

BRIEF REPORTS

A Computerized Aid to Support Smoking Cessation Treatment for Hospital Patients

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BACKGROUND: Hospital-based interventions promote smoking cessation after discharge. Strategies to deliver these interventions are needed, especially now that providing smoking cessation advice or treatment, or both, to inpatient smokers is a publicly reported quality-of-care measure for US hospitals.

OBJECTIVE: To assess the effect of adding a tobacco order set to an existing computerized order-entry system used to admit Medicine patients to 1 hospital.

DESIGN: Pre-post study.

MEASUREMENTS AND MAIN RESULTS: Proportion of admitted patients who had smoking status identified, a smoking counselor consulted, or nicotine replacement therapy (NRT) ordered during 4 months before and after the change. In 4 months after implementation, the order set was used with 76% of Medicine admissions, and a known smoking status was recorded for 81% of these patients. The intervention increased the proportion of admitted patients who were referred for smoking counseling (0.8 to 2.1%) and had NRT ordered (1.6 to 2.5%) ($p < .0001$ for both). Concomitantly, the hospital's performance on the smoking cessation quality measure improved.

CONCLUSIONS: Adding a brief tobacco order set to an existing computerized order-entry system increased a hospital's provision of evidence-based tobacco treatment and helped to improve its performance on a publicly reported quality measure. It provides a model for US hospitals seeking to improve their quality of care for inpatients.

KEY WORDS: hospital medicine; medical informatics; physician behavior; smoking cessation; quality improvement.

J Gen Intern Med 23(8):1214-7

DOI: 10.1007/s11606-008-0610-4

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INTRODUCTION

Smoking is the leading preventable cause of death in the United States.¹ Smoking cessation decreases smoking-attributable morbidity and mortality, even when cessation occurs after the onset of a smoking-related disease.^{2,3} A hospitalization provides a smoker with an opportunity to stop smoking. Initiating a smoking intervention in the hospital increases a smoker's odds of stopping smoking after discharge by 65%.^{4,5} Since 2004, hospital quality-of-care standards set by the Joint Commission (JCAHO) and Medicare (CMS) have included a tobacco measure.⁶ It assesses the proportion of smokers who received smoking advice, counseling, or medication during a hospitalization for acute myocardial infarction (AMI), congestive heart failure (CHF), or pneumonia. This measure is reported quarterly on a public website⁷ and is included in pay-for-performance reimbursement programs.

To meet this quality standard, hospitals must document that smoking cessation advice or assistance was consistently provided to every smoker admitted with a qualifying diagnosis. The simple documentation of patients' smoking status is associated with higher hospital quality rankings on the JCAHO/CMS measure.⁸ Smoking status is usually recorded in hospital charts, but rarely in a way that can be extracted systematically to ensure that a patient's smoking is addressed before discharge. This capacity could be built into hospital clinical information systems. Computerized order-entry systems are becoming more widely adopted by US hospitals to improve hospital quality and safety. These systems typically include templated order sets and decision support for prescribing medications.⁹ This paper reports on an initiative to improve the delivery of evidence-based tobacco treatment to hospitalized smokers by building into 1 hospital's computerized order-entry system a new tobacco-related order template that prompted clinicians to identify every admitted patient's smoking status and facilitated the ordering of smoking cessation counseling and medications.

METHODS

Using a pre-post study design, we tested the impact of adding a tobacco order template to an existing computerized clinician order-entry template used to admit patients to Brigham and Women's Hospital (BWH) in Boston, MA. The study was approved by the hospital's Institutional Review Board.

