ED use made 17 759 visits over the study period, while the 1928 patients with frequent ED use made 12 289 visits. Approximately half (49.8%) of all ED visits occurred on weekdays, while BMC primary care practices were open. Most ED visits were for low-severity conditions.

Comment. Emergency department use by primary care patients at an urban safety-net hospital was high, though most visits were of low severity. One possible reason for this is lack of access to primary care,[4] with few available appointments to see a PCP. While data on time to third next available appointment, a standard measure of primary care access,[5] are not available for the primary care practices during the study period, other practice metrics suggest that access may have been a problem. For example, missed primary care appointment rates were high, averaging 24.5%. High missed appointment rates are often correlated with long wait times to schedule appointments.[6] In addition, monthly telephone call statistics show that only between 72.4% and 88.1% of patient telephone calls were answered by the primary care call center over the study period. It is possible that patients called the practices with an urgent problem, did not have their telephone call answered promptly, and decided to seek care in the ED instead. Indeed, 13% of telephone calls were abandoned by patients over the study period (patients called and subsequently hung up while they were kept on hold). The fact that nearly half of all ED visits took place during the hours of primary care clinic operation further suggests that appointment availability may have been an issue. In addition, a sizable minority, roughly one-fifth, of primary care is provided by residents,[7] who have limited availability when they are not in clinic. It is also possible that Massachusetts health reform has affected access to primary care. As newly insured patients have entered primary care in large numbers, it is possible that access to primary care has worsened for other patients.

Massachusetts has been a bellwether for the implementation of health reform and will be a bellwether for the transformation of primary care, with the move away from fee-for-service payments and the introduction of global payments for health care. Overall ED volume has continued to increase in Massachusetts after health reform.[8] It is unclear if changes in primary care practice and payment will be sufficient to reduce high levels of ED use among patients at an urban safety-net hospital.

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1. Billings J, Parikh N, Mijanovich T. Emergency department use: the New York Story. *Issue Brief (Commonw Fund)*. 2000;(434):1-12.
2. Ballard DW, Price M, Fung V, et al. Validation of an algorithm for categorizing the severity of hospital emergency department visits. *Med Care*. 2010; 48(1):58-63.
3. Wharam JF, Landon BE, Galbraith AA, Kleinman KP, Soumerai SB, Ross-Degnan D. Emergency department use and subsequent hospitalizations among members of a high-deductible health plan. *JAMA*. 2007;297(10):1093-1102.
4. Smulowitz P, Landon BE, Burke L, Baugh C, Gunn H, Lipton R. Emergency department use by the uninsured after health care reform in Massachusetts. *Intern Emerg Med*. 2009;4(6):501-506.
5. Murray M, Berwick DM. Advanced access: reducing waiting and delays in primary care. *JAMA*. 2003;289(8):1035-1040.
6. Lasser KE, Mintzer IL, Lambert A, Cabral H, Bor DH. Missed appointment rates in primary care: the importance of site of care. *J Health Care Poor Underserved*. 2005;16(3):475-486.
7. Zallman L, Ma J, Xiao L, Lasser KE. Quality of US primary care delivered by resident and staff physicians. *J Gen Intern Med*. 2010;25(11):1193-1197.
8. Smulowitz PB, Lipton R, Wharam JF, et al. Emergency department utilization after the implementation of Massachusetts health reform. *Ann Emerg Med*. 2011;58(3):225-234.e1.

Proton Beam Therapy and Treatment for Localized Prostate Cancer: If You Build It, They Will Come

The number of treatment options for localized prostate cancer continues to expand, amidst growing concern regarding overdiagnosis and overtreatment of low-risk disease.[1-3] Treatment patterns, however, may be driven by availability of novel tech-

