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Factors associated with improved completion of computerized clinical reminders across a large healthcare system

Michael F. Mayo-Smith[a,*], *Abha Agrawal*[b,c]

[a] *Primary Care Service Line, VA New England Healthcare System, Bedford, MA, United States*
[b] *Kings County Hospital Center, Brooklyn, NY, United States*
[c] *SUNY Downstate College of Medicine, Brooklyn, NY, United States*

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ABSTRACT

Objective: To analyze the relationship of completion rates for a standardized set of computerized clinical reminders across a large healthcare system to practice and provider characteristics.
Methods: The relationship between completion rate for 13 standardized reminders at 49 primary care practices in the VA New England Healthcare System for a 30-day period and practice characteristics, provider demographics and, via survey, provider attitudes was analyzed.
Results: There was no difference in clinical reminder completion rate between staff physicians versus nurse practitioners/physician assistants (87.6% versus 88.1%) but both were better than residents (76.6%, $p < 0.0001$). With residents excluded, there were no differences between hospital and community-based clinics or between teaching and non-teaching sites. Clinical reminder completion rate was lower for sites that did not fully utilize support staff in completion process versus sites that did (82.4% versus 88.1%, $p < 0.0001$). Analysis of survey results showed no correlation of completion rate with provider demographics or attitudes towards reminders. However there was significant correlation with frequency of receiving individual feedback on reminder completion ($r = 0.288$, $p = 0.004$).
Conclusion: Completion of computerized clinical reminders was not affected by a variety of provider characteristics, including professional training, demographics and provider attitude, although was lower among residents than staff providers. However incorporation of support staff into clinic processes and individualized feedback to providers were strongly associated with improved completion. These findings demonstrate the importance of considering practice and provider factors and not just technical elements when implementing informatics tools.

1. Introduction

Clinical reminders (CRs) are a widely used type of clinical decision support and consist of a prompt to the clinician to perform a due health care task. Computer-based clinical reminders have been shown to improve adherence to clinical practice guidelines and specific standards of care [1–5]. However, reported rates of CR completion have generally been low

* *Corresponding author at*: Veterans Affairs Medical Center, 718 Smyth Road, Manchester, NH 03104, United States. Tel.: +1 603 624 4366x6047; fax: +1 603 626 6583.
E-mail address: michael.mayo-smith@med.va.gov (M.F. Mayo-Smith).
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Table 1 – Factors identified in the prior publications which may facilitate or inhibit the use of clinical reminders

Reminder characteristics
Possible facilitating factors
Minimization of keystrokes, mouse clicks, scrolling, window changes and complexity [12,14]
Facilitation of alert completion with pre-populated alternatives [14]
Minimization of time required to document why reminder did not apply ("exceptions entry") [9–11,14]
Correct assignment of patient eligibility with updating easy and rapid [9–11,14]
Utilization of stored patient data to more precisely target patients [14]
Selective targeting of users based on department, degree and other user characteristics [14]
Provision of enough information to allow a triage decision at a glance [14]
Presence of links to other information resources [14]
Provision for users to have some control of reminders so that they can avoid unnecessary ones [14]
Presentation of CR in use of electronic medical record at the point of decision and action [14]
Including all clinically appropriate options for action, including patient refusal [7,10]
Ensuring CRs easy to locate in EMR [10]
Practice characteristics
Possible facilitating factors
Easy accessibility to computers [10,14]
Presentation of CRs at the appropriate time within the clinic workflow to the appropriate staff [10,12,14]
Coordination between nurses and providers [10]
Limitation of number of reminders to minimize "reminder fatigue" [10]
Ability for providers to document problems with CRs and receive prompt feedback [10]
Possible inhibiting factors
Provider workload and inadequate time during visit [7–14]
Interference with provider-patient interaction [9,11,12]
Use of paper records or forms in completion process [9,11]
Using reminder while not with patient [10]
Slow computer processing time [10]
CRs that benefit administration more than providers [11]
Lack of reimbursement for reminder completion [7]
User characteristics
Possible facilitating factors
Adequate training on reminder use [9,11]
Staff provider vs. resident physicians [11]

[5–7]. If the full benefit of computerized clinical decision support systems such as CRs is to be realized, factors related to successful use in actual clinical practice must be understood and changes in practice to improve use instituted.

Recently there has been a number of publications identifying factors that may impact the use of CRs. Methodologies used to identify these potential factors included user surveys [7–13], user focus group [14] and a survey of individuals attending a VA informatics conference [10]. Two studies involved detailed observational studies of clinics, the first of 10 clinics using selected HIV related reminders [9] and the other of four VA medical center clinics using a number of preventive and chronic disease management reminders [10,11]. A long list of factors which might affect use of reminders has been identified through these investigations, shown in Table 1. These factors can be characterized into those related to the design of the CR itself, those related to the characteristics and workflow of the clinical setting in which the CR is being used and those related to the staff using the CR. However none of these studies examined the relationship of these factors to actual completion rate in practice.

In 2001, the primary care services in the VA New England Healthcare system agreed to standardize the CRs across the large integrated healthcare network. Use of the VA electronic medical record (EMR) was universal and the EMR included a comprehensive CR capabilities. Effort was undertaken to produce and implement a single set of well designed and accurate CRs. While the literature cited above had not yet been published, many of the recommended design elements listed in Table 1 were in fact incorporated into the reminders. Approximately 2 years after standardized reminders were implemented, we examined the completion rates for a specific set of CRs across the multiple primary care clinics in this network [15]. In that study we found an overall completion rate of 88.3% for the 142,073 reminders due in the 29,515 patients seen in the study period, a rate that was considerably higher than reported in other studies [5–7]. However significant variation in completion rate was also observed. Among the 49 clinics, completion ranged from 66.6% to 97.1% and among the 355 primary care providers completion ranged from 43.8% to 99.4%. Our experience offered an opportunity to correlate specific site and provider characteristics with actual CR usage, something that prior studies had not done. The objective of this study therefore was to evaluate the effect of provider and practice characteristics on CR completion rates.

2. Methods

2.1. *Participants*

The study included all primary care providers in 49 primary care practice sites affiliated with the eight medical centers of