

Interventions to Reduce Inappropriate Emergency Department Use: Review of Existing Literature

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Aim

This review of evidence aims to synthesize the current research on ED diversion programs and interventions, determine the level of effectiveness, and identify potential strategies for further exploration.

Background

According to recent data from the National Quality Forum, 56% of Emergency Department (ED) visits are considered avoidable, which contribute to \$38 billion in wasteful spending (National Quality Forum, 2010). One third of ED visits are made during clinic's business hour, with the average cost of an ED visit being \$580 more than a primary care office visit (National Quality Forum, 2010). It is a commonly held assumption that Medicaid patients are the highest users of the ED and contribute to ED overcrowding. Medicaid beneficiaries, in fact, use the ED almost twice as much as privately insured patients, and non-urgent visits represent 10% of ED visits for Medicaid members, compared to 7% of visits for those who are privately insured (Sommers, 2012). Evidence suggests the higher utilization by Medicaid members is likely driven by unmet social and behavioral needs, and inability to access healthcare services in more appropriate outpatient settings (Sommers, 2012).

The Centers for Medicare and Medicaid recently released an informational bulletin addressing non-urgent use of the ED in which they highlighted three strategies to reduce ED use: broadening access to primary care services, focusing on frequent ED users or "super-utilizers", and targeting the needs of people with behavioral health problems (Mann, 2014). A review of the literature shows the same or similar approaches have been piloted and tested with mixed effects. Efforts to reduce utilization generally target common barriers experienced by patients in accessing appropriate care. Such barriers have been cited as a lack of transportation, lack of childcare, need for after-hours and weekend care, limited access to timely and ongoing primary care services, no health insurance, and lack of education on the most appropriate venue for their health concerns (Wexler, 2015; Rodriguez, 2015; Doran, 2013). Many of these barriers, specifically inadequate access to ongoing and timely healthcare, are more critical and have major implications for the health outcomes of patients living in rural communities (Jonk, et al., 2015). In addition, it is widely recognized that patients, specifically Medicaid beneficiaries, who receive primary care services at the ED have poorer health outcomes (Falik, Needleman, & Korb, 2001). Current information and research into what drives non-urgent ED use provides some insight, but gaps in the literature present challenges when selecting and implementing evidence-based strategies to reduce inappropriate ED use (Uscher-Pines, 2013).

Methods

Existing systematic reviews of ED visit reduction programs targeting frequent or high ED utilizers published from January 1, 2010 through December 1, 2016 were identified through an informal search using PubMed and Google Scholar. Seven relevant systematic reviews were identified. The list of included studies in each systematic review was examined, and studies that were conducted in the United States, targeted high ED utilizers, included ED use as a primary outcome, and were published from January 1, 2000 through December 1, 2016 were included in this review. The review of included studies lists yielded 33 studies, which included a combination of randomized controlled trials (n=5), quasi-experimental (n=13) and observational studies (n=15). Each study was then categorized based on the type of intervention explored, which yielded 10 different intervention categories. Table 1 describes the studies included in each intervention category.

Table 1. Included Studies Details

Author, Year	Setting	Population	N	Intervention Details
Access (n=3)				
Wang, 2005	Large, private, primary care pediatric practice with Medicaid patients	Children	N = 17, 382	Increase capacity in non-ED settings through increased care coordination, case management, expanded after-hours clinics and walk-in hours at clinic
Falik, 2001	FQHCs	Medicaid beneficiaries receiving more than 50% of their preventive and primary care services from FQHCs Controls = Medicaid beneficiaries receiving care from other outpatient providers	N = 48,738	Increasing primary care medical doctors or primary care centers
Rust, 2009	Rural counties in Georgia with a CHC vs. none	All emergency visits made in the hospital ED by uninsured patients in 117 rural counties	N = 117 rural counties	Primary care provided through the presence of a Community Health Center in a county
Care Coordination (n=3)				
Kolbasovsky, 2007	Multiple EDs in NE	Adult plan members presented to ED with anxiety diagnoses	N = 307	Care Coordination: (1) mailed info on anxiety, outpatient tx options, importance of PCP involvement, contact info to access tx; (2) CM telephone contact to do needs assessment, tx options, connect with outpatient care, additional calls as needed

