Three-quarters of Americans feel that the United States does not get good value from its healthcare spending. This concern is partially driven by the systematic underuse of high-value care, coupled with the widespread provision of medical care services that do not improve patient-centered outcomes. One proposed strategy to enhance efficiency is the use of electronic health records (EHRs). Since the passage of the Health Information Technology for Economic and Clinical Health Act in 2009, EHR systems have become nearly ubiquitous in US health systems. EHR adoption was intended to both decrease costs and improve patient-centered outcomes via the use of clinical support tools, medication reconciliation, reduced duplication of services, and enhanced patient–provider communication. Although recent study results have demonstrated that EHR implementation has led to improvements in guideline adherence, patient satisfaction, and medical spending, the totality of available data is mixed.

Given that every aspect of an EHR is subject to human design, there is ample opportunity to create a system that encourages high-value care. Informed by the field of behavioral economics, which seeks to understand the rationality behind seemingly irrational human behaviors, several other studies have examined the inherent design of EHRs. For example, one nationwide survey of emergency departments looked at the default number of pills when a provider prescribed an opiate and noted default pill numbers as high as 90 tablets. Another study developed various “nudges” within the EHR to encourage less-intensive glycated hemoglobin (A1C) targets in appropriate patients.

Our study sought to evaluate whether any EHR system appears to be designed to facilitate the ordering of higher-value care. A behavioral economics model would suggest that making higher-value care easier to order would provide an intrinsic incentive to deliver this care. However, we suspect that most current EHR systems do not facilitate efficient ordering behavior. Accordingly, the aim of this study was to quantify the ease of EHR ordering of specified high-value and low-value services.

**ABSTRACT**

**OBJECTIVES:** The use of electronic health record (EHR) systems by US clinicians is nearly ubiquitous. One motivation for EHR implementation is the ability to increase provider efficiency and improve patient-centered outcomes. There are no data examining how EHR design aligns with the ordering of high- and low-value clinical services.

**STUDY DESIGN:** A survey of outpatient providers utilizing various EHR systems.

**METHODS:** Five high-value and 5 low-value services that would typically be ordered in a primary care setting were identified. Providers using different EHR systems quantified the number of computer clicks required to order each service.

**RESULTS:** Five unique EHR systems representing those used by nearly two-thirds of health systems were included. No correlation was found between the ease of EHR ordering and the value of the clinical service. Three of the 5 services that were easiest to order were low value, and 3 high-value services were among the most difficult to order.

**CONCLUSIONS:** In EHR systems used nationwide, no association existed between the clinical value of a service and the ease of ordering. This disconnect suggests that EHR redesign can significantly improve clinician workflow to facilitate the use of more high-value care and fewer low-value services.

METHODS

From April to June 2018, a survey was sent to medical institutions to identify a sample of EHR systems. Prior to the survey being sent, the study was approved for institutional review board (IRB) exemption by the Michigan Medicine institutional IRB. Respondents who agreed to participate in the study were sent a standardized form that listed 5 high-value and 5 low-value services that would be frequently ordered in an outpatient primary care setting. Rationale for their inclusion was derived from published national guidelines (Table 9-19). The services were listed in random order, in that the form did not specify whether the services were considered high or low value. Participants were instructed to count the number of EHR clicks required to order each of the services. When typing was required, it was predetermined that any typing would count as a single click, with the rationale being that number of characters typed would be highly variable among providers but that typing of any amount represented additional provider documentation.

RESULTS

Participants from 7 medical institutions, representing 5 unique EHR systems (Epic, CPRS, Practice Fusion, Allscripts, and Cerner), were identified and agreed to complete the survey. Responses were received and included from 5 systems: 3 academic institutions, 1 Veterans Affairs hospital, and 1 community hospital. Nearly all order entries (47/50) required some typing in addition to clicking. Glucometers were ordered outside the EHR workflow in 2 systems; flu shots were ordered outside the EHR in 1 system.

Little correlation was seen between the value of a service and ease of ordering (Figure). Of the 5 easiest services to order, 2 were designated high value (flu shot [9.0 clicks], A1C testing [9.8 clicks]) and 3 were deemed low value (prostate-specific antigen screening [10.0 clicks], vitamin D screening [10.2 clicks], lumbar x-ray for back pain [11.2 clicks]). Similarly, of the 5 most difficult to order, 3 were designated as high value (glucometer [12.0 clicks], pulmonary rehabilitation [13.6 clicks], colonoscopy [13.6 clicks]) and 2 as low value (upper endoscopy for gastric reflux [14.4 clicks], computed tomography angiogram for coronary calcium [16.28 clicks]).

