Impact of an Electronic Health Record Reminder on Abdominal Aortic Aneurysm Screening in a General Internal Medicine Clinic

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ABSTRACT

- Objective: To determine the impact of electronic health record (EHR) reminders on abdominal aortic aneurysm (AAA) screening rate.
- Methods: A retrospective chart review was conducted to assess the AAA screening rates in pre- and post-intervention periods of 4 months’ duration at an academic outpatient practice. The 1-month intervention consisted of implementing an EHR reminder and making providers aware of the new EHR reminder system.
- Results: There was pre-intervention data for 235 patients. Although 157 (66.8%) met criteria for screening, only 14 (8.9%) were screened. The post-intervention period included 199 patients, with 108 (54.3%) meeting screening criteria and 25 (23.1%) undergoing screening. The AAA screening rate increase was significant ($P = 0.002$).
- Conclusion: Point-of-care reminders through the EHR significantly improved AAA screening.

Abdominal aortic aneurysm (AAA) rupture leads to nearly 13,000 deaths yearly in the United States [1]. Age, male sex, and a history of smoking are the principal risk factors for AAA [2]. AAA accounts for 2% to 4% of all deaths among males. Rupture of the AAA occurs in 1% to 3% of men aged 65 or older. Despite advances in surgical treatment, the mortality is 70% to 95% upon rupture [3]. However, mortality is less than 5% for elective surgery [4].

In a meta-analysis of AAA screening studies, Fleming et al reported an odds ratio of 0.57 (confidence interval, 0.45–0.74), favoring an association between screening and reduced AAA mortality [5]. The relative risk reduction for deaths from AAA was 43% because of ultrasound screening [5]. Other meta-analyses of mid- and long-term effects have shown a reduction in AAA-related and overall mortality [6,7]. AAA screening costs about $50 per patient [8] and its cost-effectiveness is similar to that of other preventative services [8].

In 2005, the U.S. Preventive Services Task Force recommended a one-time screening for AAA by ultrasound in males aged 65 to 75 who have ever smoked, defined by the Centers for Disease Control and Prevention as more than 100 cigarettes during their lifetime. In this highest-risk group, a single screening was sufficient to reduce risk for more than 10 years [5]. In the United States, effective 1 January 2007, provisions of the SAAAVE Act (Screening Abdominal Aortic Aneurysm Very Efficiently) now provide a free, one-time, ultrasound AAA screening benefit for qualified seniors. In the UK, by March 2013 screening is expected to be offered to all men in their 65th year, with expected reduction in AAA ruptures and deaths [9].

Despite these recommendations, many patients do not receive appropriate screening [10]. The use of clinical practice guidelines has been proposed as a way of improving health care processes and outcomes [11–13]. However, gaps have been observed between guideline recommendations and actual practice [14–16]. A number of guideline dissemination and implementation strategies have been evaluated to assess which are likely to be effective under different circumstances [16–18]. Previously, we disseminated and encouraged use of the Task Force guidelines with provider education through a didactic component, emails, and an audit with feedback/discussion [19]. Our intervention was associated with an immediate increase in the AAA screening rate, but the improvement faded over a 6-month period [19].
Passive dissemination of a guideline is not likely to translate into changed practice behaviors, better health outcomes, or contained costs [11,18]. Therefore, in this paper, we assess the effectiveness of an EHR reminder on AAA screening rates in a general internal medicine clinic.

**METHODS**

The study was conducted at general internal medicine clinic at the Southern Illinois University School of Medicine. To assess the quality of AAA screening per the Task Force guidelines, we examined the electronic health record to review the visits of all men between 65 and 75 years of age during a 4-month period (June through September 2010). Demographic and clinical details of the patients, including age and smoking status, were recorded. Patients were excluded if they had never smoked or if they had abdominal imaging (ultrasound, computed tomography [CT], or magnetic resonance imaging [MRI]) in the last 5 years and the status of abdominal aorta was documented. We considered those patients as “screened” if the physician documented the offer of screening or ordered AAA screening during that visit. We also recorded the AAA screening result, when available. For repeat visits during the study period by a patient who had not been previously “screened,” the patient was considered new because the physician could recommend screening during that visit.

Then, we implemented a point-of-care EHR reminder for patients eligible for AAA screening and informed general internal medicine attending and resident physicians about the change in October 2010. In our EHR, the physician can view all the preventive studies tailored for the given patient by clicking on the "Protocols" tab (Figure 1). This brings up a pop-up screen with appropriate preventive screening reminders and the date they were last performed. We included an AAA screening reminder in this pop-up screen (Figure 2).

A post-intervention analysis was performed from November 2010 to February 2011. Descriptive statistics and nonparametric (Fisher’s exact test) statistics were computed using PASW 18 software (SPSS, Chicago). The project was approved by the institutional review board.