Received November 6, 2007

Revised February 6, 2008

Accepted March 3, 2008

Published online May 9, 2008

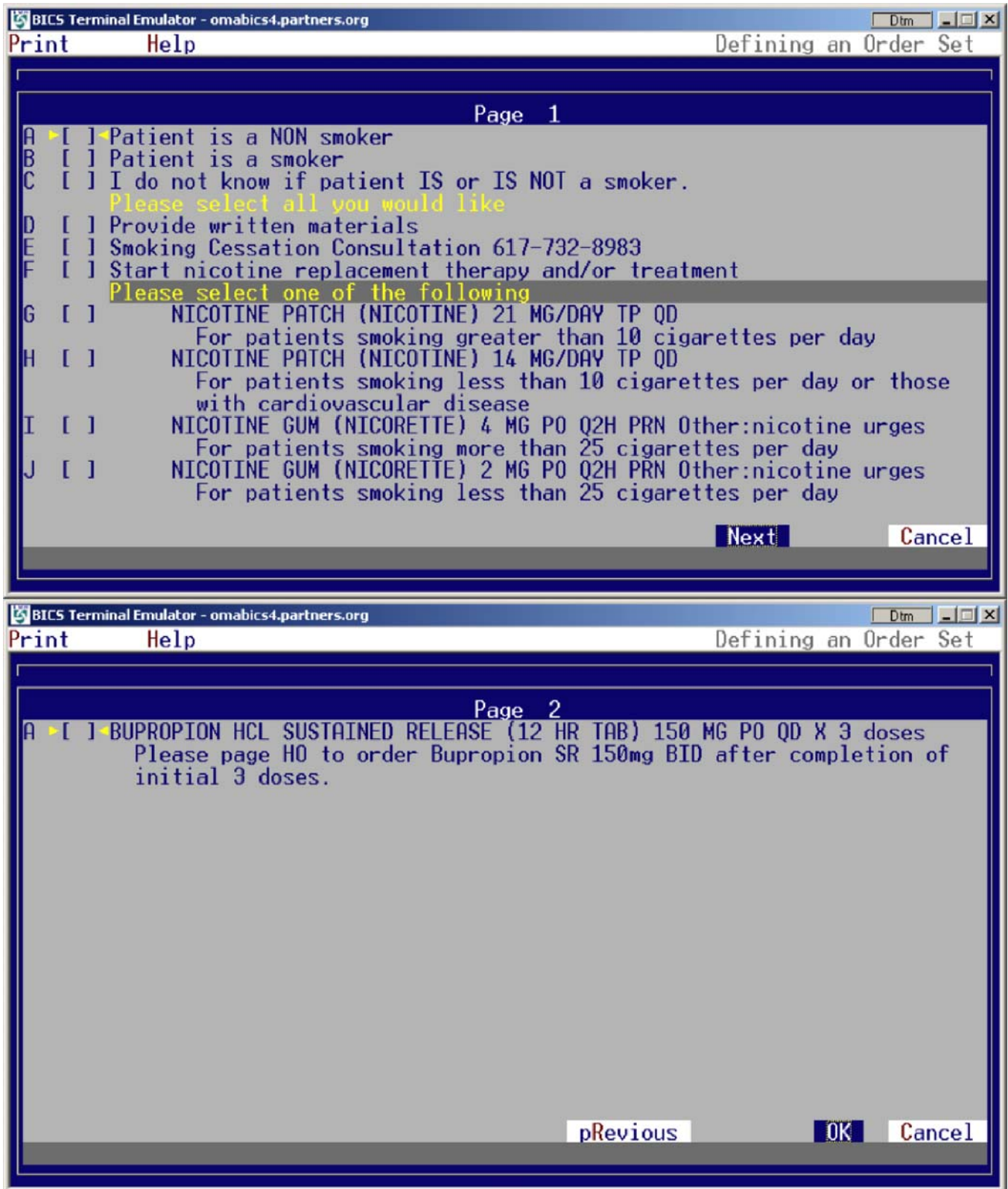


Figure 1. The tobacco order template added to the clinician order entry system.