Author, Year	Setting	Population	N	Intervention Details
Horwitz, 2005	Yale-New Haven hospital	Adults presented to ED, no PCP, no substance abuse/mental illness	N = 121	Health promotion advocates assisted with choosing PCP; faxed info to PCP; PCP care managers contact/schedule appts by telephone, mail, and home visits; assist with setup of other services
Dehaven, 2012	Dallas, Texas	Uninsured and <200% of Federal Poverty Level	Total = 574 IG = 265	Project Access Dallas (PAD) - based on intake interview and HRA patients assigned to either community care coordination (CCC) or self-care. CCC patients assigned to CHW they met with monthly; self-help pts not assigned to CHW, but had access to patient telephone help line for medical care questions and could request CHW services as needed

Author, Year	Setting	Population	N	Intervention Details
Case Management (n=9)				
Grover, 2010	U.S.	≥5 ED visits a month	N = 96	ED treatment plan, referral to PCP, assistance with financial entitlements, chemical dependency treatment program, pain management, psychiatric services, and social services
Lee, 2006	One ED in teaching hospital	Patients with ≥3 ED visits per month	Total: 50 IG: 50 *Historical controls	Limiting narcotics, referral and coordination with PCPs, referral to community services, social worker, and substance abuse counseling
Shah, 2011	One hospital ED	Low-income, uninsured frequent ED users (≥4 ED visits in 12 months)	Total: 258 IG: 98	Access to primary care, insurance coverage, access to support services, and care coordination
Shumway, 2008	One urban public hospital ED	Patients seen in ED ≥5 times in past 12 months with psychosocial problems	Total: 252 IG: 167	Group support, help with psychosocial problems, access to medical care providers
Okin, 2000	One urban hospital ED	Frequent ED users (≥5 visits in 12 months)	Total: 53 IG: 53 *Historical controls	Social worker conducted extensive and persistent outreach, crisis intervention, individual and group supportive therapy, arrangement of stable housing and financial entitlements, referral to PCP, substance abuse referral, and community services
Crane, 2012	One not-for-profit hospital	Low-income patients with ≥6 ED visits in past 12 months	Total: 71 IG: 35	Telehealth line, drop-in group meetings, and life skills training
McCormack, 2013	NYC Bellevue Hospital	5 ED visits annually for 2 consecutive years and 1 within 6 months; alcohol dependence, un-domiciled without shelter use for 9 of 24 months	Total: 60 IG: 20 *historical and prospective controls	Social worker approached on 1 st visit; homeless outreach team came to ED to confirm eligibility and enroll on subsequent visit; social worker and outreach team met with patient according to care plans and offered shelter; assigned case workers relocated pts to supportive housing and coordinate care
Witbeck, 2000		Substance abusing or chronically mentally ill homeless who frequently utilize emergency medical services	N = 18 IG = 10	Supported by local county public funds, and conducted by a local nonprofit social work agency, designed to provide intensive case management services to link clients to a broad range of entitlements and community services
Sciorra, 2009	Camden, NJ EDs	High ED utilizers (5 or more ED visits during a one year period)	N = 132 IG = 33 *Retrospective controls	Targeted care management project to help patients work towards stabilizing their social environment and finding an appropriate medical home
ED Diversion (n=2)				

