright or supine position radiograph for detecting pneumothorax. Validating digital portable chest radiographs for pneumothorax detections was a critical step in moving translating what at the time was novel technology into widespread clinical practice.

- a. Carr JJ, Reed JC, Choplin RH, Pope TL Jr, Case LD. Plain and computed radiography for detecting experimentally induced pneumothorax in cadavers: implications for detection in patients. *Radiology*. 1992 Apr;183(1):193-9. PubMed PMID: [1549671](#).
2. Spiral or helical CT scanners, now known as multi-detector CT, can image the coronary arteries and measure coronary artery calcium(CAC) comparable to electron beam CT. Electron beam CT had previously been the only method for measuring CAC; but availability was limited with <50 systems in the entire US. The use of multi detector CT scanners allowed measurement of coronary artery calcification on scanners found in most hospitals. This validation allowed more robust evaluation of CAC in population based studies including diverse populations, including Women's Health Initiative, MESA, CARDIA, Jackson Heart Study, and Family Heart Study.
  - a. Carr JJ, Crouse JR 3rd, Goff DC Jr, D'Agostino RB Jr, Peterson NP, Burke GL. Evaluation of subsecond gated helical CT for quantification of coronary artery calcium and comparison with electron beam CT. *AJR Am J Roentgenol*. 2000 Apr;174(4):915-21. PubMed PMID: [10749222](#).
  - b. Carr JJ, Nelson JC, Wong ND, McNitt-Gray M, Arad Y, Jacobs DR Jr, Sidney S, Bild DE, Williams OD, Detrano RC. Calcified coronary artery plaque measurement with cardiac CT in population-based studies: standardized protocol of Multi-Ethnic Study of Atherosclerosis (MESA) and Coronary Artery Risk Development in Young Adults (CARDIA) study. *Radiology*. 2005 Jan;234(1):35-43. PubMed PMID: [15618373](#).
  - c. Manson JE, Allison MA, Rossouw JE, Carr JJ, Langer RD, Hsia J, Kuller LH, Cochrane BB, Hunt JR, Ludlam SE, Pettinger MB, Gass M, Margolis KL, Nathan L, Ockene JK, Prentice RL, Robbins J, Stefanick ML. Estrogen therapy and coronary-artery calcification. *N Engl J Med*. 2007 Jun 21;356(25):2591-602. PubMed PMID: [17582069](#).
  - d. Detrano R, Guerci AD, Carr JJ, Bild DE, Burke G, Folsom AR, Liu K, Shea S, Szklo M, Bluemke DA, O'Leary DH, Tracy R, Watson K, Wong ND, Kronmal RA. Coronary calcium as a predictor of coronary events in four racial or ethnic groups. *N Engl J Med*. 2008 Mar 27;358(13):1336-45. PubMed PMID: [18367736](#).
3. Pericardial adipose tissue is an important predictor of coronary artery calcification and cardiovascular disease events. Prior studies had suggested that abdominal visceral adipose tissue was active in glucose and lipid metabolism pathways and also a contributor to cardiovascular disease risk, but the role of visceral adipose tissue was often explained by associated risk factors. Pericardial adipose tissue is an ectopic deposition related to visceral fat, but in direct contact with the coronary arteries and cardiac muscle. Our laboratory developed a non-contrast CT protocol and analysis platform for measuring pericardial adipose tissue in large population studies. Consequently, these methods have been used to show that pericardial adipose tissue independently contributes to risk of cardiovascular events.
  - a. Wheeler GL, Shi R, Beck SR, Langefeld CD, Lenchik L, Wagenknecht LE, Freedman BI, Rich SS, Bowden DW, Chen MY, Carr JJ. Pericardial and visceral adipose tissues measured volumetrically with computed tomography are highly associated in type 2 diabetic families. *Invest Radiol*. 2005 Feb;40(2):97-101. PubMed PMID: [15654254](#).
  - b. Ding J, Kritchevsky SB, Hsu FC, Harris TB, Burke GL, Detrano RC, Szklo M, Criqui MH, Allison M, Ouyang P, Brown ER, Carr JJ. Association between non-subcutaneous adiposity and calcified coronary plaque: a substudy of the Multi-Ethnic Study of Atherosclerosis. *Am J Clin Nutr*. 2008 Sep;88(3):645-50. PubMed PMID: [18779279](#); PubMed Central PMCID:

[PMC3282464](#).