**RESULTS**

In the pre-intervention period, there were 157 patients who met the screening criteria. Mean age was 69.38 years (SD ± 3.7). Only 14 (8.9%) underwent screening. In the post-intervention period, 108 patients met the criteria
for screening. The mean age was 69.8 years (SD ± 3.1). Twenty-five (23.1%) underwent screening.

The nonparametric Fisher’s exact test analyzed the significance of change because the sample size was small and nonrandomized. The 2-tailed P value (0.0023) was statistically significant for an AAA screening rate increase.

DISCUSSION

In our general internal medicine clinics, the rates of AAA screening were low. The overall AAA screening rate in our study was 8.9%, similar to prior reports of 5% to 7% of the eligible population [19–21]. In 2009, a retrospective analysis of 279 eligible veterans found that only 30% were offered screening for AAA [10]. However, their results included patients who had recent abdominal imaging like ultrasound, CT, or MRI for other purposes [10]. Later, after implementation of the electronic clinical reminder, the above group showed an increase in AAA screening to 56.4% [20]. In our study, implementation of the electronic clinical reminder increased the screening to 23.1%, a significant change.

Eaton et al and Padberg et al also showed efficacy of EHR reminders by approximately doubling the number screened [21,22].

In a systematic review, Prior et al [23] concluded that traditional educational strategies and guideline dissemination by themselves are ineffective. A review by Davis and Taylor-Vaisey examined variables affecting the adoption of guidelines [15]. These included qualities of the guidelines, characteristics of the health care professional, social norms, ethics, regulations, characteristics of the practice setting, rewards or incentives, and patient factors. Various reviews found varying effectiveness for different types of interventions: weak (didactic, traditional continuing medical education and mailings), moderately effective (audit and feedback, especially concurrent, targeted to specific providers and delivered by peers or opinion leaders), and strong (reminder systems, academic detailing, and multiple interventions) [15]. In our previous study, pre-intervention AAA screening rates were 6.8%, which improved to 17.7% immediately following the passive educational interventions (weak to moderate effect). The increase in AAA screening was significant ($P = 0.034$). However, 6 months later, only 9.0% underwent screening, indicating that the intervention’s effect decreased over time ($P = 0.781$) [19]. In this study, we utilized a ‘strongly effective’ point-of-care reminder system, as 15 of 20 studies showed a positive effect of a reminder system on guideline implementation [23].
Physicians are under pressure to recall appropriate screening recommendations and remember to order them with an increasing number of recommended screening tests together with shorter visit times. Consequently, lack of time has been identified as an important barrier in delivering preventive care [15,24]. In our study, patients due for screening were identified by real-time clinical decision support, reminding providers to order age- and gender-specific screening tests. Moreover, recent studies have raised doubts on the effectiveness of AAA screening which may also affect the screening rates. Shreibati et al examined the effect of the 2007 Screening Abdominal Aortic Aneurysms Very Efficiently (SAAAVE) Act by using Medicare data from 2004 to 2008. They found a modest increase of 15% in AAA screening among eligible 65-year-old men during the study period [25]. They noted that the financial costs of the test, lack of physician reminders, limited access, and low patient awareness of disease risk as factors that may help explain why the increase was not greater. However, no significant differences were seen in the rates of AAA repair, AAA rupture, or all-cause mortality in a 1-year follow-up. Authors stated that the number of these events in their study was quite low, limiting statistical power. Further, most aneurysms detected by screening programs were small and the short follow-up period of the study limited the assessment of actual long-term negative outcomes. Despite shortcomings, Harris et al in the invited commentary to the study by Shreibati et al suggested reassessment of AAA screening criteria and its implementation in the future [26]. In contrast, Thompson et al in the UK Multicenter Aneurysm Screening Study (MASS) randomized trial reported a reduction in all-cause mortality of 3% and the benefit in AAA-related mortality continued to accumulate throughout follow-up [27]. Similar to other screening programs, such as mammography and fecal occult blood testing, which reduce disease-specific mortality, AAA screening has been shown to reduce AAA-related mortality by 50%; however, like the above screening programs, it has not been shown to reduce all-cause mortality [28–32]. Reducing AAA-related deaths would have relatively little impact on all-cause mortality because it contributes only 1% of overall deaths.

There are several limitations of this study. First, we utilized a retrospective design with a small sample size. Second, our methods did not control for confounding variables like type of visit, length of visit, or type of provider. Third, the providers included attending physicians and residents at different levels of training. Fourth, the EHR reminder shows up only if the "Protocols" tab is clicked by the provider. Finally, we did not reassess the long-term effectiveness of the current intervention. Despite these weaknesses, this study showed that EHR reminders aimed at increasing the awareness of AAA screening guidelines increased the rate of screening significantly at our GIM clinics.

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REFERENCES


8. United States Preventive Services Task Force. Screening for...