Author, Year	Setting	Population	N	Intervention Details
Schaefer, 2002	EMS	EMS patients	N = 1,016	Low-acuity pts offered an alternate care source (clinic or home care) rather than ED use by the EMS staff
Doran, 2013	Bellevue Hospital, New York	Pts presenting to ED with low-acuity concerns, defined as recognizable by layperson; ≥23 years, afebrile, triage indicated no need for ED	N = 662	Referral of low-acuity pts to onsite primary care clinic (1) primary care clinic navigator used VoIP system to communicate onsite PCP walk-in availability to ED navigator (2) ED navigator referral of low-acuity pts to PCP if estimated wait time less than time to evaluate in the ED urgent care clinic (3) navigator escorted pt to PCP, assisted with registration/orientation (4) patient existing PCP contacted, otherwise assigned PCP, given card and contact info
Educational (n=2)				
DeSalvo, 2000	U.S.	Medicaid and Medicare patients	N = 536 IG = 288	Facilitate use of the primary care clinic
Michelen, 2006	Manhattan, NY	Frequent ED flyers, low-income and socially marginalized groups in an urban setting	N = 711	Using Health Priority Specialists (HPS) and Community Health Workers (CHW)
Information Sharing (n=2)				
Stokes-Buzzelli, 2010	One urban hospital ED	Patients with high ED use	Total: 36 IG: 36 *Historical controls	Including treatment plan, support with social and medical issues, access to health care providers through EHR
Murphy, 2014	U.S.	High ED utilizer Medicaid patients, frequent users (3-11 ED visits in last year); extreme users (≥12 ED visits in last year)	N = 141 Extreme = 76 Frequent = 65	Multi-disciplinary ED care coordination program with a regional hospital information system capable of sharing patients' individualized care plans with cooperating Eds. Individualized ED-care guidelines created for each patient, but also at its core is a regional HIS that allows participating EDs to view guidelines. Guidelines inform the emergency physician on proper care in the ED while directing the patient to further care in the appropriate setting.
Patient Navigation (n=1)				
Enard, 2013	Health System in Houston, Texas	Medicaid, uninsured, or covered by subsidized medical benefit program who frequently use the ED	N = 13,642 IG = 1905	Using CHWs as patient navigators at ED - designed to promote appropriate primary care utilization and prevent or reduce primary-care related ED use. CHWs were bilingual and state-certified, trained in peer-

Author, Year	Setting	Population	N	Intervention Details
				to-peer counseling and connect medically underserved pts with medical homes and related support services; provide education on importance of primary care, assist with appointment scheduling, and f/u with pts to monitor and address additional barriers
Policy Changes (n=8)				
Catalano, 2005	Single state	Single-state Medicaid patients in areas with capitation	N =	Community mental health centers under capitated agreement with Medicaid. Centers billed by hospital EDs for psychiatric emergency services
Wong, 2001	U.S.	Chronically ill patients	N = 1700	Comparing no, low, and high copays
Wharam, 2007	Single state	Enrollees with HDHP for at least 6 months, after 1 year of traditional HMO	N = 8,724	Copayment for each ED (\$20-\$100) and outpatient visit (\$5-\$25)
Hartung, 2008	U.S.	Medicaid members	N = 116,822	Implementing a copay policy
Waters, 2011	Single state	High-deductible health plan group members initially in PPO, then switched and maintained in HDHP for 3 study years	N = 1,354	Individuals in the HDHP have annual deductibles ranging from \$1700 - \$6000 vs. PPO plan. HDHP enrollees used standard PPO contracted amounts before meeting their deductibles
Wallace, 2008	Oregon	Medicaid adult enrollees OHP-Standard Control: OHP-Plus	N = 10, 176	OHP Policy changes (See Lowe, 2010)
Lowe, 2010	Oregon	Medicaid adult enrollees (OHP-S) *control group = categorically eligible Medicaid enrollees (OHP-Plus)	N = 321, 622	OHP policy changes for expansion program (OHP-S); intro of \$5 copays for PCP, \$50 copayments for ED visits, \$50 for emergency transportation, \$250 hospitalizations; dropped benefits for outpatient mental health, substance abuse tx, dental, vision, nonemergency transport; providers allowed to refuse services for inability to pay; premium increases and forced disenrollment
Mortensen, 2010	38 U.S. states	Residents of 9 states that increased Medicaid copayments	N = 17, 952	States increased copayments for non-emergency visits, ranging from \$3-\$50
Post-Discharge Follow-up (n=1)				
Balaban, 2008	2 community teaching hospitals	Medicaid and Medicare patients	N = 96 IG = 47	Telephone follow-up designed to promptly reconnect patients to their medical home via RN outreach from their primary care

Author, Year	Setting	Population	N	Intervention Details
			*concurrent controls	clinic who conducted symptom review, medication review, needs assessment, and appointment confirmation
Enhancing Workflows (n=2)				
Wexler, 2015	U.S.	Medicaid patients presenting to the ED without an identified PCP	N = 140 IG = 72	System change innovation designed to remove system barriers to primary care access for Medicaid patients - RA used EMR to schedule appt at PCP (fam med or Intern med), patient chose location, date, and sex of physician. This was done in "real time" before patient was discharged from ED. Patient given reminder card and directions to PCP, RA sent message via EMR to PCP scheduled with (patient name, MRN, date/time of appt, reason for ED visit, and patient was part of study). Pts received auto-call reminder day before appt
Goodman, 2013	U.S.	PCP-level assignment based on annual ED visit rates for PCP-treatable conditions	N = 26 PCPs IG = 11 PCPs	Revisiting and focusing on simple and generally known primary care office management practices has a meaningful impact on emergency department (ED) utilization for conditions that likely could have been treated in the primary care office setting (primary care physician [PCP] treatable). IPA Communication guide OFR PC offices topics: new pt welcome materials, conversations, access to care policy, after-hours telephone script, general points

Findings

After reviewing seven recent systematic reviews focused on interventions or programs aimed at reducing inappropriate Emergency Department use for studies relevant to the local population and context, several intervention approaches or types were identified. Studies were categorized by intervention type and are described below.

