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Review article

Automated alerts and reminders targeting patients: A review of the literature

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ABSTRACT

Objective: Information technology supporting patient self-management has the potential to foster shared accountability for healthcare outcomes by improving patient adherence. There is growing interest in providing alerts and reminders to patients to improve healthcare self-management. This paper describes a literature review of automated alerts and reminders directed to patients, the technology used, and their efficacy.
Methods: An electronic literature search was conducted in PubMed to identify relevant studies. The search produced 2418 abstracts; 175 articles underwent full-text review, of which 124 were rejected. 51 publications were included in the final analysis and coding.
Results: The articles are partitioned into alerts and reminders. A summary of the analysis for the 51 included articles is provided.
Conclusion: Reminders and alerts are advantageous in many ways; they can be used to reach patients outside of regular clinic settings, be personalized, and there is a minimal age barrier in the efficacy of automated reminders sent to patients. As technologies and patients' proficiencies evolve, the use and dissemination of patient reminders and alerts will also change.
Practice implications: Automated technology may reliably assist patients to adhere to their health regimen, increase attendance rates, supplement discharge instructions, decrease readmission rates, and potentially reduce clinic costs.

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1. Introduction

Using information technology (IT) to support patient self-management has the potential to foster shared accountability for healthcare outcomes by improving patient adherence to healthcare regimens. When delivered at the point of care to clinical providers, IT interventions in the form of alerts and reminders have been shown to contribute to improved health outcomes [1,2]. Currently the majority of alerts have been developed for clinicians to assist them in clinical care management. However, there is growing interest in providing alerts and reminders to patients in order to improve healthcare self-management. Leveraging IT to foster patient engagement in their healthcare regimen may be particularly significant, as a patient only spends a small amount of time in a clinical environment. Increasing the reach of support and guidance of providers from the clinical environment to patient's daily lives can encourage patients to incorporate health behaviors into their daily routines [3,4].

Given that clinical decision support (CDS) elements have benefitted patients when employed in the healthcare environment, it is important to examine the utility when provided to patients outside of the healthcare environment. Providing IT tools to patients and caregivers can facilitate shared accountability for disease management between the healthcare provider and patient [5]. This paper describes a literature review of automated alerts and reminders provided directly to the clinical domains in which they are employed, the technology used, and their efficacy.

1.1. Background

According to the American Medical Informatics Association (2006), CDS provides "clinicians, patients or individuals with knowledge and person-specific or population information, intelligently filtered or presented at appropriate times, to foster better health processes, better individual patient care, and better population health [6]." CDS enhances decision-making through the use of technology by processing individualized data with an inference mechanism that can generate and deliver relevant information at critical time or interaction points [7]. Alerts and reminders are among the most successful and widely deployed components of CDS that provide timely and relevant information which have the potential to improve health outcomes [6]. A CDS system uses logical software programming that consists of facts and rules, and if conditions are met, an alert or reminder is triggered to notify the intended user of the information contained in the alert. Alerts and reminders are informatics interventions typically delivered through an electronic health record (EHR), a digital record of patient data, but can also include paper mailings and brochures.

Alerts have been used to notify a physician of a contraindicating condition like an allergy, interaction with another medication or supplement (immediate alert), or to prompt a clinician to respond to an abnormal lab value (event-driven alert) [8]. Reminders have been used to notify clinicians and patients about appointments like preventive screenings or vaccinations [9]. Alerts and reminders are delivered in several ways that reflect the urgency of the information from a conspicuous pop-up box or text message, which usually indicates that the alert is important, to something as subtle as a change in font that can designate a difference between a generic or brand name medication [9].

When directly provided to patients, alerts and reminders not only cue patients to complete a desired behavior but can also foster shared accountability and patient autonomy in their heath care management. Currently, there are no reviews that survey direct automated alerts and reminders for patients. This review of the literature on the use of automated alerts and reminders targeted to patients provides an overview of how these interventions have been used, and discusses possible outcomes. Additionally, this review discusses the use of healthcare IT to directly benefit patients.

Medication adherence and management are problematic behaviors for clinicians and researchers to measure and evaluate. However, health IT can improve adherence by both reminding patients to take their medications (execution adherence) and reducing compromised execution of medication use [10].

Table 1
Inclusion and exclusion criteria.

Inclusion criteria	English and human
	Automated approach (alert or reminder had to be programmed to be automatically sent to recipient) Patient alerts or reminders directed to patients or caregivers
	• Reminders or alerts to patients or caregiver • Information technology supported messaging to patient • Information communication technology—email, telephone, smart phone, short message service (SMS)/text messaging, electronic medical record, computer assisted, and internet/web
	Electronic alerts or reminders that were interventions (implemented) and had an evaluation metric
Exclusion criteria	Alerts or reminders directed towards clinicians
	Studies assessing patient preferences or willingness to receive electronic alerts or reminders Implantable devices that contain information communication technology such as implantable cardioverter-defibrillator (ICD) Articles published before 2003

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