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Novel Integration of Systems-Based Practice Into Internal Medicine Residency Programs: The Interactive Cost-Awareness Resident Exercise (I-CARE)

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Novel Integration of Systems-Based Practice Into Internal Medicine Residency Programs: The Interactive Cost-Awareness Resident Exercise (I-CARE)

Innovations Winner in the 2013 Costs of Care and ABIM Foundation Teaching Value & Choosing Wisely® Competition

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Background: The Accreditation Council for Graduate Medical Education and American Board of Internal Medicine have identified cost-awareness as an important component to residency training. Cost-awareness is generally not emphasized in current, traditional residency curricula despite the recognized importance of this topic. **Description:** Using a traditional Morning Report structure and actual charge data from our institution, the charges associated with trainee-directed workup of clinical cases are compared in a friendly competition among medical students, interns, residents, and faculty. **Evaluation:** Anonymous, voluntary survey of all participants and comparison of expenditures by training level were used to assess this pilot program. The educational quality of the I-CARE was rated higher than the prior format of Morning Report by participants (10-point Likert scale; 8.57, 6.81 respectively; $p < .001$). Open-ended comments were overwhelmingly supportive from faculty and trainees. Cost was lower for attending physicians than for trainees (\$1,027.45 vs. \$4,264.00, $p = .02$) and diagnostic accuracy was also highest for attending physicians. **Conclusions:** The I-CARE is easy and quick to implement, and the preliminary results show a popular cost-awareness educational experience for internal medicine trainees. Further study is needed to determine change in practice habits.

Keywords residency training, cost-effectiveness, systems-based practice

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INTRODUCTION

The Accreditation Council for Graduate Medical Education (ACGME) has identified systems-based practice (SBP) as a Core Competency for resident education.¹ The ACGME has specifically included cost-awareness as a component of this requirement. In addition, the American Board of Internal Medicine (ABIM) and the ACGME jointly recommend that the ability of residents to demonstrate the incorporation of cost-awareness into standard clinical judgment and decision making be considered a specific residency training milestone.² As described by Kravitz, the issue of cost containment in healthcare would benefit from active physician involvement.³ Furthermore, the ABIM's Choosing Wisely Campaign⁴ and the American College of Physicians' High Value Cost Conscious Care Curriculum⁵ show a profession-wide movement toward cost understanding and control. Despite these efforts, there is limited value-based and cost-based education in residency programs.³ There are new educational tools and frameworks actively being published^{6,7} to address the need for value-based and cost-based education. This emerging focus in training programs to educate and expose residents on value and cost-conscious health care is in parallel with the greater movement in healthcare to engage in high-value care practices.⁸

There is evidence that physician behavior can be altered by cost awareness.^{9,10} Prior evidence, however, shows that physicians have a limited knowledge of cost related to healthcare.¹¹ Providing education to physicians regarding cost in healthcare

may help to alter behavior and provide physicians with tools to better assess the cost-benefit of a given intervention or diagnostic tool.

This innovation is designed to increase exposure to healthcare cost, a component of SBP, without adding time burden or new demands to the residency curriculum. This novel method uses the ubiquitous case-based Morning Report teaching sessions to expose trainees to cost of their clinical decisions without sacrificing other, more traditional educational objectives of a case conference.

SETTING AND PARTICIPANTS

The Yale University School of Medicine has three distinct training pathways for Internal Medicine. A Traditional Internal Medicine Program, a Primary-Care Residency Program, and a combined Internal Medicine-Pediatrics Residency Program. Each program has separate leadership, but teaching conferences are shared among the three programs. Report occurs most mornings with one session for interns and the rest for residents. Each session runs 1 hour, conducted by a Chief Resident from either the Traditional, Primary Care, or Internal Medicine-Pediatrics Program, and takes place at one of three training sites: Yale-New Haven Hospital, a 946-bed urban, tertiary care facility in New Haven, CT, with members of all three training programs; The West Haven Campus of the VA Connecticut Healthcare System, a 259-bed VA Medical Center in West Haven, CT, with members of the Traditional Program only; and Waterbury Hospital, a 357-bed community hospital in Waterbury, CT, with members of all three training programs. Attending physicians on the teaching faculty also participate in Morning Report regularly at each site.

