vard medical students of Improvehealthcare.org, which makes online lecture series available, and the Kaiser Family Foundation makes available tutorials on websites such as Kaiseredu.org. Many schools have adopted Khan Academy–like systems for many parts of the curriculum, and health policy might follow suit.[6]

An important move to encourage and inspire pervasive curriculum change within medical education would be to incorporate health policy domains into the step 1 boards. Boards have adapted over the years in numerous ways to address more clinical approaches to teaching medicine, and the introduction of health policy to the boards, to which the traditional medical school curriculum would then respond, would be in line with that evolution.

Facing organizational resistance to curriculum change is a challenge. But a grassroots education reform may be a feasible and focused effort at a time when complex politics has left health reform supporters feeling the feckless nature of electoral politics and the Supreme Court. Medical students could demand this kind of change; many have paved the road for change already, fueling the necessary discussion. In a 2010 survey of US medical school deans, 58% reported that they had "too little" health policy education, only 25% required students to take a class in which the primary topic was health policy, and 52% reported a process of increasing health policy education reform, although resources and finding time in the training are clear obstacles. Notably, most of those respondents who claimed to require health policy education in preclinical and clinical years reported only 10 hours or less of instruction over the 4 years of training.[5]

Besides weighing in on the bill as it reaches critical junctures like 2014, a basic understanding of health policy may influence more than medical students' support for the ACA. It may have an impact on their decision to enter primary care when there is a clear shortage, their ability to benefit from new loan repayment programs, and their ability to be more knowledgeable advocates for their patients. As others have concluded, medical school should be the training grounds for discerning physicians who are also leaders in health policy. While they need not all aspire to take leadership roles, all medical students should become proficient in the fundamentals of the US health care system. Whether or not the ACA finds solid ground and support in the coming years, emerging medical professionals will find themselves needing these skills for survival in the changing terrain ahead.

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RESEARCH LETTERS

Reducing Radiology Use on an Inpatient Medical Service: Choosing Wisely

Diagnostic imaging costs and use are increasing rapidly without clear evidence of incremental benefit.[1] Approximately 20% to 50% of these tests fail to provide information that improves clinical care; more alarming, the prevalence of unnecessary radiation exposure or subsequent testing may generate patient harm.[2-4] Addressing these facts and the burgeoning costs associated with test overuse provides an opportunity to change physician behavior. Because cost consciousness and physician stewardship are not a standard curricular focus in medical ecucation,[5,6] optimizing physicians' test ordering behavior can also align educational imperatives with a value-based initiative. Herein, we present the results of a quality-improvement intervention that evaluated the impact of providing cost, utilization, and radiation exposure data on radiology test ordering practices.

Methods. We implemented a 2-phase interrupted educational intervention on our inpatient medical service at the University of California, San Francisco (UCSF) Medical Center. Each intervention targeted a total of 48 house staff and 32 attending physicians. The first intervention (October–November 2011) provided cost and utilization data for commonly ordered radiographic tests, including national comparisons. After a 2-month intervention-free period (December 2011–January 2012) the second intervention (February–March 2012) provided radiation exposure data for the same radiographic tests to determine if one, both, or neither strategy would have an impact on physicians' ordering practices. Both interventions delivered targeted educational materials that were sent electronically and posted in common ordering areas on the wards. In addition, we developed a "Radiology Utilization Facilitator's Guide" for attending physicians to use during teaching rounds. The guide served to engage the inpatient teams in an active learning and reflective exercise about our local radiology utilization data, the impact of unnecessary test ordering on cost (first intervention) and preventable radiation exposure (second intervention), and strategies to improve the appropriateness of test-ordering practices.

We assessed ordering practices for each intervention independently and compared them with a 12-month baseline period leading up to the first intervention. All x-ray film and computed tomographic scan orders were tracked before and after intervention, with intensive care unit–

Table. X-Ray Film and CT Scan Orders Before and After Educational Interventions

	Baseline, No.[a]	No.[a] (% Change)		
		First Intervention	No Intervention	Second Intervention
X-ray chest[c]	32.4	23.2 (−28.4)[b]	30.7 (−5.1)	30.1 (−7.2)
X-ray body[c]	15.4	12.3 (−18.6)[b]	14.2 (−7.8)	12.9 (−16.1)[b]
CT body[c]	14.6	12.8 (−11.7)[b]	13.7 (−6.2)[b]	12.2 (−16.4)[b]
CT head[c]	5.7	6.3 (+10.7)	5.4 (−5.6)	6.4 (+11.6)
Total	**68.1**	**54.6** (−19.8)[b]	**64.0** (−6.0)[b]	**61.6** (−9.5)[b]

Abbreviation: CT, computed tomography.
[a] No. is the number of tests per 100 patient-days.
[b] $P < .05$.
[c] Uniform Billing codes: X-ray chest, 324; X-ray body, 320; CT body, 351; and CT head, 352.

based orders excluded from the analysis. We then calculated the mean weekly number of tests ordered, adjusted by patient-days. We also estimated annual direct cost savings from each intervention by multiplying the percentage change in tests ordered by the total direct cost reported in 2011 based on national billing codes. Finally, we administered a brief house staff survey before and after each intervention to understand their attitudes about the impact of cost, utilization, and radiation exposure data on their own test ordering practices. For all data, we conducted 2-tailed statistical testing. This study was covered by a UCSF Human Research Protection Program waiver for quality improvement activities.

Results. The mean number of tests ordered per 100 patient-days was reduced by 19.8% during the first intervention and 9.5% during the second intervention, with statistical significance compared with the baseline period (**Table**). The greatest reductions in ordering were seen for chest radiography during the first intervention and for body computed tomography during the second. The estimated annual direct cost savings of these changes in ordering practices was \$108 285 and \$78 155, respectively, during each intervention.

