

acteristics and risk taking ( $P = .32$ ), stress from uncertainty ( $P = .30$ ), and malpractice fear ( $P = .26$ ) were not predictive of head CT use. Even after controlling for the patient factors, physician identity was still strongly associated with head CT use ( $P < .001$ ), suggesting that significant variation in head CT use exists among physicians.

**Comment.** We found significant variation in head CT use for ED trauma patients that was not explained by patient factors and was not associated with physician risk tolerance or malpractice fear. Variation in head CT use by ED physicians has been demonstrated previously,<sup>8,9</sup> but not specifically for ED trauma patients. Because well-validated decision rules are available to guide imaging for patients with mild traumatic brain injury, this suggests that an opportunity for quality improvement exists.

The lack of association between physician risk tolerance and head CT use contrasts with prior findings of physician risk aversion being associated with increased use of diagnostic imaging and health care resources.<sup>3-5,7</sup> One reason for this discrepancy may be the shared decision making involved in the care of ED patients at our academic center, which, at a minimum, includes either a resident physician or physician assistant in addition to the attending physician. For patients with trauma team activation, the surgical trauma service and possibly other consulting services may be involved. Because this study measured only the risk tolerance of ED attending physicians, its impact on use may have been diluted by the influence of other decision makers. Initiatives to reduce variation and inappropriate imaging for ED trauma patients should consider all decision makers involved in patient care and might ultimately require institution-level support for clinical decision rules or appropriateness measures.

James E. Andruchow, MD, MSc  
Ali S. Raja, MD, MBA, MPH  
Luciano M. Prevedello, MD, MPH  
Richard D. Zane, MD  
Ramin Khorasani, MD, MPH

**Published Online:** March 26, 2012. doi:10.1001/archinternmed.2011.2243

**Author Affiliations:** Center for Evidence-Based Imaging (Drs Andruchow, Raja, Prevedello, Zane, and Khorasani) and Departments of Radiology (Drs Prevedello and Khorasani) and Emergency Medicine (Drs Andruchow, Raja, and Zane), Brigham and Women's Hospital, and Harvard Medical School (Drs Andruchow, Raja, Prevedello, Zane, and Khorasani), Boston, Massachusetts.

**Correspondence:** Dr Andruchow, Brigham and Women's Hospital Center for Evidence-Based Imaging, 20 Kent St, Second Floor, Brookline, MA 02445 (jandruchow@partners.org).

**Author Contributions:** *Study concept and design:* Andruchow, Raja, Zane, and Khorasani. *Acquisition of data:* Andruchow, Raja, and Prevedello. *Analysis and interpretation of data:* Andruchow, Raja, Zane, and Khorasani. *Drafting of the manuscript:* Andruchow, Raja, Zane, and Khorasani. *Critical revision of the manuscript for important intellectual content:* Andruchow, Raja, Prevedello, and

Khorasani. *Statistical analysis:* Andruchow, Raja, and Prevedello. *Obtained funding:* Raja and Khorasani. *Administrative, technical, and material support:* Khorasani. *Study supervision:* Raja, Zane, and Khorasani. **Financial Disclosure:** None reported.

1. Studdert DM, Mello MM, Sage WM, et al. Defensive medicine among high-risk specialist physicians in a volatile malpractice environment. *JAMA*. 2005; 293(21):2609-2617.
2. Katz DA, Williams GC, Brown RL, et al. Emergency physicians' fear of malpractice in evaluating patients with possible acute cardiac ischemia. *Ann Emerg Med*. 2005;46(6):525-533.
3. Pines JM, Isserman JA, Szyld D, Dean AJ, McCusker CM, Hollander JE. The effect of physician risk tolerance and the presence of an observation unit on decision making for ED patients with chest pain. *Am J Emerg Med*. 2010;28(7):771-779.
4. Pines JM, Hollander JE, Isserman JA, et al. The association between physician risk tolerance and imaging use in abdominal pain. *Am J Emerg Med*. 2009; 27(5):552-557.
5. Wong AC, Kowalenko T, Roahen-Harrison S, Smith B, Maio RF, Stanley RM. A survey of emergency physicians' fear of malpractice and its association with the decision to order computed tomography scans for children with minor head trauma. *Pediatr Emerg Care*. 2011;27(3):182-185.
6. Raja AS, Andruchow JE, Zane R, Khorasani R, Schuur JD. Use of Neuroimaging in US Emergency Departments. *Arch Intern Med*. 2011;171(3):259-262.
7. Baskerville JR, Herrick J. Head multidetector computed tomography: emergency medicine physicians overestimate the pretest probability and legal risk of significant findings. *Am J Emerg Med*. 2012;30(2):367-370.
8. Kirsch TD, Hsieh Y-H, Horana L, Holtzclaw SG, Silverman M, Chanmugam A. Computed tomography scan utilization in emergency departments: a multi-state analysis. *J Emerg Med*. 2011;41(3):302-309.
9. Prevedello LM, Raja AS, Zane RD, et al. Variation in use of head computed tomography by emergency physicians [published online February 10, 2012]. *Am J Med*. doi:10.1016/j.amjmed.2011.06.023.