Access

Three studies assessed the impact of improving access to care through several means such as; extending clinics hours, increasing capacity in non-ED settings by hiring additional primary care providers and providing primary care through community health centers. Wang, et al., sought to improve non-ED access to care in a large, private primary care pediatric practice with a large Medicaid eligible population (2005), which included 17, 382 Medicaid members. Patients enrolled in the enhanced access program had access to extended office hours, multiple access locations, and care

coordination (Wang, et al., 2005). At the end of 12 months, enhanced access patients saw a 20% reduction in ED utilization ($p=0.007$); in addition, the per member per month cost for ED utilization was \$1.36 less for program patients compared to controls ($p=0.0298$) (Wang, et al., 2005). Falik, et al. assessed whether 48,738 Medicaid beneficiaries who received more than half of their preventive and primary care services from a Federally Qualified Health Center (FQHC) had better outcomes related to ED visits and admissions compared to those who received their care in other outpatient settings (2001). Medicaid members receiving care at local FQHCs were less likely to go to the ED for primary care treatable conditions (14.9% vs. 15.7%, $p<0.02$) (Falik, et al., 2001). Rust, et al., also saw similar results among uninsured rural patients in 117 counties in Georgia (2009). Counties without a community health center (CHC) had 33% higher rates of uninsured all-cause ED visits (RR: 1.33, 95% CI: 1.11-1.59) (Rust, et al., 2009). These studies all demonstrate the impact of having regular, timely access to care has on ED utilization and cost savings.

Care Coordination

A study focused on community care coordination called Project Access Dallas (PAD), which used a care coordination model to assign patients to a CHW whom they met with on a monthly basis, along with access to a telephone help line for medical care questions and concerns (DeHaven, et al., 2012). At 12 months PAD enrollees ($n=265$) had significantly fewer ED visits compared with non-PAD patients 0.93 vs. 1.44 ($p<0.01$), as well as 60% less direct hospital costs compared to non-PAD patients (\$446 vs. \$1188, $p>0.01$) (DeHaven, et al., 2012). Another study using a care coordination approach reduced ED visits among 307 adults who presented to the ED with anxiety concerns; at 6 months post discharge, ED visits decreased compared to usual care patients (IRR: 1.35, $P<0.01$) (Kolbasovsky, Reich, & Futterman, 2007). In addition a decrease in total ED costs among intervention patients compared to controls (\$11.77 vs. \$19.69 per member per month) was realized ($p=0.01$) (Kolbasovsky, Reich, & Futterman, 2007).

Despite the other two studies showing the impact of care coordination on reducing ED use, a third study saw no difference in the probability of any ED visit among 121 adults who presented to the ED, with no PCP, and no substance abuse or mental health concerns compared to usual care (RR: 1.07, 95% CI: 0.72-1.58) (Horwitz, Busch, & Balestracci, 2005).

Case Management

Studies that looked at case management as strategies to reduce ED utilization were abundant. Nine studies focused on case management as a strategy to reduce ED utilization among frequent flyers. McCormack, et al. implemented a case management program within the ED that specifically focused on high ED utilizers who were homeless and had alcohol dependency concerns (2013). When an eligible patient visited the ED a social worker was paged using an auto system which was linked to registration data. The social worker and outreach team met with patients to help obtain shelter upon discharge (McCormack, et al., 2013). Case workers were assigned to patients and followed up post-discharge to help relocate patients into more supportive settings, coordinated multi-disciplinary care, and updated care plans during biweekly interagency meetings based on the patient's medical, psychosocial, and

housing needs (McCormack, et al., 2013). Over 6 months, the median ED visit rate dropped from 18.5 to 12. In addition, 18 of 20 patients were connected with housing or a shelter.

