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Research Article

Utilization of the Electronic Health Record to Improve Provision of Smoking Cessation Resources for Vascular Surgery Inpatients

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Abstract

Background and Objectives: Identification of hospitalized patients who smoke has shown significant improvement in recent years, but provision of evidence-based tobacco cessation treatment remains a challenge. This study evaluated the utilization of an electronic health record (EHR) to facilitate implementation of evidence-based clinical practice guidelines for smoking cessation on a vascular surgery inpatient unit.

Methods: A pre- and post-intervention cohort study was conducted over 6 months at a single academic medical center with a comprehensive EHR. All patients admitted to the vascular surgery service and documented as current smokers were included. A vascular surgery discharge order set with an evidence-based smoking cessation module was developed and implemented. The primary outcome was prescription of nicotine replacement therapy (NRT) at the time of discharge. The secondary outcome was referral for smoking cessation counselling at the time of discharge.

Results: There were 52 and 42 smokers in the pre- and post-intervention cohorts, respectively. Over the 3 months following implementation of the EHR order set, prescription of NRT at the time of discharge did not change significantly (27% vs. 19%, p=0.30). Referral for outpatient smoking cessation counselling increased in the post-intervention group, but did not reach significance (64% vs. 72%, p=0.20).

Conclusions: Implementation of a brief tobacco dependence treatment order set in an existing EHR increased cessation counselling referrals on a vascular surgery inpatient unit. One potential limitation of the study was the modest sample size. Not being able to make smoking cessation treatment a mandatory component in discharge orders may also have contributed to the modest effect. Assessing the differential effect of EHR-based order implementation will be important in future research on this topic.

Keywords

Vascular surgery; Electronic health record; Nicotine replacement therapy

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Introduction

The Centres have identified systematic, comprehensive treatment of tobacco dependence in hospitalized patients as a national healthcare priority for Medicare & Medicaid Services (CMS), and The Joint Commission (TJC). In addition, TJC released a tobacco use performance measure set in 2012, which greatly expands on previously required interventions for tobacco users; namely, the limitation to patients admitted with acute myocardial infarction, congestive heart failure, or pneumonia has been eliminated. Utilization of the electronic health record (EHR) has been shown to increase adherence to these guidelines [1]. High risk patient populations, such as patients admitted for complications of peripheral arterial disease (PAD), can be the focus of targeted interventions to improve the quality of healthcare delivery.

Inpatient hospitalization for complications of PAD is an unequalled opportunity for evaluation of readiness to quit using tobacco, to provide patients with evidence-based, appropriate treatment while hospitalized, as well as continued treatment upon discharge with scheduled follow up. Smoking cessation and subsequent abstinence from tobacco use have been shown to decrease PAD-related morbidity and mortality [2]. The U.S. Department of Health and Human Services Public Health Service tobacco treatment guidelines (2008 update) emphasize the effectiveness of counselling and pharmacologic interventions, especially in combination, in increasing smoking-cessation rates [3].

The use of EHRs has increased exponentially over the past decade and this technology offers a unique opportunity for efficient integration of system level changes aimed at improving the quality of health care delivery. A recent Cochrane review supports the use of the EHR as a tool to increase documentation of tobacco use status and referral to cessation counselling [4].

A standardized, evidence-based tobacco cessation evaluation and referral EHR module, with a focus on tobacco use treatment at the time of hospital discharge, was designed and implemented on a vascular surgery inpatient unit. The aim of this study was to assess the impact of the new EHR module on provision of tobacco cessation treatment, including counselling and pharmacotherapy, at the time of discharge.

Methods

Using a pre-post study design, we tested the impact of adding a tobacco cessation module to an existing vascular surgery discharge order set in the EHR (Health Link, Epic) utilized at the University of Wisconsin Hospital and Clinics (UWHC) in Madison, WI (Figure 1).

A standardized discharge order template is used to discharge all patients from the Vascular Surgery inpatient service at UWHC. A "tobacco abstinence" module was designed and added to the existing order set already in use (Figure 1). The module includes clinical decision support by automatically populating the patient smoking status as documented by the admitting nurse.

If clinicians do not complete the tobacco abstinence module, they are still able to complete the discharge order set and the overall

process of discharging the patient from the hospital. An electronic stop on the discharge process for failure to complete the tobacco abstinence module was not implemented.