## Treatment Intensity at the End of Life in Older Adults Receiving Long-term Dialysis

Life expectancy after the initiation of long-term dialysis is often severely limited in the elderly,<sup>1</sup> and it is becoming increasingly clear that many older patients who are receiving dialysis experience a significant burden of concomitant illness,<sup>2</sup> functional limitation,<sup>3</sup> and symptoms.<sup>4</sup> Such considerations have fostered a growing interest in end-of-life care and advanced care planning in this population.

Relatively little is known about the contemporary patterns and determinants of end-of-life care among older patients who are receiving long-term dialysis. Available data indicate that hospice referral is infrequent in this population and that rates of hospice referral and dialysis discontinuation vary substantially across regions.<sup>5</sup> To our knowledge, detailed information on other aspects of health care utilization at the end of life, including hospitalization, intensive care unit (ICU) admission, and use of intensive procedures, has not been reported for this population. Herein, we present the results of a retrospective mortality study to characterize the end-of-life care practices among older Medicare beneficiaries who are receiving long-term dialysis.

**Methods.** Using data from the United States Renal Data System (USRDS), a comprehensive registry for end-stage renal disease (ESRD), we identified 99 329 fee-for-service Medicare patients aged 65 years and older who initiated long-term dialysis between January 1, 2004, and Decem-

**Table. Intensity of Care During the Final Month of Life**

Intensity of Care	Medicare Beneficiaries		
	Dialysis (Present Study)	Cancer <sup>7</sup>	Heart Failure <sup>8,9</sup>
Hospitalization, %	76.0	61.3	64.2
Days hospitalized, mean	9.8	5.1	NA
Intensive care unit admission, %	48.9	24.0	19.0
Days in an intensive care unit, mean	3.5	1.3	NA
Any intensive procedure, %	29.0	9.0	NA
Hospice use, %	20.0	55.0	39.1
Death in a hospital, %	44.8	29.0	35.2

Abbreviation: NA, not available.

ber 31, 2007, and died before January 1, 2009. Information regarding their sociodemographic background, coexisting illnesses at onset of dialysis, primary cause of ESRD, primary cause of death, and whether they were referred to hospice before death was extracted from USRDS files. This study was approved by the institutional review board at the University of Washington, Seattle.

Using inpatient and outpatient Medicare claims supplied by the USRDS, we ascertained information on hospitalization, ICU admission, and use of the following intensive procedures during the final month of life: mechanical ventilation, feeding tube placement, and cardiopulmonary resuscitation. Patients were assigned to a hospital referral region based on their zip code at the onset of ESRD. We used an end-of-life care expenditure index (EOL-EI) based on deaths between 2000 and 2003 from the *Dartmouth Atlas of Health Care* (<http://www.dartmouthatlas.org/>) to characterize each region's level of health care spending among older Medicare beneficiaries during the last 6 months of life.<sup>6</sup> Regions were categorized into quintiles of EOL-EI, with the first quintile representing regions with the lowest EOL-EI; and the fifth quintile, regions with the highest. Using multivariate logistic regression, we measured the association of individual patient characteristics and quintile of EOL-EI with hospitalization, ICU admission, and use of intensive procedures during the final month of life.

**Results.** Altogether, 76.0% of patients were hospitalized, 48.9% were admitted to an ICU, and 29.0% received at least 1 intensive procedure during the final month of life. The most common procedure was mechanical ventilation (22.2%), followed by cardiopulmonary resuscitation (11.9%) and feeding tube placement (3.9%).

