Improving the Emergency Department Discharge Process:

Environmental Scan Report

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Introduction

Millions of patients visit hospital emergency departments each year for a variety of injuries and ailments. It is crucial for these patients to receive appropriate preparation for their return home so that they can properly manage their recovery. Emergency department (ED) discharge failure, such as ED return within 72 hours or more, poor compliance, or lack of comprehension, carries significant clinical implications for patients, including unfinished treatments and progression of illness. But there is only limited understanding of such risk factors currently.

The Agency for Healthcare Research and Quality contracted with the Johns Hopkins University Armstrong Institute for Patient Safety and Quality to examine the state of the ED discharge process and ways to improve it. Our environmental scan aimed to identify those factors associated with adult patients at high risk for ED discharge failure. This report presents the purpose, methods, and results of the environmental scan the research team conducted on existing literature in this area.

Purpose

We conducted an environmental scan of the literature on ED discharge procedures to describe existing processes, along with their strengths, weaknesses, omissions, barriers, and facilitators. The first purpose of the scan was to establish a foundational understanding of:

- The causes, dimensions, and types of effects of problems with existing ED discharge processes and associated areas for improvement. We focused on areas amenable to change through an improved discharge process and attention to the specific discharge and postdischarge needs of the types of patients who most frequently or repeatedly seek treatment in the ED.
- The mission, structure, and work processes in the ED that may constrain options for, or implementation of, tools to improve discharge and to identify existing tools, approaches, or strategies that seek to improve discharge, care transitions, and care coordination.

In addition, the scan was designed to address three questions:

1. What are the risk factors for patients at high risk for discharge failure?
2. What are the identified, demonstrated, or proposed interventions to improve the ED discharge process?
3. What are the metrics to measure the effectiveness of the ED discharge process?

Overview

This environmental scan report contains:

- A proposed definition of a high-quality ED discharge.
- A conceptual framework of the ED discharge process, highlighting distinctive challenges associated with ED discharge and types and magnitude of impact of those challenges for providers and patients.

- A mapping, or integration into the conceptual framework, of identified best practices, tools, strategies, or approaches to addressing problem areas and criteria/outcomes for assessing their effectiveness (with a focus on problem areas amenable to change through an improved discharge process).
- A reference list.

Table 1 shows the functions of the ED discharge process. Figure 1 shows barriers to effectively carrying out the process, and Figure 2 shows an analytical framework for examining the discharge process, including populations affected, interventions to change the process, and outcomes of the process.

Table 1. Broad functions of ED discharge process

Communicate With/Educate Patients	Support Post-ED Discharge Care	Coordinate Care With Other Providers and Services
• Communicate with patients what occurred during the ED visit (treatments, tests, procedures) • Educate patient on diagnosis • Educate patient on treatment plan • Communicate with patients about reconciled medication list • Educate patient on expected course of illness • Educate patient on signs and symptoms to watch for	• Ensure patients appropriately take new medications • Ensure patients stop or avoid taking certain medications (depending on condition) • Ensure patients are capable and able to care for wounds • Ensure patients understand and comply with dietary restrictions • Ensure patients can receive the appropriate physical therapy (depending on condition) • Discuss use of medical devices (crutches, walker, neck brace, inhalers, glucometers, etc.) • Discuss activity restrictions • Facilitate further diagnostic testing • Facilitate further health care provider evaluation and treatment	• Share records with primary care physician (PCP) and specialists • Communicate further plans with PCP and specialists • Make appointment with PCP and specialists • Facilitate admission to substance abuse recovery facilities • Facilitate public housing services

