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Original Contributions

A RANDOMIZED CONTROLLED TRIAL OF A CITYWIDE EMERGENCY DEPARTMENT CARE-COORDINATION PROGRAM TO REDUCE PRESCRIPTION OPIOID-RELATED VISITS: AN ECONOMIC EVALUATION

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□ **Abstract—Background: Care provided in the emergency department (ED) can cost up to five times as much as care received for comparable diagnoses in alternative settings. Small groups of patients, many of whom suffer from an opioid use disorder, often account for a large proportion of total ED visits. We recently conducted, and demonstrated the effectiveness of, the first randomized controlled trial of a citywide ED care-coordination program intending to reduce prescription-opioid-related ED visits. All EDs in the metropolitan study area were connected to a Web-based information exchange system. Objective: The objective of this article was to perform an economic evaluation of the 12-month trial from a third-party-payer perspective. Methods: We modeled the person-period monthly for the 12-month observation period, and estimated total treatment costs and return on investment (ROI) with regard to cost offsets, over time, for all visits where the patient was admitted to and discharged from the ED. Results: By the end of month 4, the mean cumulative cost differential was significantly lower for intervention relative to treatment-as-usual participants (−$1370; p = 0.03); this figure climbed to −$3200 ($p$ = 0.02) by the end of month 12. The ROI trended upward throughout the observation period, but failed to reach statistical significance by the end of month 12 (ROI = 3.39, p = 0.07). Conclusion: The intervention produced significant cost offsets by the end of month 4, which continued to accumulate throughout the trial; however, ROI was not significant. Because the per-patient administrative costs of the program are incurred at the time of enrollment, our results highlight the importance of future studies that are able to follow participants for a period beyond 12 months to more accurately estimate the program's ROI.**

□ **Keywords—economic evaluation; frequent ED use; ED care coordination; nonmedical prescription opioid use**

INTRODUCTION

The Patient Protection and Affordable Care Act focuses on achieving the objectives of the Triple Aim® (Institute for Healthcare Improvement, Cambridge, MA); they are: improve the quality of patient care, improve population health, and reduce the cost of per-capita health care (1). Among the financial incentives for providers and insurers to achieve these objectives under the Affordable Care Act, particular emphasis has been placed on care coordination; however, this process often breaks down when patients seek care at the emergency department (ED). For example, Stiell et al. found that ED providers did not have relevant patient information, such as medical history and laboratory test results, in almost one-third of the ED visits they examined (2). This information was deemed to be crucial to patient care in just under half of the cases

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examined. Moreover, the lack of information resulted in an average ED length-of-stay increase of 1.2 h.

The ED is generally believed to be an area capable of large efficiency gains for the health care system. Many ED visits are thought to be nonemergent, and therefore, treatable in an alternative setting; what's more, recent statistics show that over 60% of ED visits occur during business hours (3–5). Patient care provided in the ED is expensive relative to care received in alternative settings, with findings indicating ED care may cost up to five times as much for comparable diagnoses (6–8). Additionally, it has been shown that small groups of patients often account for a relatively large proportion of total ED visits. LaCalle and Rabin's systematic literature review revealed that between 4.5% and 8% of ED users account for 21–28% of all ED visits (9). Frequent ED users are generally in relatively poor physical health and suffer from comorbid substance use or mental health disorders (10–16). Consequently, this population consumes immense quantities of health care resources (14,17–20). Furthermore, heavy ED use has been associated with ED crowding, which can culminate in longer wait times, undue stress on ED staff, and even inferior treatment outcomes (18,21–28). These findings imply that a targeted multidisciplinary ED care-coordination program could be very beneficial to this patient population, providers, hospitals/health systems, payers, and society as a whole.

We recently completed, and demonstrated the effectiveness of, a multisite, randomized controlled trial of a citywide ED care-coordination program with a Web-based information exchange system, for the management of frequent ED users exhibiting opioid-prescription-seeking behavior (29). Participants in the care-coordination intervention had fewer visits to the ED, received fewer opioids and opioid prescriptions in the ED, and had fewer prescribers over the 12-month observation period. However, evidence of effectiveness is often not sufficient for implementation of such programs, given the resource constraints faced by payers of health care services. Therefore, the average cost of $729 per patient for this intervention (see the Cost Measures section below) may serve as a barrier to adoption if potential downstream cost offsets are not taken into account. The objective of this study was to conduct a longitudinal economic analysis of the ED care-coordination program from a third-party-payer perspective. The findings from this study will be an important contribution to the literature given the unique nature of our program and the very limited number of studies that have evaluated the cost of other multidisciplinary case-management interventions for frequent ED users, as well as the weaknesses associated with the design and analyses of those prior studies (30).

METHODS

The Multidisciplinary ED Care-Coordination Trial

A 12-month randomized controlled trial designed to test the effectiveness of a multidisciplinary ED care-coordination program with regard to ED visits, amount of opioids prescribed, and the number of opioid-analgesic prescriptions written in the ED was conducted between March 2012 and July 2013, with study enrollment ending in July 2012 (29). The program is designed to reduce "unnecessary" use of the ED while also ensuring that patients get the care they need in the appropriate setting. An individualized ED care plan is created for each participant by a team of health care providers, including the patient's primary care physician, emergency physicians and nurses, and mental health and substance-use-disorder professionals, among others. Additionally, the program is connected to a Web-based information exchange system capable of sharing relevant patient information with ED care providers and other stakeholders, such as case managers and primary care providers, in real time, whenever an enrolled patient registers at an ED using the system. The framework and day-to-day administration of the program have been described in detail elsewhere (29,31).

Patients in the control group received treatment as usual (TAU) in the ED. Data on ED use and costs, as well as prescriptions written, were collected on participants for the 365 days prior to and after randomization. The study was approved by the Washington State University Institutional Review Board and each of the study hospitals. A waiver of informed consent was obtained to ensure that being part of the study did not influence participant behavior or affect the patient–physician relationship.

The study took place in a metropolitan area in Washington State with a population of just over 250,000 people. The metropolitan area contained three hospitals, all of whom participated in the study. Each hospital belonged to a separate health care system, and each had an ED that was connected to the Web-based information exchange system described above.

Potential participants were selected in descending order of total ED visits in the 12 months prior to January 2012, across all three EDs in the catchment area. Eligible participants were at least 18 years of age; had five or more ED visits in the 12 months prior to trial enrollment, the majority of which were related to noncancer pain complaints or drug-seeking behaviors; did not already have an ED care plan in place; did not have a medical condition that could interfere with safe study participation in the trial; did not have any indication of acute suicidal behaviors in their medical record in the 30 days prior to