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Original Contribution

Seventy-two-hour antibiotic retrieval from the ED: a randomized controlled trial of discharge instructional modality

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ABSTRACT

Background: Limited health literacy is a risk factor for poor outcomes in numerous health care settings. Little is known about the impact of instructional modality and health literacy on adherence to emergency department (ED) discharge instructions.

Purpose: To examine the impact of instructional modality on 72-hour antibiotic retrieval among ED patients prescribed outpatient antibiotics for infections.

Methods: English-speaking ED patients diagnosed as having acute infections and prescribed outpatient antibiotics were randomized to standard discharge instructions, standard instructions plus text-messaged instructions, or standard instructions plus voicemailed instructions targeting ED prescriptions. Health literacy was determined by validated instrument. Seventy-two-hour antibiotic retrieval, 30-day report of prescription completion, and discharge instructional modality preference were assessed.

Results: Nearly one-quarter of the 2521 participants demonstrated low health literacy. Low health literacy predicted decreased 72-hour antibiotic retrieval ($\chi^2 = 9.56$, $P = .008$). No significant association with antibiotic retrieval was noted across the 3 treatment groups ($\chi^2 = 5.112$, $P = .078$). However, patients randomized to the text message group retrieved antibiotic prescriptions within 72 hours more frequently than did those randomized to the voicemail treatment group ($\chi^2 = 4.345$, $P = .037$), and patients with low health literacy randomized to voicemailed instructions retrieved their antibiotic prescriptions less frequently than did those randomized to standard of care instructions ($\chi^2 = 5.526$, $P = .019$). Reported instructional modality preferences were inconsistent with the primary findings of the study.

Conclusions: Discharge instructional modality impacts antibiotic retrieval in patients with low health literacy. Preference for discharge instructional modality varies by degree of health literacy, but does not predict which modality will optimize 72-hour antibiotic retrieval.

1. Introduction

Nearly half of all Americans have difficulty understanding and acting upon health information [1]. Lower health literacy is associated with increased health care spending and utilization, ED visits and inpatient admissions and readmissions, fewer physician office visits, preferential use of emergency care, and poorer disease outcomes [2–6]. In addition, patients with lower health literacy have decreased knowledge about their chronic disease and have more unreconciled medications [7,8]. Limited health literacy negatively impacts chronic obstructive pulmonary disease–related health status [5], medication management in patients with heart disease [9,10], and patient comprehension of outpatient prescriptions [11] and antibiotics [12]. Conversely, analysis of insurance claims data demonstrates that adequate health literacy is associated with decreased health care spending [2].

Emergency departments (EDs) are rife with unique challenges to discharge planning and follow-up, including language barriers, health literacy disparities, cultural misunderstandings and misgivings, and socioeconomic barriers. These barriers may go unnoticed by even the most engaged providers, whereas their impact on health outcomes may be amplified in the setting of acute illness. All detract from patients' capacities to comply with ED follow-up instructions. Health materials are written at levels of complexity that poorly match population health literacy levels, with approximately half of all sampled printed materials generated in health care settings written at a level of complexity beyond the skills of the patients for whom they were intended [13]. A recent systematic review found that at least 40% of ED patients possess health

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literacy at or below the eighth-grade level. In contrast to patient health literacy levels, ED patient materials were assessed at a ninth-grade level of complexity or above [3]. Published data support the theory that patients often neither understand discharge instructions nor are aware of their own inadequate comprehension [14,15], suggesting a problem colored both by challenges unique to the ED and by the complex nature of patient interactions with health care information. In the tense, often traumatic setting of a busy ED, discharge instructions delivered at a high literacy level may be lost on the patients for whom they are intended.

The difficulty with which patients access discharge instructions has previously been described [16], but the most effective manner of communicating specific instructions to patients remains unclear. Discharge education for patients presenting to the ED with complaints as diverse as acute anaphylaxis, hypoglycemia, and minor head injury has been found to be lacking [17–20]. Strategies to improve accessibility of patient-directed written information may improve patient comprehension and ultimately contribute to the realization of improved outcomes, including medication compliance [21,22]. Thus, research defining optimal discharge instructional delivery is needed.

Patients leaving the ED are given discharge instructions by way of verbal communication and a printed "after-visit summary" (AVS). It is typically complex with respect to content and format, is written at a high literacy level, and would reasonably be expected to be inaccessible to those with low health literacy levels. Previous studies suggest that as many as 45% of ED patients are unable to comprehend their discharge instructions [3,23]. In our ED catchment population, at least 15% of our patients display health literacy inadequate to comprehend their ED discharge instructions [24]. Verbal instructions may be equally difficult to process and retain, particularly in the context of a highly charged and often noisy environment such as the ED. Furthermore, verbal communication of discharge instructions and education is time consuming for individual practitioners, potentially resulting in abridged or incomplete instructions. Verbal discharge instructions may vary across different providers and as ED workload varies, and may be inconsistent with published guidelines addressing a patient's diagnosis [25]. Computer-generated discharge instructions, although standardized to a diagnosis-specific message, do not uniquely address health literacy deficits.