Crane, et al., employed an interdisciplinary team comprised of a family physician, behavioral health professional, and nurse case manager to provide wrap-around case management for low-income and uninsured patients with 6 ED visits in past 12 months (2012). Patients had direct telephone access to a RN-care manager and small group “life skills and support” sessions, as well as short individualized sessions after group medical visits (Crane, et al., 2012). ED use dropped from 0.58 visits per patient per month to 0.23 visits per patient per month.

Grover, et al. also employed a similar multi-disciplinary case management model to address patient specific issues through the use of individualized care plans, ensuring that patients were able to receive consistent outpatient care (2010). At 6 months, the 96 patients enrolled in case management saw the average number of ED visits per month fall from 2.3 ED visits per patient per month to 0.6 ED visits per patient per month ($p < 0.0001$), an overall decrease of 83% in ED use. An intervention targeting frequent ED users with substance abuse concerns or chronic mental illness saw a 58% reduction in emergency transport to the ED among the 10 patients in the year following referral to case management compared to the previous year ($p < 0.03$) (Witbeck, Hornfield, & Dalack, 2000).

Sciorra, Brenner, and Gill employed a care management model targeting patients in Camden, New Jersey who had visited the ED 5 or more times within one year. Thirty-three patients were enrolled in targeted care management, of which 42% had a subsequent ED visit compared to 60.6% of historical controls (2009). Targeted case management was associated with a 69% reduced risk of subsequent ED utilization compared to historical controls (HR: 0.31, 95% CI: 0.15-0.62) (Sciorra, Brenner, & Gill, 2009).

Okin, et al. employed a case management program that saw a 40% reduction in ED visits among 53 high ED utilizers at 12 months ($p < 0.01$), as well as a decrease in median ED costs per patient from \$4,124 to \$2,195 ($p < 0.01$) (Okin, et al., 2000). One case management program used a group support method to help 167 ED high utilizers with psychosocial issues obtain access to medical providers (Shumway, Coccillari, & O’Brien, 2008). At 24 months the mean number of ED visits per year decreased from 3.6 to 1.4 ($p < 0.01$). In addition, a reduction in ED costs was also observed ($p < 0.01$) (Shumway, Coccillari, & O’Brien, 2008). Shah et al. also tested the impact of a case management program on 98 low-income, uninsured patients who had four or more ED visits in the past 12 months (2011). This program had a 4.3 reduction in the mean number of ED visits ($p < 0.001$), and a 26% reduction in ED costs per patient (Shah, et al., 2011). One study, Lee and Davenport, found a non-significant impact on ED use at 6 months among 50 frequent ED utilizers (2006).

ED Diversion

One study looked at a point-of-care intervention that took place in the Emergency Department. Adults with low-acuity problems, who were willing, were navigated from the ED to a primary care clinic where they were assigned a physician, were given an overview of clinic services, and received same-day care at the clinic (Doran, et al., 2013). Of patients who agreed to be navigated to primary care, 50.3% versus 36.9% of patients who declined navigation, had a least one primary care clinic follow-up visit in

the year after the intervention. The absolute difference in having at least 1 primary care clinic follow-up for the intervention group compared to the control group was 9.3% (95% CI: 2.2-16.3) (Doran, et al., 2013). There was no significant difference in the number of future ED visits (Doran, et al., 2013).

Schaefer, et al., looked at the impact of a pre-hospital diversion program that employed EMS staff to divert non-urgent EMS calls from the ER (2002). Compared with historical controls, 1,016 patients offered care at an alternate site had 7% fewer ED visits (44.6% vs. 51.8%, $p=0.001$) (Schaefer, et al., 2002). In addition, the intervention group used primary clinics 3.5% more than historical controls ($p<0.001$) (Schaefer, et al., 2002).

Educational

Patient education efforts focused on how to navigate the health care system, and reinforced the importance of relationships with primary care. Michelen, et al. employed Health Priority Specialists and Community Health Workers to provide education on how to navigate the health care system to 711 low-income, socially marginalized high ED utilizers in New York (2006). The mean number of ED visits made at baseline was 4.06 (SD=1.62), which decreased to 0.99 (SD=1.46) among 537 patients at 3 months, and further decreased to 0.77 (SD=1.34) among 177 patients at 6 months (Michelen, et al., 2006). High drop-out rates throughout the study period present limitations in interpreting the results of the study.