Standardized admission order templates are used to admit patients to the Medical Service. Templates are available but not required for admissions to other services. We added a tobacco order set to 4 admission templates: basic admission orders,

AMI, CHF, and pneumonia. (Fig. 1) The smoking order set required the admitting clinician to identify and record the patient's smoking status (as smoker, nonsmoker, or unknown status) to complete the patient's admission. The "unknown

status" option was intended for use when illness or other circumstance precluded smoking status identification at admission. For smokers, the system automatically generated an order requesting a referral to the hospital's smoking counselor and provided a check-box for ordering nicotine replacement therapy (NRT) or bupropion, along with simple decision support to ensure correct dosing. Completing the new template required approximately 8 seconds. Previously, ordering a smoking cessation consultation and cessation medication required about 90 seconds and accessing multiple screens. The hospital information system did not previously capture patient smoking status, prompt smoking counselor consultations or orders for NRT or bupropion, or provide decision support for medication dosage.

The template was implemented on February 6, 2006. In the preceding month, Internal Medicine house staff received a brief educational program consisting of a one-hour lecture, 2 emails, and a pocket card in which the rationale for the change and details of the new template were explained.

We compared outcomes between 4-month periods before and after the template was implemented. We focused on the Medical Service where admission templates were routinely used but also report results for other hospital services to detect spill-over effects. The primary outcomes were NRT orders and smoking counselor consultations. NRT orders were obtained from hospital pharmacy records. Smoking counselor consults were obtained from the electronic database kept by hospital smoking counselors. The rate of smoking status identification and the smoking prevalence of patients admitted could be assessed only in the postintervention period because previously these data were not electronically collected. Hospital databases provided information on the number and characteristics of admissions during the study period and on JCAHO/CMS smoking measures scores.

Data analysis was performed using Stata statistical software.¹⁰ The unit of analysis was hospital admission. We present rates of template use, smoking status identification, and NRT and consult orders. To compare rates over time, the denominator was all admissions rather than all admitted smokers because patient smoking status preintervention was not known. We assumed that the smoking prevalence of hospital admissions was stable over the short study period. We used binomial tests to compare the rates of template use and smoking status identification by hospital service and to assess change in the rates of NRT and consult orders before and after the intervention.

RESULTS

Brigham and Women's Hospital had 17,024 admissions (5,414 to Medicine, 11,610 to other services) during 4 months before template implementation and 17,530 admissions (5,627 to Medicine, 11,903 to other services) during 4 months after implementation. Median postimplementation length-of-stay was 4 days.

The tobacco order template was used for 7,278 (41.5%) of the 17,530 admissions in the postimplementation period. Template use was higher on the Medical Service ($n=4,290$ of 5,627, 76.2%) than on other services (2,988 of 11,903, 25.1%). Smoking status was recorded as known (i.e., smoker or

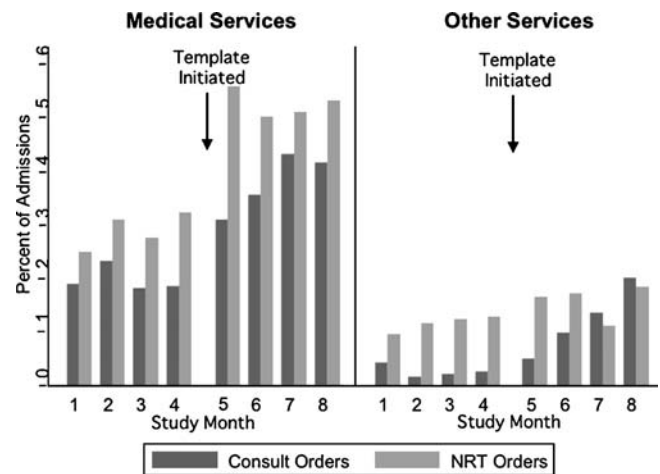


Figure 2. Orders for nicotine replacement therapy and smoking counseling consultations, 4 months before and after implementation of the tobacco template.

nonsmoker) for 5,281 (72.6%) of the 7,278 admissions in which the template was used and as unknown for 1,997 (27.4%). A higher proportion of Medical Service admissions had a known smoking status compared with other services (80.7% vs 64.2%, $p<.001$). The prevalence of current smoking among the 5,281 admissions with known smoking status was 12% on both the Medical Service and all other services.