Figure 1. Map of barriers that hinder effective ED discharge

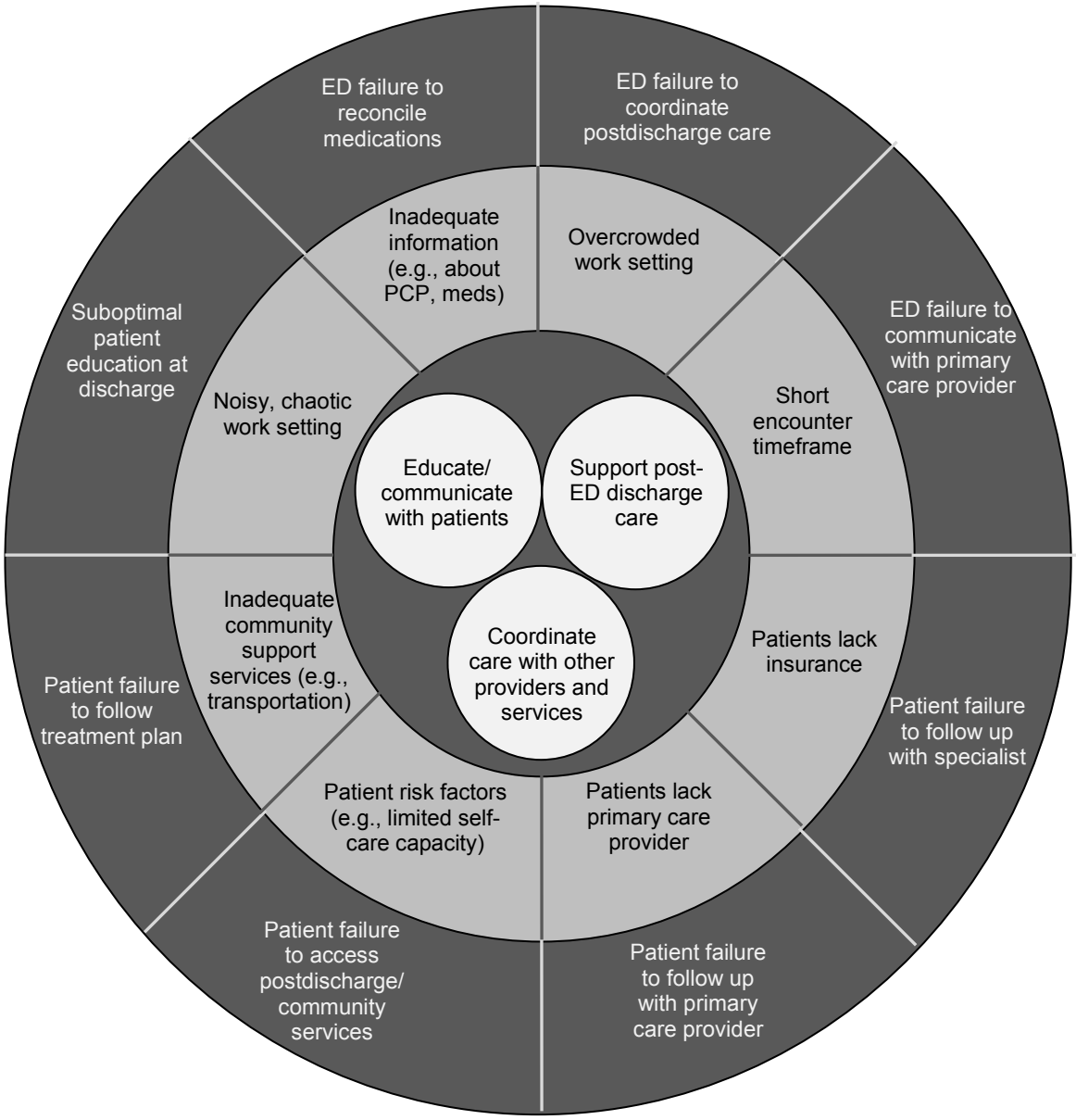
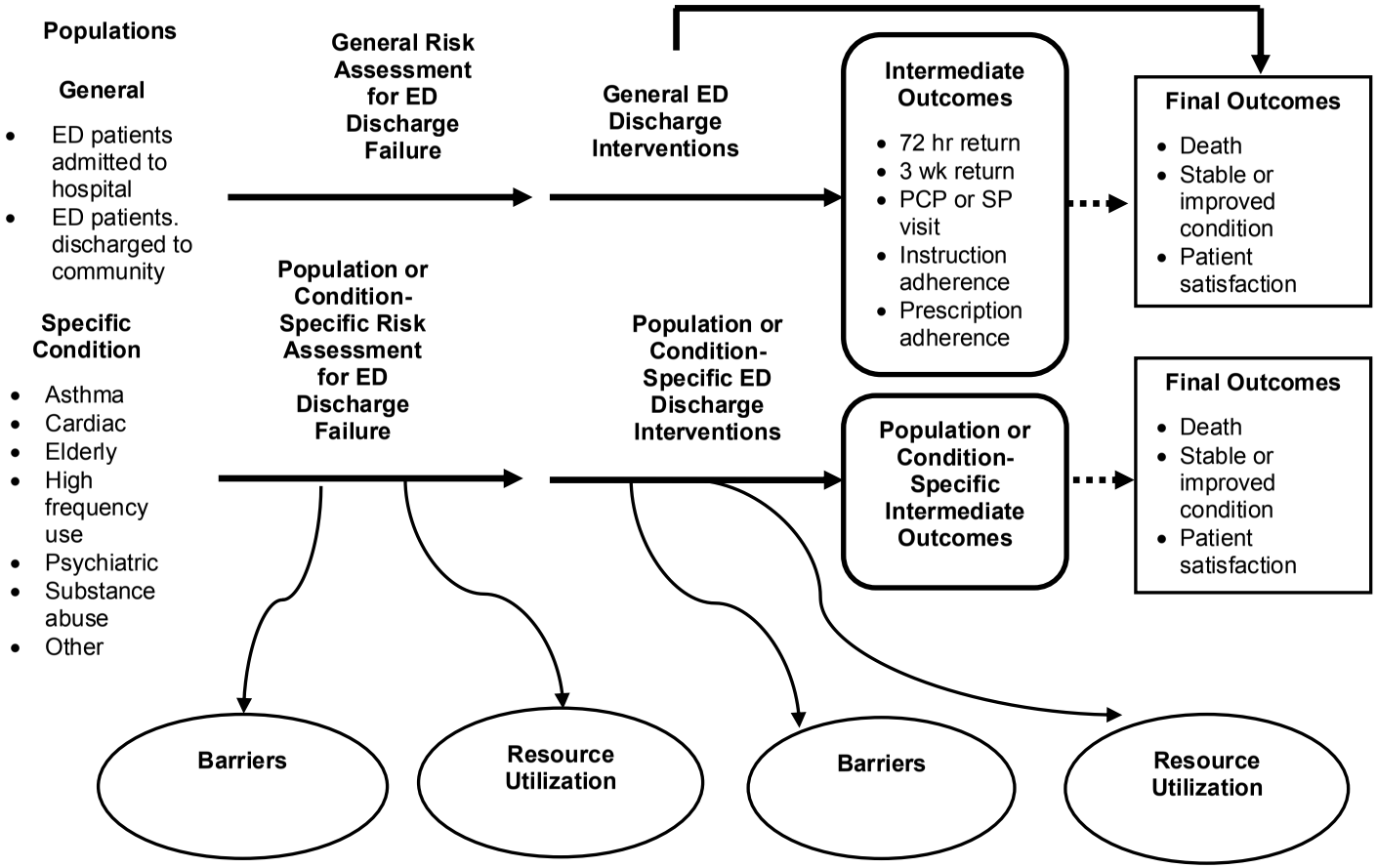