In adjusted analyses, use of intensive procedures was more common among patients who were black (40.9% vs 35.6%; odds ratio [OR], 1.68; 95% CI, 1.61-1.76), who were 75 years or younger (34.7% vs 24.8%; OR, 1.48; 95% CI, 1.43-1.54), and who died of cardiovascular causes (35.4% vs 25.2%; OR, 1.39; 95% CI, 1.34-1.44). Use of intensive procedures did not differ greatly by sex, cause of ESRD, comorbid illness, or duration on long-term dialysis (data available on request). After differences in patient characteristics were adjusted for, patients living in regions in the highest quintile of EOL-EI as compared with the lowest quintile of EOL-EI were more likely to

be hospitalized (79.7% vs 69.0%; OR, 1.60; 95% CI, 1.50-1.71), to be admitted to an ICU (55.5% vs 40.9%; OR, 1.62; 95% CI, 1.54-1.71), and to undergo an intensive procedure (36.4% vs 20.1%; OR, 1.61; 95% CI, 1.51-1.71) during the final month of life.

**Comment.** Older Medicare beneficiaries who are receiving long-term dialysis experience very high rates of hospitalization, ICU admission, and use of intensive procedures during the final month of life. Intensity of care at the end of life in this population is substantially higher than that reported for other Medicare beneficiaries with life-limiting illnesses (**Table**).<sup>7-9</sup> Receipt of intensive procedures was more strongly and consistently associated with level of regional health care spending than with individual patient characteristics. While patterns of end-of-life care should ideally reflect patient values and preferences, these findings appear to suggest that end-of-life care among older patients who are receiving dialysis may be driven more by practice-related factors.

Susan P. Y. Wong, MD  
William Kreuter, MPA  
Ann M. O'Hare, MD, MA

**Author Affiliations:** Department of Medicine (Drs Wong and O'Hare) and Center for Cost and Outcomes Research (Mr Kreuter), University of Washington, and Veterans Affairs Puget Sound Healthcare System (Dr O'Hare), Seattle, Washington.

**Correspondence:** Dr Wong, Department of Medicine, University of Washington, 1959 Pacific St NE, PO Box 359945, Seattle, WA 98195 (spywong@uw.edu).

**Author Contributions:** All authors had full access to all the data in the study and take responsibility for the integrity of the data and accuracy of the data analysis. *Study concept and design:* Wong and O'Hare. *Acquisition of data:* Wong, Kreuter, and O'Hare. *Analysis and interpretation of data:* Wong and O'Hare. *Drafting of the manuscript:* Wong. *Critical revision of the manuscript for important intellectual content:* Wong, Kreuter, and O'Hare. *Statistical analysis:* Wong. *Obtained funding:* O'Hare. *Administrative, technical, and material support:* Kreuter and O'Hare. *Study supervision:* O'Hare.

**Financial Disclosure:** None reported.

**Funding/Support:** Dr O'Hare was supported by a Beeson Career Development Award from the National Institute of Aging (5K23AG028980) and by an inter-agency agreement between the Veterans Affairs Puget Sound Healthcare System and the Centers for Disease Control.

**Disclaimer:** This work was conducted at the University of Washington and does not represent the opinion of the USRDS.

**Additional Contributions:** The *Dartmouth Atlas of Health Care* supplied the EOL-EI on hospital referral regions.

1. Kurella M, Covinsky KE, Collins AJ, Chertow GM. Octogenarians and nonagenarians starting dialysis in the United States. *Ann Intern Med.* 2007;146(3):177-183.
2. US Renal Data System. *USRDS 2010 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States.* Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 2010.
3. Kurella Tamura M, Covinsky KE, Chertow GM, Yaffe K, Landefeld CS,

- McCulloch CE. Functional status of elderly adults before and after initiation of dialysis. *N Engl J Med*. 2009;361(16):1539-1547.
4. Murtagh FE, Addington-Hall J, Higginson IJ. The prevalence of symptoms in end-stage renal disease: a systematic review. *Adv Chronic Kidney Dis*. 2007;14(1):82-99.
  5. O'Hare AM, Rodriguez RA, Hailpern SM, Larson EB, Kurella Tamura M. Regional variation in health care intensity and treatment practices for end-stage renal disease in older adults. *JAMA*. 2010;304(2):180-186.
  6. Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending, I: the content, quality, and accessibility of care. *Ann Intern Med*. 2003;138(4):273-287.
  7. Unroe KT, Greiner MA, Hernandez AF, et al. Resource use in the last 6 months of life among medicare beneficiaries with heart failure, 2000-2007. *Arch Intern Med*. 2011;171(3):196-203.
  8. Setoguchi S, Glynn RJ, Stedman M, Flavell CM, Levin R, Stevenson LW. Hospice, opiates, and acute care service use among the elderly before death from heart failure or cancer. *Am Heart J*. 2010;160(1):139-144.
  9. Goodman DC, Esty AR, Fisher ES, Chang CH. *Trends and Variation in End-of-Life Care for Medicare Beneficiaries With Severe Chronic Illness: A Report of the Dartmouth Atlas Project*. Lebanon, NH: Dartmouth Institute for Health Policy & Clinical Practice; 2011.

