

PROMOTION RECOMMENDATION  
UNIVERSITY OF MICHIGAN  
MEDICAL SCHOOL  
DEPARTMENT OF RADIOLOGY

Ruth C. Carlos, M.D., associate professor of radiology, with tenure, Department of Radiology, Medical School, is recommended for promotion to professor of radiology, with tenure, Department of Radiology, Medical School.

Academic Degrees:

M.S.	2001	University of Michigan
M.D.	1993	Pritzker School of Medicine, University of Chicago
B.S.	1989	University of Chicago

Professional Work:

2006-present	Associate Professor of Radiology, University of Michigan
2001-2006	Assistant Professor of Radiology, University of Michigan
1999-2001	Lecturer, Department of Internal Medicine, University of Michigan
1998-2001	Lecturer, Department of Radiology, University of Michigan

Summary of Evaluation:

Teaching: Dr. Carlos participates in all aspects of the Department of Radiology educational program. She provides teaching to medical students, radiology residents and fellows in abdominal radiology through formal presentations at noon conferences and on-the-job-training on the clinical services. Dr. Carlos has taken a leadership position in the development of research faculty in the Department of Radiology. She created a program for up to four faculty per year to foster clinical research, technology assessment and health services research. The program combined formal didactic lectures and intensive one-on-one mentoring sessions with the goal of producing a competitive career development grant application. Since 2006, six of the ten participants have received career development awards and an additional three have submitted grant applications. The quality of Dr. Carlos' teaching is very good. Radiology residents rank her at the mean of the department for the quality of her teaching on the clinical service. Comments include "great to work with" and "really knows her MRI. Takes time to teach with each case."

Research: Although Dr. Carlos' subspecialty training has been in abdominal imaging, she has focused her research on comparative effectiveness and methodologies that support evidence based imaging practices. In order to improve the appropriateness of medical imaging, Dr. Carlos and colleagues addressed one of the most common imaging challenges, the solitary pulmonary nodule. They demonstrated that there was little difference in the specificity or sensitivity among

commonly used imaging modalities and suggested that the best choice should be determined by a combination of local patient access, available expertise and cost. Dr. Carlos and colleagues expanded this work with the use of positive and negative predicted values. They suggested the use of a nomogram combining patient characteristics, lesion characteristics and test characteristics to determine the post-test probability of malignancy. Dr. Carlos has also investigated the use of imaging for staging, especially sentinel node mapping and biopsy as an alternative for treatment planning compared to the more invasive axillary node dissection for patients with breast cancer. While iodinated contrast media are an important component of many diagnostic radiology examinations, especially CT, they are also associated with contrast induced renal failure. Dr. Carlos and colleagues performed a meta-analysis to evaluate the use of renal protective agents. Among 41 randomized clinical trials involving 6,379 patients, only N-acetylcysteine significantly reduced the risk of contrast induced nephropathy. This review is an important contribution to our understanding and ability to prevent contrast nephropathy.

#### Recent and Significant Publications:

Cronin P, Dwamena BA, Kelly AM, Carlos RC: Solitary pulmonary nodules: Meta-analytic comparison of cross-sectional imaging modalities for diagnosis of malignancy. *Radiology* Jan 30, 2008. [Epub ahead of print]

Cronin P, Dwamena BA, Kelly AM, Bernstein SJ, Carlos RC: Solitary pulmonary nodules and masses: a meta-analysis of the diagnostic utility of alternative imaging tests. *Eur Radiol* 18: 1840-1856, 2008. Epub

Nandalur KR, Dwamena BA, Choudhri AF, Nandalur MR, Carlos RC: Diagnostic performance of stress cardiac magnetic resonance imaging in the detection of coronary artery disease: a meta-analysis. *J Am Coll Cardiol* 50:1343-1353, 2007.

Kelly AM, Dwamena B, Cronin P, Carlos RC: Breast Cancer: Sentinel node identification and classification after neoadjuvant chemotherapy – systematic review and meta analysis. *Acad Radiol*. 16:551-563, 2009.