PROGRAM DESCRIPTION

The Interactive Cost-Awareness Report (I-CARE) follows a traditional, Morning Report-style teaching session run by a Chief Resident, where the diagnostic workup of a patient is discussed in a 1-hour didactic session. I-CARE takes place during 3 to 4 days every 4th week. One hour each day is provided for each level of training: medical students, interns and subinterns, residents, and attending physicians. Those planning to participate in one session are prohibited from observing the other sessions; however, all trainees are present to observe the attending physician session. This pattern was preserved throughout our pilot program. In other words, each group of trainees has a private session, whereas the attending physicians, who are the last session chronologically, have a public session attended by all participants. This was publicized in advance and should a noninvited participant arrive, the Chief Residents would excuse that person from the room. Faculty physicians are, however, permitted to attend trainee sessions. If a faculty member does attend a trainee session, it is only in an observer role and she is not permitted to participate in the faculty session. Sessions

for trainees typically have 10 to 15 participants; faculty sessions typically have three to 10 faculty participants and up to 30 trainees observing. Attendance was not prospectively recorded, but repeat participation is common among both trainees and attending physicians. Approximately two thirds of the interns and residents are on rotations that include Morning Report at any time, so repeat attendance at I-CARE sessions from month to month is likely to be high.

Cases are selected by the Chief Residents from case reports published in the literature¹²⁻¹⁶ and take approximately 3 to 5 hours to prepare. Specifically, the Chief Complaint, History of Present Illness, Medical and Surgical History, current medications, and basic physical exam are provided sequentially to each group of trainees in a lecture format. Following the initial presentation, trainees can inquire of the Chief Resident for further information in an effort to make a diagnosis. Additional history and/or physical exam maneuvers not included in the initial presentation (such as travel history, dermatographism, straight leg raise) have no associated cost and are free to the group of trainees should they be specifically requested. Laboratory tests, diagnostic imaging, and diagnostic procedures can also be requested, and the actual patient charge from our institution for that item is recorded by the Chief Resident in real time. These charges, obtained through a partnership with the hospital's finance department, are blinded to the participants at the time of the exercise. If requested history, physical exam and/or diagnostic testing is not available; it is simply reported as "not specified."

Once the trainees, working as a group, come to a diagnosis, the session is concluded, the true diagnosis is revealed by the Chief Resident, and a debriefing session regarding pertinent learning points is coordinated by the Chief Resident. The total charges for the diagnostic workup requested during the session is tabulated by the Chief Resident and recorded. This process is repeated at each session, and the trainees are instructed to not share any information with those who have not yet participated. Unique to the last daily session, the attending physicians assume the role of the trainees and work through the case using the same rules. The attending physicians are encouraged to talk openly about their thought process, and all trainees are encouraged to observe. Following the attending physician session, the results of each group are shared, including the total charge incurred by each group. The group with the correct diagnosis and lowest cost is considered to have won the exercise (Table 1).

PROGRAM EVALUATION

The program was trialed over a 5-month period and evaluated after 2 months using an anonymous, Internet-based survey. The 2-month mark was chosen for the survey to limit the number of trainees that participated twice at the time of the survey. Cost data per session was also recorded. The program and evaluation process were granted an exemption by the Yale University Human Investigation Committee.

TABLE 1
Survey response by training level

Level of Training (<i>n</i>)	Old Format Rating (<i>SD</i>)	New Format Rating (<i>SD</i>)	<i>p</i>	Participants Rating New Format as Overall Improvement
PGY-1 (6)	7.67 (1.5)	9.67 (0.5)	.01	83%
PGY-2 (15)	6.67 (1.9)	9.20 (0.8)	<.001	73%
PGY-3 (7)	6.57 (2.0)	9.14 (0.8)	.004	86%
Attending (9)	3.33 (1.1)	6.33 (2.3)	<.001	100%

Interns, residents, and attending physicians were asked to complete the survey in the time period between the second and third sessions. Thirty-seven surveys were returned (39% response rate overall). Attending physicians completed nine surveys (90% response rate), 2nd- and 3rd-year residents completed 14 surveys (52% response rate), and interns returned six surveys (14% response rate). Comments provided by participants were overwhelmingly positive, with 31 respondents (84%) identifying the SBP case as “an overall improvement” to Morning Report. Using a 10-point Likert scale, survey respondents rated the educational quality of the I-CARE case 8.57 (range = 1–10) and the educational quality of the prior morning report format 6.81 (range = 1–10, *p* < .001; Table 1). Narrative responses from survey respondents were also positive (Figure 1).

Sampling of the first five cases from January 2012 through May 2012 revealed 100% accuracy of diagnosis by the attending physician group, 60% accuracy by residents and interns, and 50% accuracy by medical students. Furthermore, a dichotomous *t* test was performed (Excel 2010, Redmond, WA) to determine

difference in expenditures. The attending physician group spent less on average than nonattending participants (\$1,027.45 vs. \$4,264.00, *p* = .02). This difference persisted with medical students excluded from the analysis (\$1,027.45 vs. \$3,962.80, *p* = .03; Table 2).

Faculty and trainees alike have taken to this program with great enthusiasm. The dates are announced by the Chief Residents well in advance, and attendance is very high among invited participants and faculty. The friendly competition among training sites is also positive.