House staff also reported increased knowledge and likelihood of changed test-ordering behavior. Compared with baseline, there was a 27.3% increase after the first intervention in response to the statement "I know the cost of radiology tests I order" (2.56 to 3.26 on a 1-5 Likert scale; $P < .05$) and a 14.9% increase in response to the statement "I take the cost of radiology tests into consideration when ordering them" (3.28 to 3.74 on a 1-5 Likert scale; $P < .05$). There were no statistically significant differences in house staff knowledge and attitudes with regard to radiation exposure during the second intervention.

Comment. Our interventions combined a targeted educational curriculum with the provision of local radiology utilization data to influence ordering practices. While both interventions led to reductions in test ordering, the cost and utilization focus had a greater impact on test ordering and resident-reported knowledge and practice. Increased national attention to cost consciousness, catalyzed most recently by the American Board of Internal Medicine's *Choosing Wisely* campaign,[7] may have increased the impact of our interventions. Our findings demonstrate that in our current culture, interventions to improve the utilization of health care resources need not be high-cost themselves. Providing physicians with individualized audit and feedback reports on their resource utilization, clinical decision-support tools, and educational interventions such as ours offer ways reinforce an important message. Providing high-value care, rather than just high quality, is a priority of our health care delivery systems.[8,9]

Training institutions have the responsibility to shape the behavior of future health care providers. Trainees must learn to prioritize the stewardship of making the best decisions for our patients in a system with increasingly constrained resources. Having trainees view this as part of their education and supervising attending physicians view this as part of their role modeling is a necessary partnership for desired system change.

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Variation in Use of High-Cost Diabetes Mellitus Medications in the VA Healthcare System

The Department of Veterans Affairs (VA), the largest integrated health care system in the United States, may serve as a model of efficient use of prescription drugs. It consistently ranks among the top of all US health care systems in objective ratings of quality of care for chronic diseases,[1] and it does so with low medication costs. The VA negotiates steep price discounts with pharmaceutical manufacturers and engages in robust formulary management using a national formulary. This centralized approach to pharmacy benefit management stands in stark contrast to Medicare Part D, which contracts with over 1000 private plans, each with its own formulary, and which has substantial regional variation in per capita drug spending.[2] Even within a tightly managed system such as the VA, however, there may also be significant variation across facilities in medication use and spending. We examined national VA data for over 1 million outpatients with diabetes mellitus (DM) to understand how prescribing of high-cost medications varies across facilities.

See Invited Commentary at end of letter

Methods. We identified a national cohort of veterans with type 2 DM using a previously validated approach.[3] We focused on the facility-level use, in fiscal year (FY) 2009, of 2 classes of high-cost DM medications: thiazolidinediones (rosiglitazone, pioglitazone) and long-acting insulin analogues (detemir, glargine). We measured the proportion of patients on oral medications receiving thiazolidinediones, and the proportion of patients treated with insulin receiving long-acting analogues. We chose these 2 classes because of their relatively high cost and lack of clear evidence for improved clinical outcomes relative to other DM medications.[4-7] Thiazolidinediones were available for use with prior authorization at the time of the study. There were no restrictions on long-acting analogues.

To calculate an adjusted rate of thiazolidinedione and analogue use at each facility, adjusting for differences in patient-level characteristics, we used random effects logistic regression. We adjusted for age, race/ethnicity, sex, modified Charlson score (removing DM and DM complications),[8] number of diabetic complications (diabetic retinopathy, neuropathy, nephropathy, or peripheral vascular disease), whether individuals had any visits to an endocrine/DM specialty clinic, and whether they had a medication copay. We centered each of these covariates and used the facility random intercept to compute an adjusted rate of thiazolidinedione/analogue use for patients at that facility with all covariates equal to the population mean. All analyses were performed using SAS statistical software (version 9.2; SAS Institute Inc) and STATA 11 software (StataCorp Inc).

Results. In FY 2009, there were 1 158 809 patients with type 2 DM. Their mean age was 66.5 years, and 97.4% were male. Almost 1 in 7 (13.8%) visited an endocrine/DM clinic, and 30.8% had at least 1 DM complication. Overall, 906 720 patients (78.3%) received 6 182 859 prescriptions for DM medications; 66.7% received an oral medication, and 27.7% received insulin (16.1% received both).

Across the 139 facilities, the adjusted percentage of patients receiving oral DM medications who used a thiazolidinedione ranged from 1.4% at the lowest-using facility to 25.4% at the highest, with a median of 8.2% (interquartile range [IQR], 4.9%-10.5%) (**Table**). The adjusted percentage of patients receiving insulin who used long-acting analogues ranged from 4.0% to 71.2%, with a median percentage of 40.6% (IQR, 28.1%-52.1%). The adjusted facility-level rates of use were almost identical with the unadjusted rates across facilities (correlation $r=0.99$).

Comment. In this cohort of over 1 million patients with type 2 DM, we find substantial variation in use of 2 classes of high-cost DM medications—thiazolidinediones and long-acting insulin analogues. This variation exists in an integrated VA system with a uniform national formulary with established criteria for use of drugs, such as the thiazolidinediones, and clinical practice guidelines supporting conservative use of medications. While some variation is expected given reasonable differences in prescribing practices, the observed 18-fold variation across facilities was unexpected.

Adjusting for observable patient characteristics across facilities explained virtually none of the facility-level variation in use of high-cost drugs, suggesting that there are important facility factors at play. Even if some unmeasured patient characteristics are driving some of the variation, the magnitude of the variation is large enough that clinical need alone cannot explain it. Despite the na-