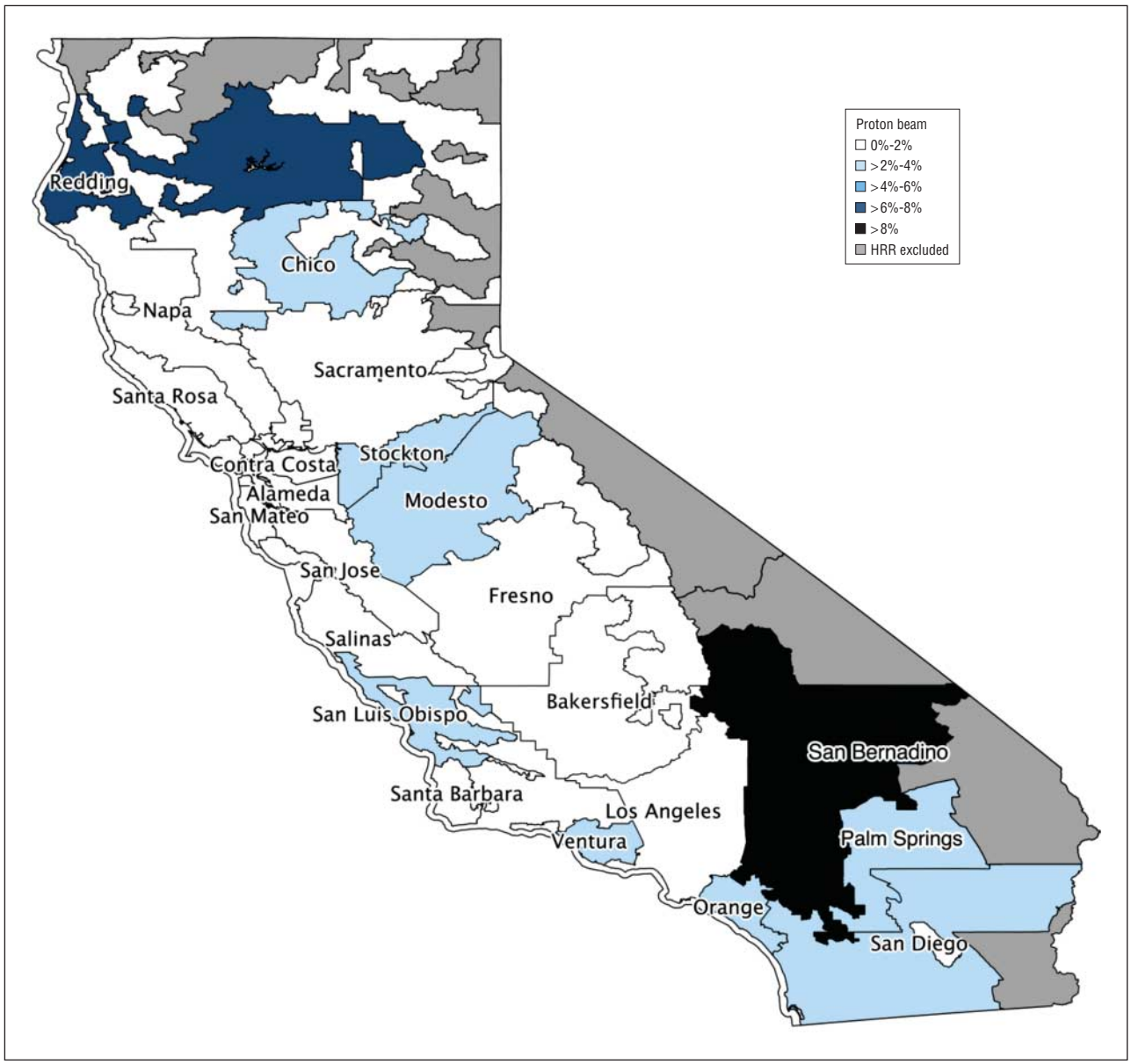

Figure. Rates of proton beam therapy in California by hospital referral region (HRR).

nologies rather than by clinical indications. We aimed to examine regional treatment choices of men diagnosed as having localized prostate cancer living inside or outside of a defined hospital referral region containing a proton beam cyclotron in California.

Methods. We performed a retrospective cross-sectional analysis of men with prostate cancer identified through the California Cancer Registry from 2003 to 2006. Inclusion criteria were low- to intermediate-risk prostate cancer, defined by clinical stage (≤T2c) and well- to moderately differentiated histology (Gleason score ≤7). Patients were grouped according to their hospital referral region (HRR) at time of diagnosis, as defined by the Dartmouth Atlas group (http://www.dartmouthatlas.org).[4] In brief, HRRs represent regional health care markets for tertiary medical care. Four HRRs extending into neighboring states were excluded.

Our primary predictor was a binary variable signifying whether a man was living in the HRR for San Bernardino, California (SBHRR), where the proton beam facility resides at Loma Linda University. The primary dichotomous outcome was prostate cancer treatment by proton beam therapy vs treatment by other modalities (including active surveillance). Prostate cancer treatment patterns were analyzed by HRR using logistic regression models. All candidate predictors were included in a multivariable model, including age, tumor grade, stage of cancer, race/ethnicity, year of diagnosis, and residence in the SBHRR. Statistical analyses were performed using SAS v9.2 software (SAS Institute Inc). The institutional review board at the University of California, San Francisco, approved the study.