DISCUSSION

Healthcare costs now account for 17.9% of gross domestic product in the United States and is rising at rates exceeding 3% per year.¹⁷ As creatively described by Detsky,¹⁸ the healthcare industry is facing fundamental questioning and reorganization, most notably with the Patient Protection and Affordable Care Act, passed in 2010.¹⁹ As the economics of our healthcare system receive more attention, it is imperative that the physicians of today and tomorrow be well equipped to engage and participate in these important, cost-related discussions. Education in cost awareness is vital in providing physicians with basic tools to understand the debate around them. I-CARE provides a safe, interactive environment to simulate real-life diagnostic workup and introduces cost implications of the decisions made by the trainees. This follows previously published innovations regarding the use of cost and value in medical education.^{6,7,9} Unique to the I-CARE is the ease of implementation, the short start-up time, and the minimal need for new or additional resources to implement.

The major limitation of the I-CARE is the oversimplification of a very complex process. There is no inclusion of physician fees, capitated payment schedules, or other aspects of care. The applicability of this case to the actual financing at a given institution is limited; however, as a starting point for the trainees, this format lays groundwork for later education and self-study. The low response rate, especially among interns, is also a limitation, but the 90% response among the teaching faculty and the overwhelmingly positive narrative comments are encouraging.

“Helps raise awareness of costs.”
 “Helps prioritize more helpful tests.”
 “... eye-opening experience of learning how much each individual test costs.”
 “It encourages a more realistic sequence of diagnostic testing.”
 “It teaches us to be cognizant of the cost of health care.”
 “Learning the social and financial impact of medical decision-making.”
 “Promotes more realistic work-up.”
 “More systematic decision-making process, more cost efficient.”
 “It makes us think more about why we would order a test, how it would guide our diagnostic evaluation, and if it would change any management — I found that we thought through the usefulness (or lack thereof) of all sorts of tests in a way that we almost never do in a regular work day. It's also interesting to learn how much various tests might cost.”

FIG. 1. Selected narrative comments from survey.

TABLE 2
Average charge data by case and training level

Case	Students	Interns	Residents	Attendings	Diagnosis
1 ^c	N/A ^a	\$7,344.58	\$5,304.64 ^b	\$2000.08	Tuberculosis lymphadenitis ¹⁴
2	\$8,864.69	\$7,969.97	\$5,473.37	\$691.51	Hereditary hemorrhagic telangiectasia ¹³
3	\$7,165.78 ^b	\$4,440.09 ^b	\$2,432.09 ^b	\$433.54	Strongyloides hyperinfection syndrome ¹⁵
4	\$1,136.26 ^b	\$2,502.94	\$2,407.94	\$234.37	Hypereosinophil Syndrome ¹²
5	\$2,901.32	\$1,208.32 ^b	\$544.08	\$1,777.73	Mycoplasma associated Stevens-Johnson ¹⁶

^aStudents were not available for Case 1.

^bIncorrect diagnosis. All other diagnoses were correct.

^cCase 1 included mandatory surgical procedure for all groups of \$19,683 which is not included here.

To further improve the I-CARE, a budget constraint could be implemented and factors such as hospital stay and complications of risky procedures could be calculated and included in the case. Also, using actual patients on the medical service and comparing the cost of care in the I-CARE to the cost of actual care could be informative.

A key lesson was learned during the trial period as residents began to prioritize the minimization of cost above a correct diagnosis, leading to incomplete and minimalist testing with guessing of diagnoses. To prevent this in the future, a rule was created that sufficient objective data, as determined by the Chief Resident, must be obtained prior to diagnosis. Also notable was a comment in the survey responses that this program doubles the time interns spend in report each week, precluding them from clinical duties. They attend the intern session, then attend the attending physician session later in the week. Also, the attending session, with all trainees observing, removes the entire clinical team from their clinical duties other than emergencies. These sessions may impact the clinical workday but does not necessarily affect work hours.

Next steps could focus on assessing for the impact of I-CARE on cost-awareness among trainees. Many comments from respondents described the cost of testing as “eye-opening” or “surprising.” A formal pre- and postintervention assessment of cost-awareness among trainees might prove fruitful. To further assess this intervention over time, a ratio of trainee-to-faculty expenditures may serve as a useful tool. A change in the ratio may be a useful metric to assess impact of this intervention. Using the ratio rather than absolute expenditure would help correct for the inherent variation in cost based on the diagnosis. One learner commented that this exercise “emphasizes cost-saving as the ultimate goal of medicine.” Although not the intent of this program, this perspective should be considered when implementing cost-awareness education programs.

The I-CARE differs from many other educational improvements in that it provides for immediate inclusion of SBP education into an Internal Medicine Residency Program with minimal resources by using a preexisting educational conference, and the I-CARE does not disrupt scheduling. The I-CARE is resource

neutral, is easy to implement, and has a short start-up time, and the preliminary results show a popular, well-received educational experience. Most important, it formalizes cost education in a safe environment and can serve to open a dialogue regarding cost-effective healthcare.

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