DeSalvo, et al. also assessed the impact of education to facilitate the use of primary care clinics as the routine source of care among 536 Medicaid and Medicare patients (2000); however, at 3 months there was no difference in ED utilization between patients receiving education and usual care.

Information Sharing

Two studies looked at interventions around information sharing between primary care and emergency departments. Murphy and Neven used a regional hospital information system that was capable of sharing patients' individualized care plans with EDs (2014). Individualized care guidelines were created for each patient, information on existing pain management agreements, recurring opioid prescriptions, medical conditions, and ED treatment suggestions all informed the individualized care guidelines accessed and used in the ED (Murphy and Neven, 2014). The information sharing resulted in a significant decrease in ED visits among 65 frequent ED users (3-11 visits/year) from an average of 7 visits to 2 visits over 6 months ($p<0.0$), and among 76 extreme ED users (≥ 12 visits/year) from 19 to 4 visits ($p<0.0$) (Murphy & Neven, 2014). This type of HIE system is receiving more attention in other locations and is considered a best practice in some health systems.

One other study looked at the impact of sharing patient care plans developed in a multi-disciplinary group of care providers that were uploaded and shared through the EHR which "allowed universal 24/7 access and guidance for all healthcare providers" (Stokes-Buzzelli, et al., 2010). The care guidelines were informed by an ED physician, social worker, mental health social worker, psychologist, and clinical nurse specialist (Stokes-Buzzelli, et al., 2010). Guidelines were reviewed and refined by the team twice per month (Stokes-Buzzelli, et al., 2010). Among 36 patients whom guidelines were developed for, the average number of annual ED visits decreased by 25% from 67.4 to 50.5 ($p=0.046$)

(Stokes-Buzzelli, et al., 2010). In addition, ED charges fell 24% from \$64,721 to \$49,208 ($p=0.049$) (Stokes-Buzzelli, et al., 2010)

Patient Navigation

Enard & Ganelin used bilingual, state-certified Community Health Workers (CHWs) as patient navigators intended to encourage appropriate primary care utilization and prevent or reduce primary-care related ED use (2013). Community Health Workers were trained in peer-to-peer counseling and connecting uninsured and Medicaid patients with no usual source of care with medical homes and support services (Enard & Ganelin, 2013). In addition, the CHW reinforced the importance of primary care, assisted with appointment scheduling, and followed up with patients to monitor and address additional barriers (Enard & Ganelin, 2013). Preliminary findings showed patients with 5 or more ED visits at baseline had a 10.3% decrease in visits at 12 months (OR: 0.96, 95% CI: 0.39-2.3), and 12.8% decrease at 24 months (OR: 0.31, 95% CI: 0.17-0.54, $p<0.001$) (Enard & Ganelin, 2013). Findings suggest that CHW-led patient navigation could be a possible strategy to decrease primary care treatable ED visits among high-risk populations.

Policy Changes

Studies that assessed policy changes for impact ED use focused on Medicaid. Lowe, Fu, and Gallia assessed policy changes to the Oregon Health Plan for the Medicaid expansion program (OHP-Standard) (2010). Policy changes included implementing premiums and copayments, specifically a \$50 copayment for an ED visit, and compared the effects of the changes to OHP-Plus members. The expansion group's ED utilization rates fell 18% after changes compared to OHP-Plus (RR: 0.82, 95% CI: 0.80-0.84), and it was concluded that policy changes may cause a substantial reduction in ED utilization among members (Lowe, Fu, and Gallia, 2010). Wallace, et al., also examined the impact of the copayment changes in Oregon, and also saw ED visits decrease by 7.2% compared to the OHP-Plus group ($p=0.03$) (2008). However, ED visit expenditures by patient increased by 7.9% compared to OHP-Plus members ($p=0.03$), despite decreased ED use (Wallace, et al., 2008).

Mortensen also looked at cost-sharing for non-emergency ED visits by assessing the impact of Medicaid copayment policy changes in nine states, which included the increase or institution of copays ranging from \$3 to \$50 (2010). Despite Lowe, Fu, and Gallia showing policy changes having a meaningful impact on ED use in Oregon, results suggested that "requiring copayments for nonemergent visits to the ED did not decrease Emergency Department use by Medicaid enrollees" (Mortensen, 2010). Despite the increased copays, there was an overall significant increase in the probability of any ED visits in a year compared to controls (33.1 per person-month vs. 24.7, $p=0.000$) (Mortensen, 2010); thus, it was suggested that the impact of policy changes may be better examined at the state level.