Results. A total of 19 816 patients met inclusion criteria. Mean age and tumor stage were similar for those liv-

ing in or outside the SBHRR. The SBHRR had the highest rate of proton beam therapy compared with the rest of California (8.5% vs 1.7%; **Figure**). Mean (SD) proton beam therapy rate was 2.3% (1.4%), and the range of patients treated by HRR was 0 to 142 for this period. Redding HRR showed the next highest rate of proton beam therapy; however, 184 patients were from that HRR, so this rate is based on only 13 patients receiving this treatment.

Patients living in the SBHRR were more likely to be treated with the proton beam therapy than if they lived outside of the SBHRR in univariate analysis (odds ratio [OR], 5.3; 95% CI, 4.3-6.5 [$P<.001$]). In multivariate analysis controlling for tumor stage, grade, race, year of diagnosis, and age, residence within the SBHRR remained independently predictive of receiving treatment with a proton beam compared with those outside the HRR (OR, 5.5; 95% CI, 4.5-6.8 [$P<.001$]). Patient age and non-Hispanic white ethnicity remained significantly independently associated with either a lower (age: OR, 0.98; 95% CI, 0.97-0.99 [$P<.001$]) or a higher (non-Hispanic white: OR, 2.1; 95% CI, 1.7-2.7 [$P<.001$]) likelihood of receiving proton beam therapy.

Comment. No prostate cancer treatment has been proven superior to the others.[5] There are, however, substantial differences in cost, which are becoming more important to society and are a focus of health care reform in the United States.[6,7] While there are theoretical advantages to proton beam therapy from a radiation physics standpoint, no study yet has demonstrated its superiority to modern photon-based therapy in terms of either oncologic or quality of life outcomes.[8,9] To our knowledge, we show for the first time that the availability of a technology, in this instance a proton beam facility, in one's HRR is associated with a higher likelihood of receiving proton beam therapy compared with those living in an HRR where this technology is not available. A single physician might explain the higher-than-expected rate of proton beam therapy in the Redding, California, HRR, since there are relatively low numbers of overall patients from this area. Interestingly, self-description as non-Hispanic white was also associated significantly with increased odds of receiving proton therapy—hinting at a possible racial disparity requiring further investigation.

There were several limitations: (1) Our prostate cancer risk stratification does not include prostate-specific antigen levels or Gleason scores because these are not included in the CCR. (2) Unmeasured confounding may exist, but the association of living in the SBHRR and receiving proton beam therapy is large. (3) Registry data are limited in clinical detail and may be biased through underreporting. However, there should not be systematic bias as the unreported cases are likely to have the same treatment distribution as the reported cases.

Proton beam therapy has not been shown to be superior to other treatments for prostate cancer and is substantially more expensive.[7] Caution should be taken when considering implementation of this technology in additional regions, which may lead to greater use of this technology.

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1. Andriole GL, Crawford ED, Grubb RL III, et al; PLCO Project Team. Mortality results from a randomized prostate-cancer screening trial. *N Engl J Med*. 2009;360(13):1310-1319.
2. Walter LC, Bertenthal D, Lindquist K, Konety BR. PSA screening among elderly men with limited life expectancies. *JAMA*. 2006;296(19):2336-2342.
3. Albertsen PC, Hanley JA, Fine J. 20-year outcomes following conservative management of clinically localized prostate cancer. *JAMA*. 2005;293(17):2095-2101.
4. Wennberg JE, Cooper MM, eds. *The Dartmouth Atlas of Health Care in the United States*. Hanover, NH: Center for the Evaluative Clinical Sciences at Dartmouth Medical School, American Hospital Publishing Inc; 1999.
5. Wilt TJ, MacDonald R, Rutks I, Shamliyan TA, Taylor BC, Kane RL. Systematic review: comparative effectiveness and harms of treatments for clinically localized prostate cancer. *Ann Intern Med*. 2008;148(6):435-448.
6. Weinstein MC, Skinner JA. Comparative effectiveness and health care spending—implications for reform. *N Engl J Med*. 2010;362(5):460-465.
7. Konski A, Speier W, Hanlon A, Beck JR, Pollack A. Is proton beam therapy cost effective in the treatment of adenocarcinoma of the prostate? *J Clin Oncol*. 2007;25(24):3603-3608.
8. Brada M, Pijls-Johannesma M, De Ruysscher D. Current clinical evidence for proton therapy. *Cancer J*. 2009;15(4):319-324.
9. Bannuru RR, Dvorak T, Obadan N, et al. Comparative evaluation of radiation treatments for clinically localized prostate cancer: an updated systematic review. *Ann Intern Med*. 2011;155(3):171-178.