Kelly AM, Dwamena B, Cronin P, Bernstein SJ, Carlos RC: Meta-analysis: Effectiveness of drugs for preventing contrast-induced nephropathy. *Ann Intern Med* 148:284-294, 2008.

Service: Dr. Carlos provides extensive service both locally and nationally. At the University of Michigan, she has served on a number of committees, both within the Department of Radiology and within the Medical School. She has been most valuable as a mentor for trainees and junior faculty in obtaining their first external funded awards. These include both NIH training grants as well as society/foundation scholarship awards. More recently, Dr. Carlos has been appointed as assistant research director in the Department of Radiology, focusing on clinical research and faculty development. On a national level, Dr. Carlos is actively involved with most of our major radiology organizations. The Radiological Society of North America (RSNA) is the largest radiology society with an annual meeting of 60,000 participants. Dr. Carlos serves as the chair

of the Scientific Program Committee Subcommittee for Health Services Research. She has also served the RSNA as a faculty in two of their ongoing programs, "Introduction to Academic Radiology" and "Writing a Competitive Grant Proposal." She serves the American College of Radiology as a representative to the National Quality Forum, as an in-service exam question writer, and as a member of the editorial board of the *Journal of the American College of Radiology*. She has served the American Roentgen Ray Society (ARRS) in multiple capacities, including chair of the Publications Committee and chair of the Roentgen Fund Research Subcommittee. This year, she became a member of the Executive Council of the ARRS which is its governing board. As a health services researcher Dr. Carlos has contributed much of her service work to the Radiology Alliance for Health Services Research. She has served in multiple capacities, including president. RAHSR is one of the umbrella organizations of the Association of University Radiologists (AUR) and Dr. Carlos is active within this organization as well. She is a member of the board of directors, is currently secretary and will become president in 2012.

#### External Review:

Reviewer A: "Her primary areas of scientific exploration involve technology assessment and comparative effectiveness research. She is considered a leader in those fields and is highly respected among her peers....She has numerous awards and has mentored quite a few residents, fellows and junior faculty over the years. Dr. Carlos is actively involved in reviewing papers for a number of prestigious journals and has served or is currently serving on a number of national committees. Her reputation for teaching is excellent."

Reviewer B: "Dr. Carlos is also extremely committed to education, particularly through her development and leadership of the Faculty Development Program at the University of Michigan Department of Radiology. She has mentored several [junior] investigators, as evidenced by her role as senior author on many of their papers."

Reviewer C: "...I believe Dr. Carlos is among a small handful of clinical researchers [in her cohort] in radiology with the expertise, assertiveness, and interest to make significant advances in directing the specialty about how to most appropriately employ its technology. She is a funded researcher with limitless potential."


Reviewer D: "Dr. Carlos is a clinical abdominal imaging radiologist who also has national and international reputations in her area of research expertise – comparative effectiveness/evidence-based imaging practices. She is one of a handful of true experts in this area....I have no doubt that she would be promoted to Professor of Radiology here [at my institution]. The University of Michigan is lucky to have such an exceptional person on its faculty."

Reviewer E: "...Dr. Carlos has been a driving influence in a number of societies. She is currently the Secretary of the Association of University Radiologists, and is scheduled to ascend to the Presidency of this organization. This is a leading organization for academic radiology, tackling questions and issues in education, research, and leadership in academic radiology....Dr. Carlos is one of the most accomplished academic radiologists in the field of health services research, and has clearly established herself as an international expert and leader."

Reviewer F: "...Dr. Carlos is an extremely accomplished and impressive physician-scientist who is making very important contributions to the highly contemporary fields of comparative effectiveness research and health care policy."

Summary of Recommendation:

A well trained diagnostic radiologist, an innovative educator, and an accomplished investigator, Dr. Carlos is an outstanding faculty at the University of Michigan. I am pleased to recommend Ruth C. Carlos, M.D. for promotion to professor, with tenure, in the Department of Radiology.



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James O. Woolliscroft, M.D.

Dean

*Lyle C. Roll Professor of Medicine*

May 2011