

BRIEF REPORTS

Residents' Self-Report on Why They Order Perceived Unnecessary Inpatient Laboratory Tests

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Resident physicians routinely order unnecessary inpatient laboratory tests. As hospitalists face growing pressures to reduce low-value services, understanding the factors that drive residents' laboratory ordering can help steer resident training in high-value care. We conducted a qualitative analysis of internal medicine (IM) and general surgery (GS) residents at a large academic medical center to describe the frequency of perceived unnecessary ordering of inpatient laboratory tests, factors contributing to that behavior, and potential interventions to change it. The sample comprised

57.0% of IM and 54.4% of GS residents. Among respondents, perceived unnecessary inpatient laboratory test ordering was self-reported by 88.2% of IM and 67.7% of GS residents, occurring on a daily basis by 43.5% and 32.3% of responding IM and GS residents, respectively. Across both specialties, residents attributed their behaviors to the health system culture, lack of transparency of the costs associated with health care services, and lack of faculty role models that celebrate restraint. *Journal of Hospital Medicine* 2016;11:869–872. © 2016 Society of Hospital Medicine

Resident physicians routinely order inpatient laboratory tests,¹ and there is evidence to suggest that many of these tests are unnecessary² and potentially harmful.³ The Society of Hospital Medicine has identified reducing the unnecessary ordering of inpatient laboratory testing as part of the Choosing Wisely campaign.⁴ Hospitalists at academic medical centers face growing pressures to develop processes to reduce low-value care and train residents to be stewards of healthcare resources.⁵ Studies^{6–9} have described that institutional and training factors drive residents' resource utilization patterns, but, to our knowledge, none have described what factors contribute to residents' unnecessary laboratory testing. To better understand the factors associated with residents' ordering patterns, we conducted a qualitative analysis of internal medicine (IM) and general surgery (GS) residents at a large academic medical center in order to describe residents' perception of the: (1) frequency of ordering unnecessary inpatient laboratory tests, (2) factors contributing to that behavior, and (3) potential interventions to change it. We also explored differences in responses by specialty and training level.

METHODS

In October 2014, we surveyed all IM and GS residents at the Hospital of the University of Pennsylvania. We reviewed the literature and conducted focus groups with residents to formulate items for the survey instrument. A draft of the survey was administered to 8 residents from both specialties, and their feedback was collated and incorporated into the final version of the instrument. The final 15-question survey was comprised of 4 components: (1) training information such as specialty and postgraduate year (PGY), (2) self-reported frequency of perceived unnecessary ordering of inpatient laboratory tests, (3) perception of factors contributing to unnecessary ordering, and (4) potential interventions to reduce unnecessary ordering. An unnecessary test was defined as a test that would not change management regardless of its result. To increase response rates, participants were entered into drawings for \$5 gift cards, a \$200 air travel voucher, and an iPad mini.

Descriptive statistics and χ^2 tests were conducted with Stata version 13 (StataCorp LP, College Station, TX) to explore differences in the frequency of responses by specialty and training level. To identify themes that emerged from free-text responses, two independent reviewers (M.S.S. and E.J.K.) performed qualitative content analysis using grounded theory.¹⁰ Reviewers read 10% of responses to create a coding guide. Another 10% of the responses were randomly selected to assess inter-rater reliability by calculating κ scores. The reviewers independently coded the remaining 80% of responses. Discrepancies were adjudicated by consensus

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TABLE 1. Residents' Self-Reported Frequency of and Factors Contributing to Perceived Unnecessary Inpatient Laboratory Ordering

	Residents (n = 116)*
Reported he or she orders unnecessary routine labs, no. (%)	96 (82.8)
Frequency of ordering unnecessary labs, no. (%)	
Daily	47 (49.0)
2–3 times/week	44 (45.8)
1 time/week or less	5 (5.2)
Agreement with statement as factors contributing to ordering unnecessary labs, no. (%)†	
Practice habit; I am trained to order repeating daily labs	105 (90.5)
Lack of cost transparency of labs	100 (86.2)
Discomfort with diagnostic uncertainty	96 (82.8)
Concern that the attending will ask for the data and I will not have it	88 (75.9)
Lack of role modeling of cost conscious care	78 (67.2)
Lack of cost conscious culture at our institution	76 (65.5)
Lack of experience	72 (62.1)
Ease of ordering repeating labs in EHR	60 (51.7)
Fear of litigation from missed diagnosis related to lab data	44 (37.9)