One study looked at the impact of a high-deductible commercial health plan on 1,354 members in Minnesota, deductibles ranged from \$1,700 to \$6,000 (Waters, et al., 2011). Enrollees into the high-deductible plan had a lower probability of ED use compared to controls ($p<0.05$) (Waters, et al., 2011). Wharam, et al., also assessed the impact of a high-deductible plan among 8,724 members (2007). A

10% decrease in ED visits compared to controls was observed (95% CI: -16.6, -2.8, $p=0.007$) (Wharam, et al., 2007).

Hartung, et al., looked at the effects of implementing a copay policy among 116, 822 Medicaid members and saw no impact on ED utilization over 3 years (2008). Another study looked at policy changes that reorganized 14 community mental health centers into 7 new agencies that contracted with the state to provide mental health services in separate geographic areas (Catalano, et al., 2005). Four of the centers operated as not-for-profits independently and received capitated payments directly from the state (Catalano, et al., 2005). Three of the centers merged with a for-profit behavioral health organization that offered administrative support and contracted with community hospitals and other providers, while receiving capitated reimbursement (Catalano, et al., 2005). The other 3 mental health centers operated on a fee-for-service basis. Over one year, a 28% decline in psychiatric ED visits in capitated areas compared to the expected rate based on trends in fee-for-service areas (814 visits vs. 2,908 expected visits) was observed (Catalano, et al., 2005).

Wong, et al., compared the effect of varying levels of copays among 1,700 chronically ill patients on ED utilization (2001). Among the 265 patients in the high copay group, defined as insurance paying half or less of costs, there was a 60% decrease in ED visits for low acuity conditions compared to the no copay group ($p<0.001$) (Wong, et al., 2001). Despite the decrease in ED use, the high copay group also saw a 78% decrease in ED visits for serious conditions compared to the no copay group ($p<0.001$), a potential adverse effect of cost-sharing that the authors caution should be closely monitored and considered.

Post-Discharge Follow-up

One study looked at the impact of a telephone-based post-discharge outreach conducted by a RN located at the patient's assigned primary care clinic (Balaban et al., 2008). Over 6 months, RN outreach was done for 47 patients following ED discharge, of which 14.9% did not complete follow up within 21 days of discharge compared to 40.8% usual care patients who did not complete follow up ($p=0.005$) (Balaban, et al., 2008). In addition, 2.1% had an ED visit within 31 days of discharge compared to controls (2.0%), although this finding was not significant.

Enhancing Workflows

Two studies assessed changes to clinic workflows and communication workflows between the ED and primary care clinic. Wexler, et al. tested a system change innovation designed to eliminate barriers to primary care access specifically for Medicaid patients using a point person in the ED who scheduled follow-up appointments in "real time" before the patient was discharged from the ED (2015). At 3 months, 28% of 140 patients had attended at least 1 PCP visit compared to patients who did not receive the intervention (OR: 2.52, 95% CI: 1.06, 6.02) which was statistically significant; however, at 12 months the difference was no longer statistically significant. In addition, among those patients receiving the intervention, not all PCP appointments were kept. The patient no-show rate was 62% and PCPs cancelled 15% of scheduled appointments. In addition, at 12 months, intervention patients had a significantly larger mean number of ED visits compared to controls (2.43 vs. 1.38, $p=0.036$), and had

higher odds of returning to the ED for non-urgent conditions compared to controls (OR: 1.27, 95% CI: 0.65-2.48) (Wexler, et al., 2015).

Goodman led a pilot study to determine whether revisiting and concentrating on simple largely known primary care office management practices has a significant impact on ED utilization for primary care treatable conditions (Goodman, 2013). A communication guide for primary care offices was used and focused on topics such as new patient welcome materials, conversations, access to care policies, after-hours telephone scripts, and other general points (Goodman, 2013). A worsening trend at the onset of the intervention, with a peak ED utilization rate of 42.9 visits per 1000 decreased to 7.3 visits per 1000 for primary care treatable conditions (Goodman, 2013) over a four year period.