DISCUSSION

Prior to the widespread adoption of EHRs, a proposed advantage of their adoption was to enhance provider efficiency. Our study sought to quantify the degree to which current EHR systems are designed

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<th>Service</th>
<th>Rationale</th>
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<tr>
<td>Screening colonoscopy</td>
<td>USPSTF: grade A recommendation for all patients aged 50 to 75 years&lt;sup&gt;1&lt;/sup&gt;</td>
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<tr>
<td>Glucometer for patients with insulin-dependent diabetes</td>
<td>American Diabetes Association: recommends routine glucose monitoring in all patients receiving multiple daily insulin doses&lt;sup&gt;10&lt;/sup&gt;</td>
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<tr>
<td>A1C testing for patients with diabetes</td>
<td>American Association of Clinical Endocrinologists Clinical Care guidelines: recommend routine A1C monitoring in all patients with diabetes&lt;sup&gt;11&lt;/sup&gt;</td>
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<tr>
<td>Flu shot</td>
<td>CDC: recommends annual flu shot in all patients older than 6 months with few exceptions&lt;sup&gt;12&lt;/sup&gt;</td>
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<tr>
<td>Pulmonary rehabilitation</td>
<td>European Respiratory Society and American Thoracic Society: recommend pulmonary rehabilitation after discharge for all patients admitted with a COPD exacerbation&lt;sup&gt;13&lt;/sup&gt;</td>
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<th>Service</th>
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<tr>
<td>Lumbar x-ray for back pain</td>
<td>American Association of Family Physicians and American College of Physicians: recommend against imaging for lower back pain without specific indications or red flag symptoms&lt;sup&gt;14,15&lt;/sup&gt;</td>
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<tr>
<td>Vitamin D screening</td>
<td>USPSTF: grade I recommendation for routine vitamin D screening&lt;sup&gt;14&lt;/sup&gt;</td>
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<tr>
<td>PSA screening</td>
<td>USPSTF: grade D recommendation at time of study (currently retains a grade C recommendation for men aged 55–69 years)&lt;sup&gt;17&lt;/sup&gt;</td>
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<tr>
<td>CTA for coronary calcium</td>
<td>USPSTF: grade I recommendation for coronary calcium scores in asymptomatic individuals&lt;sup&gt;18&lt;/sup&gt;</td>
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<tr>
<td>EGD for gastric reflux</td>
<td>American Society for Gastrointestinal Endoscopy: recommends against routine EGD evaluation of gastric reflux without red flag signs&lt;sup&gt;19&lt;/sup&gt;</td>
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A1C indicates glycated hemoglobin; COPD, chronic obstructive pulmonary disease; CTA, computed tomography angiogram; EGD, upper endoscopy; PSA, prostate-specific antigen; USPSTF, United States Preventive Services Task Force.
Ordering Services Across Electronic Health Records

To enhance the efficiency of providing high-value care. Based on our findings of a national sampling of EHR systems, representing nearly two-thirds of EHR users in hospitals, there was little correlation between the ease of ordering a particular clinical service and the strength of the evidence guiding the rationale for its use. Additionally, most of the high-value services required typing in all EHRs, which may further slow clinician workflow.

EHR vendors have promoted tools such as best practice advisories and other similar alerts to increase utilization of high-value services and reduce low-value care. Our study did attempt to quantify the use of these alerts, but only 2 systems were noted to contain any alerts for the given services. Therefore, although these alerts may provide useful clinical reminders, they do not appear to be a widespread tool for supporting high-value care based on our findings. Moreover, an increased reliance on alerts and reminders may increase alert fatigue and provider frustration with EHR systems. Results from several studies demonstrate that current EHR systems have increased clerical burden and frustration for clinicians and that this increased burden is associated with higher rates of burnout. Simplifying the ordering process for clinicians who are ordering established high-value services could decrease the workload for these clinicians as well as incentivize higher-value care by other clinicians.

Limitations
Our study does have several limitations, including that not all EHR systems are represented. Additionally, we looked only at a small fraction of potential orders available to a primary care provider. Further, our study evaluated the ability to order services through a standard ordering process. However, many EHR systems also contain redundancy and customizability features. This may potentially affect the ordering of services in individual hospital systems.

Conclusions
To our knowledge, this is the first study to explicitly quantify how current EHR design fails to facilitate efficient ordering behavior. These findings imply that there is significant potential for EHRs to better support clinicians by making it easier to order evidence-based care and more difficult to access low-value care.

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TRENDS FROM THE FIELD

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REFERENCES