2. Theory

Few studies have explicitly studied the impact of the modality of discharge instructions in the ED. Computer-generated discharge instructions have not been found to decrease the rate of 72-hour return visits to the ED among pediatric patients [26], but multimodality discharge instructions are associated with increased discharge knowledge in parents of children discharged from the ED [27]. Discharge instructions tailored to both health literacy level and individual learning preferences independently improve knowledge of hypertension on ED follow-up [28]. Immunization rates have been shown to improve when educational text messages supplant traditional written reminders, with 6.4 texts needed to result in an additional pediatric vaccination [29]. Randomized, controlled studies targeting the impact of health literacy on discharge instructions remain limited.

Despite limited outcomes data, ED patients frequently have access to multiple communication modalities, and data suggest that the penetrance of cell phones with texting capability is high in ED populations. Early data suggest that patient response to texted laboratory results would be more rapid than their response to telephone calls [30]. The feasibility, impact, appeal, and patient comprehension of alternative health information delivery modalities, including text messaging services, have been previously described [31], as have the adequate comprehension and appeal of targeted text messages promoting healthy lifestyles [32,33]. Additional investigations of text messages as a modality to overcome limited health literacy continue [34]. Although a recent investigation evaluating the impact of text messaging on retrieval of antibiotic prescriptions after an ED visit found no difference in timely prescription retrieval between patients randomized to text-messaged reminders and those randomized to standardized printed discharge instructions, the study failed to assess the impact of health literacy on prescription retrieval [35]. Thus, as noted in a recent Cochrane Review of discharge instructions, "the delivery of information besides the written format" should be the focus of further research [27].

The goal of this investigation was to characterize the rate of 72-hour antibiotic prescription retrieval from an outpatient pharmacy after ED visits in patients randomized to 1 of 3 discharge instructional modalities. Analyses were stratified by health literacy level. Secondary goals of this study were to assess patient preference for text message vs voicemail vs written AVS and to assess patient-reported completion of the antibiotic course at 30 days after their ED visit.

3. Methods

3.1. Study design and setting

This was a prospective randomized controlled study conducted at a level I trauma center with approximately 106 000 annual visits. The study was approved by the hospital's governing institutional review board and registered with ClinicalTrials.gov. We prospectively screened all patients who were prescribed outpatient antibiotics and discharged from the ED with a convenience sample from 1st July 2011 to 9th October 2013. Authors were blinded to randomization throughout the study and unblinded only on completion of analyses.

3.2. Selection of participants

All ED patients were screened for eligibility, with an electronically placed physician order for outpatient antibiotic therapy triggering initial assessment. Among those patients younger than 18 years, the accompanying adult guardian was approached for assent to include the patient. Eligible patients received an ED diagnosis of bacterial, viral, or fungal infection for which an outpatient antibiotic was prescribed from the ED, and possessed a personal cell phone capable of receiving voicemail and text messages. We excluded patients younger than 18 years and unaccompanied by an assenting parent or guardian, patients unable to consent in English, patients with clinically impaired decisional capacity (as defined by the treating physician), patients in police or protective custody, patients with a high-acuity chief concern (as defined by the treating physician), and those without a personal cell phone capable of receiving voicemail and text messages. Patients admitted to the hospital and those who eloped prior to receipt of after visit instructions were also excluded.

3.3. Interventions

The study site maintains an active research associate (RA) program staffed by medical and undergraduate students trained in numerous study protocols. Research associates identified potential patients by way of real-time surveillance of the ED trackboard within the electronic health record (EHR). Patients were approached once an order for outpatient antibiotics was placed in the EHR. After obtaining consent, basic demographic information was obtained and the patient's phone number was obtained and cross-checked with contact information in the EHR. The Newest Vital Sign (NVS; Pfizer: New York, NY), a validated health literacy assessment instrument, was then administered. The NVS is a bedside screening tool that identifies patients at high risk for low health literacy (≥50%), possible limited health literacy, or adequate health literacy. "Adequate" literacy is generally accepted to suggest reading skills at or above a ninth-grade reading level [36]. The NVS incorporates an assessment of health numeracy and requires little time (approximately 3 minutes) to administer. By way of comparison, the