---

## INVITED COMMENTARY

---

### Can We Begin With the End in Mind? End-of-Life Care Preferences Before Long-term Dialysis

**A**ligning patients' preferences with the care patients receive at the end of life is a national priority.<sup>1</sup> Although some preferences are common among patients and their families, the factors that contribute to high-quality care at the end of life vary considerably across individuals. Values and preferences may be elicited through flexible approaches to shared treatment decision making. Despite greater patient and family satisfaction with high levels of shared decision making,<sup>2</sup> end-of-life decisions are often incomplete, especially in acute care settings.<sup>3</sup> When end-of-life discussions do occur, patients are more likely to prefer less aggressive care, perhaps because they develop more realistic views about the benefits, or lack thereof, from aggressive therapies near death.<sup>2</sup>

Addressing end-of-life concerns has always been an important part of treating patients with end-stage renal disease (ESRD), particularly among older patients. Although long-term dialysis does not restore normal life expectancy for patients with ESRD, it has added countless years of incremental survival for millions. With improvements in medical technology and therapies that are keeping more people with other chronic conditions alive, indications for long-term dialysis have expanded dramatically to include a growing number of patients who develop kidney disease as a complication of an underlying disease. As a result, a worldwide increase in ESRD has been fueled by the aging of the population and by the rising prevalence of diabetes and hypertension. In many countries, older patients now make up the fastest growing segment of the dialysis population. In the United States, the rate of patients 75 years or older starting on dialysis has almost tripled over the past 2 decades from 550 to 1550 per million.<sup>4</sup> Despite the hope for longer survival that dialysis may offer, the 5-year survival rate among US patients 75 years or older is approximately 15%.<sup>4</sup> Therefore, older patients who develop ESRD must try to

optimize their quality of life while living with a grave, life-limiting chronic disease, often against a background of comorbid conditions and functional status limitations. Consequently, although dialysis offers the potential for increased survival, it may do so with tremendous limitations in quality of life and survival, especially among older patients.

Decisions to withdraw dialysis have become more common in clinical practice as a greater number of older patients discover the trade-off between survival and quality of life that dialysis can entail. Clinical practice guidelines designed to assist in the care of older patients with ESRD have outlined approaches to shared decision making for the withdrawal of dialysis, time-limited trials of dialysis care, and approaches to initiation of palliative care.<sup>5</sup> However, there is wide regional variation in rates of dialysis discontinuation among older patients receiving dialysis that is independent of patient characteristics, suggesting that practice pattern variation is related to variation in physician practice styles.<sup>6</sup> These patterns mirror those related to various other assessments of treatment intensity at the end of life.

In this issue of the *Archives*, Wong et al<sup>7</sup> expand on previous observations among older adults undergoing dialysis by examining health care resource use at the end of life, including hospitalization, intensive care unit admission, and use of intensive procedures. Using Medicare claims data to examine health care resource use in the last month of life for almost 100 000 patients 65 years or older who died within 3 to 5 years of starting long-term dialysis, they found that 3 out of 4 patients were hospitalized, almost 50% were admitted to an intensive care unit, and 3 out of 10 patients received an intensive intervention (mechanical ventilation, cardiopulmonary resuscitation, or a feeding tube). This level of intensity of care is striking and highlights the potential limitations of this therapy on patients' quality of life near death. Although intensity was found to be related to some differences in patient characteristics, important differences were more strongly related to regional patterns in Medicare expenditures during the last 6 months of life, suggesting that these regional factors dominate individual patient preferences.<sup>8</sup>

When patient preferences are specified, these wishes are usually respected, resulting in fewer health care interventions at the end of life.<sup>2</sup> Advanced care planning and shared decision making regarding end-of-life care not only would lead to better patient quality of life but also may have the additional benefit of better quality of life among surviving caregivers.<sup>2</sup> Therefore, an important initial step in addressing these concerns includes the implementation of policies that support appropriate advanced care planning and shared decision making regarding end-of-life care long before such decisions are necessary.

The Medicare Improvements for Patients and Providers Act of 2008 added kidney disease education services as a covered benefit under Medicare Part B for beneficiaries diagnosed as having advanced chronic kidney disease.<sup>9</sup> Under this benefit, Medicare covers up to 6 sessions of predialysis education and counseling to help patients delay dialysis and to prevent kidney disease com-