A chart review of vascular surgery inpatients conducted from May 2012 through August 2012, demonstrated a discharge medication prescription and counselling referral rate of approximately 10%. Thus, we calculated that a sample size of 35 documented smokers would need to be included in each cohort for the study to have 80% power to detect a 75% change in prescription of cessation medications at 3 months, at a two-sided type I error rate of 0.05. The patient population included all patients admitted to the Peripheral Vascular Surgery (PVS) service, regardless of admitting diagnosis, who were > 18 years of age.

The tobacco abstinence module was implemented on May 5, 2013. In the preceding month, educational lectures were presented to the faculty and house staff of the UW Division of Vascular Surgery, and the mid-level providers and nursing staff of the UW Vascular Surgery inpatient unit. These sessions outlined the rationale for the EHR change and summarized the details of the new module.

We compared outcomes between three-month periods before and after implementation of the module. The primary outcome was prescription of nicotine replacement therapy (NRT) or another FDA-approved pharmacologic cessation aid at discharge. The secondary endpoint was referral to the Wisconsin Tobacco Quit Line for cessation counselling at discharge. Hospital databases provided information on the number and characteristics of discharges during the study period.

Data analysis was performed using SPSS statistical software. The unit of analysis was individual patient hospital discharge plan of care documentation. We present rates of NRT prescription and referral to the Wisconsin Tobacco Quit Line for post-discharge counselling.

Results

During the 3 months prior to implementation of the intervention (February 2nd, 2013 – May 1st 2013), 213 patients were discharged from the vascular surgery service. Fifty two patients (24%) were documented current smokers and thus included in the pre-intervention cohort. During the 3 months following implementation of the tobacco abstinence module, 194 patients were discharged from the vascular surgery service. Forty two patients (22%) were documented current smokers and made up the post-intervention cohort. The cohorts were similar, without statistically significant differences in age, gender or race (Table 1).

Over the 3 months following implementation of the EHR order set (May 2nd, 2013 - August 2nd 2013), prescription of NRT at the time of discharge did not change significantly (27% vs. 19%, $p=0.30$). Referral for outpatient smoking cessation counselling increased in the post-intervention group, but did not reach significance (64% vs. 72%, $p=0.20$).

Discussion

Tobacco use is the most significant risk factor for the development of PAD, disease severity, and progression from claudication to limb-threatening ischemia with rest pain and tissue loss. Smoking cessation and subsequent abstinence from tobacco use have been shown to decrease PAD-related morbidity and mortality [3]. Unfortunately, this patient population faces significant barriers to achieving abstinence from tobacco use, including high levels of addiction and living in households with other smokers [6]. The effectiveness of intensive smoking cessation treatment, including counselling and pharmacotherapy, has been well documented. Hennrikus and colleagues evaluated the effectiveness of a smoking cessation program specifically for outpatients with PAD and noted a significant increase in abstinence in those provided with an intensive cessation regimen [6]. When patients with PAD are provided with the resources and support to quit smoking, including both cessation pharmacotherapy and counselling, they are more likely to be successful.

Inpatient hospitalization for medical conditions associated with tobacco abuse, including complications of PAD, represents a teachable moment and an unequaled opportunity to provide smoking cessation treatment. Patients admitted for smoking-related diagnoses,

Figure 1: Tobacco cessation module component of the Vascular Surgery Discharge order set as it appears within the electronic health record.

Table 1: Patient demographics in the pre- and post-intervention cohorts.

	Pre-Intervention Cohort (n = 52)	Post-Intervention Cohort (n = 42)	p Value
Age, M (SD)	61.7	62.6	0.10
Male Sex, no. (%)	29 (56)	17 (41)	0.10
Race, no. (%)			
White	44 (85)	39 (93)	0.10
Black	5 (9.6)	1 (2.4)	
Other	3 (5.7)	2 (4.8)	

particularly cardiovascular diagnoses, have been shown to have increased cessation rates compared to patients with non-smoking related illnesses [7]. More than one third of patients admitted for vascular surgical intervention identify themselves as current smokers and 40% will abstain from smoking while inpatient [8]. The smoke-free hospital environment and the direct relationship between the indication for admission and smoking may be strong motivators for patients to initiate a quit attempt while hospitalized. Furthermore, smoking cessation interventions during inpatient hospitalization have been shown to increase post-discharge quit attempts by 65% [9]. It is imperative to focus smoking cessation interventions on this high risk subset of patients during hospitalization for exacerbation of tobacco-associated illness.