NOTE: Abbreviations: EHR, electronic health record. *There were 116 responses out of 206 eligible residents, among whom 57.0% (85/149) were IM and 54.4% (31/57) were GS residents. Among the IM respondents, 36 were PGY-1 interns, and among the GS respondents, 12 were PGY-1 interns. There were no differences in response across specialty and PGY level. †Respondents were asked, "Please rate your level of agreement with whether the following items contribute to unnecessary ordering" on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Agreement included survey participants who agreed and/or strongly agreed with the statement.

between the reviewers. The University of Pennsylvania Institutional Review Board deemed this study exempt from review.

RESULTS

The sample comprised 57.0% (85/149) of IM and 54.4% (31/57) of GS residents (Table 1). Among respondents, perceived unnecessary inpatient laboratory test ordering was self-reported by 88.2% of IM and 67.7% of GS residents. This behavior was reported to occur on a daily basis by 43.5% and 32.3% of responding IM and GS residents, respectively. Across both specialties, the most commonly reported factors contributing to these behaviors were learned practice habit/routine (90.5%), a lack of understanding of the costs associated with lab tests (86.2%), diagnostic uncertainty (82.8%), and fear of not having the lab result information when requested by an attending (75.9%). There were no significant differences in any of these contributing factors by specialty or PGY level. Among respondents who completed a free-text response (IM: 76 of 85; GS: 21 of 31), the most commonly proposed interventions to address these issues were increasing cost transparency (IM 40.8%; GS 33.3%), improvements to faculty role modeling (IM 30.2%; GS 33.3%), and computerized reminders or decision support (IM 21.1%; GS 28.6%) (Table 2).

DISCUSSION

A significant portion of inpatient laboratory testing is unnecessary,² creating an opportunity to reduce

utilization and associated costs. Our findings demonstrate that these behaviors occur at high levels among residents (IM 88.2%; GS 67.7%) at a large academic medical center. These findings also reveal that residents attribute this behavior to practice habit, lack of access to cost data, and perceived expectations for daily lab ordering by faculty. Interventions to change these behaviors will need to involve changes to the health system culture, increasing transparency of the costs associated with healthcare services, and shifting to a model of education that celebrates restraint.¹¹

Our study adds to the emerging quest for delivering value in healthcare and provides several important insights for hospitalists and medical educators at academic centers. First, our findings reflect the significant role that the clinical learning environment plays in influencing practice behaviors among residents. Residency training is a critical time when physicians begin to form habits that imprint upon their future practice patterns,⁵ and our residents are aware that their behavior to order what they perceive to be unnecessary laboratory tests is driven by habit. Studies^{6,7} have shown that residents may implicitly accept certain styles of practice as correct and are more likely to adopt those styles during the early years of their training. In our institution, for example, the process of ordering standing or daily morning labs using a repeated "copy-forward" function in the electronic health record is a common, learned practice (a ritual) that is passed down from senior to junior residents year after year. This practice is common across both training specialties. There is a need to better understand, measure, and change the culture in the clinical learning environment to demonstrate practices and values that model high-value care for residents. Multi-pronged interventions that address culture, oversight, and systems change¹² are necessary to facilitate effective physician stewardship of inpatient laboratory testing and attack a problem so deeply ingrained in habit.

Second, residents in our study believe that access to cost information will better equip them to reduce unnecessary lab ordering. Two recent systematic reviews^{13,14} have shown that having real-time access to charges changes physician ordering and prescribing behavior. Increasing cost transparency may not only be an important intervention for hospitals to reduce overuse and control cost, but also better arm resident physicians with the information they need to make higher-value recommendations for their patients and be stewards of healthcare resources.