The frequency of NRT orders and smoking counselor referrals increased after template implementation. (Fig. 2) The proportion of all admitted patients with NRT ordered rose from 1.6% preimplementation to 2.5% postimplementation ($p<.0001$). The proportion with a smoking consult rose from 0.8% to 2.1% ($p<.0001$). Increases in both modalities were greater on the Medical Service than on other services. Postimplementation, a smoking consult was ordered for 95% of the 633 known smokers, and NRT was ordered for 38% of them. Consultation was not ordered for all smokers because clinicians could opt out of a referral. Because smoking status on the template cannot be updated after admission, NRT was also ordered for 3.1% of the 6,645 patients not classified as smokers by template. This rate of NRT ordering is higher than existed for all admissions before template implementation ($p<.0001$). If these patients are considered smokers, the smoking prevalence of hospital admissions increases to 15.3%.

The hospital's quarterly score on the JCAHO/CMS composite smoking measure that summarized all 3 measured diagnoses (AMI, CHF, and pneumonia) increased from 86% preimplementation (fourth quarter 2005) to 95% postimplementation (second quarter 2006) and remained at the higher level subsequently. This performance moved BWH's tobacco score on the smoking measure from below the 50th percentile to approaching the 90th percentile. Similar improvements were seen for each of the 3 specific diagnoses measured.

DISCUSSION

Adding a short tobacco order set to a hospital's existing computerized clinician order-entry system dramatically increased the provision of evidence-based tobacco treatment to

inpatients and was followed by improvement in the hospital's scores on publicly reported quality-of-care standards. We show that physicians could easily record patient smoking status when a routine electronic system was implemented. With automated ordering of smoking consultations and decision-supported NRT ordering, the proportion of patients receiving these treatments increased substantially. The positive effect was strongest on the Medical Service, the target of the intervention, but spill-over to other services occurred. The rate of NRT orders increased even for those not classified as smokers at admission, indicating that the template may have raised awareness of the importance of this therapy.

Although adult smoking prevalence in Massachusetts is 18%,¹¹ only 12% of patients were identified as smokers at admission. An additional 3% received NRT during their stay, indicating that smoking status is sometimes ascertained only after admission. Allowing the template to be accessible after admission would likely further improve smoker identification.

This study has limitations. First, because of limited funding, we measured processes of care rather than smoking cessation outcomes. Fortunately, the evidence base linking the processes measured to smoking cessation outcomes is strong.⁵ Second, assessment of cessation medications excluded bupropion because we could not determine whether bupropion was ordered for depression or smoking. However, bupropion is not widely used to treat inpatient smokers. Third, our intervention occurred simultaneously with an education campaign encouraging nurses to document smoking and consult the smoking counselor. This could have confounded the increase in smoking counselor referrals and the improvement in JCAHO tobacco scores. However, confounding of NRT ordering would have been limited because nurses do not order medications. Our finding that improvement in NRT and smoking consult ordering was greater on the Medical Service where the template was targeted than on other services that also received the nursing education program argues that the observed increase is primarily attributable to the template. Finally, identifying and treating inpatient smokers need not be done by physicians. Hospital systems could off-load some tasks to other health care team members including admissions and nursing staff.

In summary, adding a tobacco order set to a hospital's computerized order-entry system improved the care of inpatient smokers and provides a model for US hospitals seeking to meet the JCAHO/CMS quality standard.

Acknowledgment: There were no additional contributors to this manuscript. Sources of funding consist of the following: Brigham and Women's Hospital, Department of Medicine, Medical Residency Office; NIH/NHLBI (Mid-Career Award in Patient-oriented Research to Dr. Rigotti - #K24 HL04440); and Partners HealthCare, Inc.

Conflict of Interest Statement: Kate Koplan, Susan Regan, and Louise Schneider have no conflicts of interest. Robert Goldszer has served as a consultant with Leader Health. Nancy Rigotti has served as a consultant with Pfizer and Sanofi-Aventis and has received grants from Pfizer, Sanofi-Aventis, and Nabi Biopharmaceuticals.

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