Figure 2. Analytical framework for examining ED discharge process



Methods

The environmental scan included a review of published literature, searches of clinical trials, and queries directed to emergency medicine professionals regarding the ED discharge process.

Information Searches

Published Literature

The main source of information for our environmental scan was published literature found through PubMed, which includes quantitative and evidence-based trial data as well as systematic reviews. This review also included qualitative information and grey literature such as editorials, narrative reviews, case reports, and accounts by individual centers of their experiences. In addition, we looked at guidelines that address problems, gaps, and potential or promising solutions on both a small scale and large scale. Our search terms are presented in Appendix A.

Ongoing Studies

To identify ongoing studies of ED discharge processes, we searched clinicaltrials.gov using the same terms as used for title searches in PubMed (Appendix A).

Other Sources

We queried members of the American College of Emergency Physicians (ACEP) for input in identifying promising approaches to improve the ED discharge process. Input included interventions and toolkits that have been successfully implemented in EDs across a continuum of settings and patient populations. These approaches might lead to decreased unnecessary ED returns, successful handoffs to primary or specialist care, follow-through with prescriptions, better patient self-care, and better patient outcomes. The publications list incorporates items sent by ACEP members.

Results

Definition of a High-Quality ED Discharge and Discharge Failure

Based on previously used outcomes to evaluate the ED discharge process and our conceptual framework (Figures 1 and 2), we have developed the following definition of a high-quality ED discharge.