Summary of Evidence

Based on literature reviewed in this evidence synthesis, ten types of interventions were evaluated: increased access, case management, information sharing, care coordination, ED diversion, patient education, post-discharge follow-up, patient navigation, policy changes, and enhanced workflows. The impact of the ten types of frequent ED use interventions varied. Four intervention types showed evidence of effectiveness: increased access to primary care, case management, information sharing, and patient navigation. All four interventions reduced overall ED use. In addition, one care management study saw a median cost savings of \$1,2985 in direct ED costs among extreme utilizers over one year (Murphy & Neven, 2014).

Four interventions showed evidence of mixed effectiveness: care coordination, ED diversion, policy changes, and enhanced workflows. Two care coordination intervention studies showed reduced ED use, as well as evidence of direct hospital cost savings of 60% compared to controls (DeHaven, et al., 2012); however, Horwitz et al. showed no significant difference in ED use among intervention patients (2005). Several studies looked at the impact of policy changes involving the addition of copays, high-deductible plans, and cost-sharing. The majority of policy change interventions showed evidence of effectiveness in reducing overall ED use; however, two studies saw no change in ED use rates. In addition, one study saw a negative effect of increasing copays through decreased ED visits for serious symptoms that warranted care in the ED (78%) (Wong, et al., 2001). Two studies assessed the impact of enhancing workflows at the clinic level and between the ED and primary care clinic. The intervention focused on improved workflows and communication between the ED and primary care clinic showed evidence of improved attendance at primary care follow-up appointments at 3 months; however, those findings were not significant at 12 months, and ED use was increased among intervention patients at 12 months compared to controls (Wexler, et al., 2015). One study did show a reduction in ED use for PCP-treatable conditions over the entire study period (Goodman, et al., 2013). Finally, of the two studies assessing the impact of ED diversion interventions, Schaefer et al. saw a 7% less ED utilization rate among intervention patients compared to controls (2002); however, Doran et al. saw no significant difference between intervention and controls at one year follow-up (2013).

Two interventions showed minimal effectiveness and didn't seem to work in the long term. One study assessing the impact of post-discharge follow-up through the use of a RN initiated phone call did not reduce ED utilization and did not improve follow-up with primary care (Balaban et al., 2008). In

addition, educational interventions had inconclusive results. DeSalvo et al. showed no differences in ED use at 3 months (2000) between patients who received education and those that did not. Also, a study that used health priority specialists and community health workers to deliver patient education saw a consistent reduction in ED use over 6 months (Michelen, et al., 2006); however, high drop-out rates throughout the study period presented significant limitations in interpreting findings.

Conclusion

Based on review of the ten interventions, much of what drives how effective an intervention is in reducing ED use relies on the presence of routine and timely access at the primary care level, as demonstrated through the effectiveness of the access studies. Thus, improving access to primary care must underline all other interventions or approaches to reducing ED utilization. Other interventions that build on this and show some level of promise include information sharing between the ED and all providers involved in a patients care through the use of sharing platforms such as health information exchange systems and enhanced EHRs. Case management is a critical strategy, and should target extreme ED utilizers with complex social, behavioral, and medical concerns. Population level educational efforts focused on reinforcing the importance of establishing care with the PCP, and the most appropriate venue to seek care can also lead more appropriate use of the ED. Finally, evaluating policies around copays, deductibles, and cost-sharing can also be an effective means of reducing unnecessary ED use; however, such policy changes would require the involvement of the Oregon Health Authority and Medicaid waiver modification. Thoughtful planning, implementation, ongoing assessment and adaptation of such interventions can address gaps in the delivery of health care services and result in more appropriate use of the health care system, while creating sustainable access and cost management.

Recommendations

The review of the literature provided some insight into what's worked and what's not worked in regards to reducing ED use. Some of the interventions assessed in this review are already in place or being actively pursued, while others should be considered. Based on the review of evidence, the following recommendations are suggested:

1. Continue PacificSource care management focused on poorly or unengaged high risk members and look to expand reach to rising risk members to achieve greatest cost savings
2. Continue the rollout, implementation, and meaningful use of PreManage to all clinics in the region
3. Clinics should use the PreManage implementation process as an opportunity to refine or enhance workflows
4. Increased efforts and focus on addressing primary care access issues in the region
5. Population level education on appropriate use of healthcare delivery system
6. Explore pre-hospital diversion programs with special focus on behavioral health crises

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