Third, our study highlights that residents' unnecessary laboratory utilization is driven by perceived, unspoken expectations for such ordering by faculty. This reflects an important undercurrent in the medical education system that has historically emphasized and rewarded thoroughness while often penalizing restraint.¹¹ Hospitalists can play a major role in changing these behaviors by sharing their expectations

TABLE 2. Residents' Suggestions for Possible Solutions to Unnecessary Ordering

Categories*	Representative Quotes	IM, n = 76, No. (%)†	GS, n = 21, No. (%)‡
Cost transparency	"Let us know the costs of what we order and train us to remember that a patient gets a bill and we are contributing to a possible bankruptcy or hardship." "Display the cost of labs when [we're] ordering them [in the EHR]." "Post the prices so that MDs understand how much everything costs."	31 (40.8)	7 (33.3)
Role modeling restraint	"Train attendings to be more critical about necessity of labs and over-ordering. . . . Make it part of rounding practice to decide on the labs truly needed for each patient the next day." "Attendings could review daily lab orders and briefly explain which they do not believe we need. This would allow residents to learn from their experience and their thought processes." "Encouragement and modeling of this practice from the faculty perhaps by laying out more clear expectations for which clinical situations warrant daily labs and which do not."	23 (30.2)	7 (33.3)
Computerized or decision support	"When someone orders labs and the previous day's lab was normal or labs were stable for 2 days, an alert should pop up to reconsider." "Prevent us from being able to order repeating [or standing] labs." "Track how many times labs changed management, and restrict certain labs—like LFTs/coags."	16 (21.1)	6 (28.6)
High-value care educational curricula	"Increase awareness of issue by having a noon conference about it or some other forum for residents to discuss the issue." "Establish guidelines for housestaff to learn/follow from start of residency." "Integrate cost conscious care into training program curricula."	12 (15.8)	4 (19.0)
System improvements	"Make it easier to get labs later [in the day]" "Improve timeliness of phlebotomy/laboratory systems." "More responsive phlebotomy."	6 (7.9)	2 (9.5)

NOTE: Abbreviations: coags, coagulation tests; EHR, electronic health record; IM, internal medicine; GS, general surgery; LFT, liver function tests. *Kappa scores: mean 0.78; range, 0.59–1. Responses could be assigned to multiple categories. †There were 85 of 149 (57.0%) IM respondents, among whom 76 of 85 (89.4%) provided a free-text suggestion. ‡There were 31 of 57 (54.4%) GS respondents, among whom 21 of 31 (67.7%) provided a free-text suggestion.

regarding test ordering at the beginning of teaching rotations, including teaching points that discourage overutilization during rounds, and role modeling high-value care in their own practice. Taken together and practiced routinely, these hospitalist behaviors could prevent poor habits from forming in our trainees and discourage overinvestigation. Hospitalists must be responsible to disseminate the practice of restraint to achieve more cost-effective care. Purposeful faculty development efforts in the area of high-value care are needed. Additionally, supporting physician leaders that serve as the institutional bridge between graduate medical education and the health system¹⁵ could foster an environment conducive to coaching residents and faculty to reduce unnecessary practice variation.

This study is subject to several limitations. First, the survey was conducted at a single academic medical center, with a modest response rate, and thus our findings may not be generalizable to other settings or residents of different training programs. Second, we did not validate residents' perception of whether or not tests were, in fact, unnecessary. We also did not validate residents' self-reporting of their own behavior, which may vary from actual behavior. Lack of validation at the level of the tests and at the level of the residents' behavior are two distinct but inter-related limitations. Although self-reported responses among residents are an important indicator of their practice, validating these data with objective

measures, such as a measure of necessity of ordered lab tests as determined by an expert physician or group of experienced physicians or the number of inpatient labs ordered by residents, may add further insights. Ordering of perceived unnecessary tests may be even more common if there was under-reporting of this behavior. Third, although we provided a definition within the survey, interpretation among survey respondents of the term "unnecessary" may vary, and this variation may contribute to our findings. However, we did provide a clear definition in the survey and we attempted to mitigate this with feedback from residents on our preliminary pilot.

In conclusion, this is one of the first qualitative evaluations to explore residents' perceptions on why they order unnecessary inpatient laboratory tests. Our findings offer a rich understanding of residents' beliefs about their own role in unnecessary lab ordering and explore possible solutions through the lens of the resident. Yet, it is unclear whether tests deemed "unnecessary" by residents would also be considered unnecessary by attending physicians or even patients. Future efforts are needed to better define which inpatient tests are unnecessary from multiple perspectives including clinicians and patients.

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