Electronic Health Record–Based Messages to Primary Care Providers: Valuable Information or Just Noise?

Communication between clinicians is critical to coordination of care and prevention of adverse outcomes in the outpatient setting. Increasing the adoption of electronic health records (EHRs) and medical home-based care models will greatly increase electronic communication between different members of the health care team.[1-3] One method of clinician-to-clinician communication is note-based messaging through the EHR, where the recipient is requested to provide their "additional signature" to a message to attest that it was received. We recently found that primary care providers (PCPs) receive a large number of EHR-based additional signature request (ASR) alerts and spend considerable time processing them.[4] Large numbers of messages[5,6] might also cause PCPs to miss certain higher-priority notifications.[7,8] Whether ASR alerts and other types of electronic messaging (called "routing" in some systems) are relevant to patient care or just a medium for distributing legal risk is unclear.[9]

To determine the value of clinician-to-clinician messaging in the EHR, we developed and tested a new method to evaluate the content of electronic messages and determined whether they were essential to clinical care.

See Invited Commentary at the end of this letter

Methods. We conducted the study in the outpatient clinics of a large tertiary care Department of Veterans Affairs (VA) facility. In the VA, clinician-to-clinician electronic communication occurs through an asynchronous alert notification inbox within the EHR, much like e-mail, where the sender and recipient need not be simultaneously engaged. We defined an ASR alert as any note-based message that required an electronic signature to complete the alert. Messaging systems with capabilities to track routing are now available in many commercially available EHRs.

We queried a centralized alert tracking file containing details of all ASR alerts. Using methods developed in prior work,[4] we extracted 160 days of ASR alerts transmitted to any full-time PCP (physician, physician assistant, or nurse practitioner) beginning May 27, 2009. A 1% sample was randomly selected for further analysis, based on the feasibility of medical chart review.

Because each ASR alert originated from a specific note within the EHR, medical chart reviews were focused on the content of the parent note. Two PCP reviewers (H.K. and K.H.) identified each parent note and rated alerts on 3 "value" attributes: (1) urgency with which follow-up action was needed to avoid patient harm, (2) level of patient harm that might occur if the PCP missed the alert, and (3) subjective importance of the alert to PCP's care. To identify alerts that most affected clinical care, we defined "high-value" alerts as those which both reviewers rated as urgent, potentially harmful if missed, and important.

Reviewers also determined the alert sender's role, reason for the alert, and whether the information transmitted would be received through other means of communication regardless of the alert. To determine the proportion of pertinent note content, reviewers collected word counts for both the parent note and the section directly relevant to the recipient.

Results. Of 420 927 total alerts collected during the study period, 53 606 (12.7%) were ASR alerts, of which 536 (1.0%) were reviewed. For analysis, 525 ASR alert–parent note pairs were usable.

Additional signature request alerts were most commonly (38.7%) transmitted by other members of the primary care clinic, including medical assistants, technicians, nurses, and less commonly, mid-level health care providers and other PCPs. Twenty-six percent originated from the telephone triage service, which provides after-hours telephone support, while the remaining were transmitted by specialists, pharmacists, and other support services. In almost all alerts (99.2%), the PCP would not typically receive the information outside the alert notification system. Parent notes contained a median of 142 words, of which 28 (19.7%) were considered relevant to the PCP receiving the note.

Reviewers identified 15 unique reasons for alert transmission (**Table**), the most frequent of which was to inform PCPs about patients' medication refill requests (40.0%). In addition, 18.9% relayed new or persistent symptoms reported by patients.

Overall, 282 alerts (53.7%) met high-value criteria. Most refill requests (89.0%) and reports of new or persistent symptoms (64.6%) were deemed high value. Conversely, alerting about patient home events, order status updates, inpatient visits, and progress note completion (residents to supervising attending) were infrequently (<15%) of high value, even though many were rated as "important."