Practical, systematic provision of smoking cessation resources within the current healthcare system represents a significant challenge for clinicians. Time constraints and the need for efficient work flow impacts on the success of any intervention aimed at improving systems for delivering smoking cessation treatment [4,10] Utilization of EHRs to facilitate implementation of evidence-based clinical practice guidelines for smoking cessation has been investigated [2,4,10-19]. The majority of EHR-based interventions have been implemented in the outpatient primary care setting and have demonstrated an increase in documentation of smoking status and provision of counselling services, albeit without a significant improvement in prescription of pharmacologic cessation aids [10,11,14,19]. In this study, the addition of a brief "tobacco abstinence" module to an existing discharge order set demonstrated a trend toward increase in referrals to the Wisconsin Tobacco Quite Line, an outpatient smoking cessation counselling service, on an inpatient vascular surgery service.

A Cochrane review published in 2011, which included randomized and observational studies on the use of the EHR to support smoking cessation, noted a short term increase in documentation of tobacco use status and increased referral to cessation counselling [4]. Nearly half of the studies reviewed limited their focus to increasing the level of provider documentation. Though an important first step, routine documentation of smoking status satisfies only the first of the four components of TJC tobacco use performance measure set.

Smoking cessation interventions have been shown to be effective in the inpatient setting. EHR-based interventions to improve evidence-based smoking cessation treatment in this clinical setting have been grossly neglected in the existing literature, with only one study published by Koplan and colleagues in 2008. In their work at the Brigham and Women's Hospital, adding a brief order set to the existing EHR in the inpatient hospital setting increased the provision of evidence-based smoking cessation treatment, including documentation of smoking status, referral to a counselor and prescription of nicotine replacement therapy [14].

Review of the Vascular Study Group of New England registry revealed that 75% of the variation in tobacco cessation rates could be attributed to the treatment center, with hospitals providing referral to cessation specialists or offering pharmacotherapy or both, being more likely to have patients quit smoking [20]. This finding further supports hospital system-level initiatives, such as the EHR modifications described here, to enhance tobacco cessation among vascular surgery patients.

It is clear that the design and implementation of EHR systems to improve the quality of patient care is effective, however, it is important to note the complex and often time-consuming nature of this enterprise. Neinstein and colleagues described a 2-year process of coordinated work between physicians, nurses, pharmacists and programmers to transition to computerized provider entry for glycemic control [21]. Successful implementation of EHR system changes requires broad stakeholder input and buy-in, as well as a commitment to ongoing modifications in response to user feedback. Support from hospital administration for this substantial time and man-power investment may be more readily obtained by utilizing robust national data registries, such as the Vascular Quality Initiative (VQI), to collect and assess data. In fact, increased smoking cessation after surgery through referral to QUIT lines is currently a regional quality initiative under the auspices of the VQI [22,23].

This study has significant limitations. First, education regarding the new EHR module was provided to practitioners during the pre-intervention study period. This may have resulted in increased awareness of the importance of tobacco cessation treatments and subsequently increased provision of resources to inpatients prior to implementation of the intervention. Second, although the number of patients included in the study did reach statistical power to evaluate the primary endpoint, the cohorts were small. Finally, the tobacco cessation module was not a required component of the discharge order set. We were unable to place a "hard stop" (meaning that the electronic system does not allow the provider to complete the full order set without completing that particular order) on the tobacco cessation component of the discharge order set due to concerns that this could delay the patient discharge process. Not being able to make smoking cessation treatment a mandatory component in discharge orders may also have contributed to the modest effect. Creating a "hard stop" in the tobacco abstinence module of the discharge order set would further systematize provision of smoking cessation resources at the time of hospital discharge.

Conclusion

Evidence-based smoking cessation treatment measures should be a mandatory component of hospital discharge EHR order sets to systematize provision of these resources. Assessing the differential effect of EHR-based order implementation will be important in future research on this topic.

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