- c. Ding J, Hsu FC, Harris TB, Liu Y, Kritchevsky SB, Szklo M, Ouyang P, Espeland MA, Lohman KK, Criqui MH, Allison M, Bluemke DA, Carr JJ. The association of pericardial fat with incident coronary heart disease: the Multi-Ethnic Study of Atherosclerosis (MESA). *Am J Clin Nutr*. 2009 Sep;90(3):499-504. PubMed PMID: [19571212](#); PubMed Central PMCID: [PMC2728641](#).
  - d. Liu J, Fox CS, Hickson D, Sarpong D, Ekunwe L, May WD, Hundley GW, Carr JJ, Taylor HA. Pericardial adipose tissue, atherosclerosis, and cardiovascular disease risk factors: the Jackson heart study. *Diabetes Care*. 2010 Jul;33(7):1635-9. PubMed PMID: [20413524](#); PubMed Central PMCID: [PMC2890373](#).
4. Use of CT to measure body composition phenotypes in clinical trials and epidemiologic research studies. Our laboratory has contributed to expanded scientific knowledge through the development of CT scanning techniques and analysis protocols used to measure ectopic adipose tissues, bone, and peripheral artery calcifications in epidemiologic studies of cardiovascular disease risk. We have also developed tools and techniques to measure changes in body composition changes in clinical intervention trials.
- a. Nicklas BJ, Wang X, You T, Lyles MF, Demons J, Easter L, Berry MJ, Lenchik L, Carr JJ. Effect of exercise intensity on abdominal fat loss during calorie restriction in overweight and obese postmenopausal women: a randomized, controlled trial. *Am J Clin Nutr*. 2009 Apr;89(4):1043-52. PubMed PMID: [19211823](#); PubMed Central PMCID: [PMC2667455](#).
  - b. Shea MK, Nicklas BJ, Marsh AP, Houston DK, Miller GD, Isom S, Miller ME, Carr JJ, Lyles MF, Harris TB, Kritchevsky SB. The effect of pioglitazone and resistance training on body composition in older men and women undergoing hypocaloric weight loss. *Obesity (Silver Spring)*. 2011 Aug;19(8):1636-46. PubMed PMID: [21233810](#); PubMed Central PMCID: [PMC3091968](#).
  - c. Messier SP, Mihalko SL, Legault C, Miller GD, Nicklas BJ, DeVita P, Beavers DP, Hunter DJ, Lyles MF, Eckstein F, Williamson JD, Carr JJ, Guermazi A, Loeser RF. Effects of intensive diet and exercise on knee joint loads, inflammation, and clinical outcomes among overweight and obese adults with knee osteoarthritis: the IDEA randomized clinical trial. *JAMA*. 2013 Sep 25;310(12):1263-73. PubMed PMID: [24065013](#); PubMed Central PMCID: [PMC4450354](#).
  - d. Murphy RA, Register TC, Shively CA, Carr JJ, Ge Y, Heilbrun ME, Cummings SR, Koster A, Nevitt MC, Satterfield S, Tylvasky FA, Strotmeyer ES, Newman AB, Simonsick EM, Scherzinger A, Goodpaster BH, Launer LJ, Eiriksdottir G, Sigurdsson S, Sigurdsson G, Gudnason V, Lang TF, Kritchevsky SB, Harris TB. Adipose tissue density, a novel biomarker predicting mortality risk in older adults. *J Gerontol A Biol Sci Med Sci*. 2014 Jan;69(1):109-17. PubMed PMID: [23707956](#); PubMed Central PMCID: [PMC3859360](#).

## D. Research Support

### Ongoing Research Support

R01 HL098445-05 Carr, John Jeffrey (PI) 08/01/10-03/31/16

Longitudinal Changes in Pericardial Adiposity and Subclinical Atherosclerosis

Role: PI

R01 DK 097084, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

Miljkovic, Iva (PI) 12/01/12-11/30/17

Skeletal Muscle Adiposity in Black Men with High Type 2 Diabetes Risk – TOBAGO

Through a subcontract with the University of Pittsburgh, the Vanderbilt CT Reading Center will analyze 1600 CT scans from subjects in the Tobago study for coronary artery calcium, aortic

artery calcium, abdominal adipose tissue volumes, abdominal muscle volumes and composition, pericardial adipose tissue, and liver attenuation.

Role: Co-Investigator

### **Completed Research Support**

R01 HL 093009 , National Heart, Lung and Blood Institute (NHLBI) Carr, John Jeffrey (PI)  
01/12/12-11/30/15

Mediators of Atherosclerosis in South Asians Living in America (MASALA)

In the MASALA study, the Vanderbilt CT Reading Center (CTRC) will receive CT images in DICOM format. We will archive images to a secure research PACS, analyze the images for pericardial adipose tissue (PAT), epicardial adipose tissue and liver attenuation (i.e. steatosis), perform quality control activities, and report results as directed based on the provided identifier in the DICOM header. The CTRC will also fully participate in data interpretation and publication of study findings.

Role: Co-Investigator

R24 HL 085343, National Heart, Lung and Blood Institute (NHLBI) Winslow, Rai (PI) 07/01/10-11/15/15

The Cardiovascular Research Grid - The Cardiovascular Research Grid (CVRG)

The Cardiovascular Research Grid - The Cardiovascular Research Grid (CVRG) Project is a national resource providing the capability to store, manage, and analyze data on the structure and function of the cardiovascular system in health and disease. The Wake Forest team will develop an imaging informatics platform that will enhance the ability to explore and analyze data to understand the cause and treatment of heart disease. Role: subcontract co-PI with Yaorong Ge

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Role: Co-Investigator