A high-quality ED discharge contains three main characteristics:

1. It informs and educates patients on their diagnosis, prognosis, treatment plan, and expected course of illness. This includes informing patients of the details of their visit (treatments, tests, procedures).
2. It supports patients in receiving post-ED discharge care. This might include medications, home care of injuries, use of medical devices/equipment, further diagnostic testing, and further health care provider evaluation.
3. It coordinates ED care within the context of the health care system (other health care providers, social services, etc.).

We therefore define a discharge failure as a discharge that does not meet one of these three main criteria. This has been defined in a variety of ways, depending on the perspective of the researcher in the literature. ED discharge failures have been described as follows:

- ED revisits within specified timeframes (e.g., 48 hours, 72 hours, 7 days).
- Frequent ED revisits.
- Frequent emergency medical services (EMS) utilization.
- Hospital admission after ED discharge.
- Poor patient comprehension of discharge instructions.
- Poor patient adherence to prescribed medications.
- Poor patient adherence to primary care followup.
- Poor patient adherence to specialist followup.
- Poor management of specific conditions, such as asthma symptoms, or poor adherence to care plan.
- Death after ED visit.

Publications

Our PubMed search yielded 963 records of multiple publication types. These results decreased to 217 records (Appendix E) after the project team screened the titles for relevance. These titles were transferred into a Microsoft Access database and characterized by publication type, aims addressed (corresponding to the three questions above), risk factors identified in the study, interventions implemented in the study, and outcome metrics used.

After sorting by the aims addressed in each publication, we obtained the following:

- 88 articles that address risk factors and tools to identify high-risk ED discharge failure patients,
- 118 articles referencing previously used tools and interventions, and
- 76 articles pertaining to metrics, benchmarks, or quantitative parameters that measure ED discharge effectiveness.

This totals 282, indicating that 65 publications address more than one aim.

Risk Factors for Discharge Failure

Overall, a host of social and medical problems put patients at risk for ED discharge failure. Social factors include:

- Lack of insurance or inadequate insurance,
- Homelessness,
- Low income,
- Lack of a primary care provider (PCP),
- Poor comprehension or health literacy, and
- Race/ethnicity.

Medical factors include:

- Alcohol dependence,
- Drug use,
- Psychiatric illness,
- Physical or cognitive impairment,
- Various medical conditions and chief complaints,
- Advanced or young age, and
- Male sex.

In addition, certain characteristics of the visit can also play a part in discharge failure, such as reason for the visit. Frequency of previous ED visits also is a strong predictor of discharge failure.

Undoubtedly, many of these risk factors are correlated and it is challenging to determine the independent contribution of each risk. These factors put patients at risk for a variety of poor outcomes, including ED revisits, poor prescription compliance, poor PCP followup, and poor comprehension of discharge instructions. These poor outcomes make up the varying definitions of a discharge failure.

Several screening tools have been developed to predict patients at risk for discharge failure. All have fairly low specificity, underscoring the difficulty in predicting discharge failures.

Social Factors

Lack of or Inadequate Insurance

Several studies found that patients who either did not have health insurance or lacked adequate health insurance were at high risk for discharge failure. In most cases, underinsurance meant having public insurance such as Medicaid. ED discharge failures for uninsured and underinsured patients included 72-hour returns[1] (odds ratio [OR] 1.2) and failure to attend followup appointments.[1,2] Conversely, a study of patients with asthma found that those with private insurance were more likely to respond to telephone followup (relative risk [RR] 1.5).[3]

Homelessness

Housing status was identified as a risk factor for ED discharge failure among a cohort of psychiatric ED patients. Those who lived in an unstable housing situation were four times more likely to experience ED readmissions.[4]

Low Income

In many studies, income levels could not be obtained. As such, Medicaid indicators and receipt of social services acted as proxies to determine whether a patient belonged in the low income category. Among pediatric psychiatric patients, 30 percent of those with a return visit were involved with social services, compared with 15 percent of patients with a one-time visit.[5] In addition, patients with low income were at risk for not attending followup visits.[6]

Lack of a Primary Care Provider

Four articles identified lack of a PCP as a risk factor for ED discharge failure. These patients were at risk for 72-hour returns to the ED,[7] repeated ED revisits, prescription nonadherence, and failure to follow up with a physician. In a study of asthma patients, those with a PCP were more likely to be reachable for telephone followup than those without (RR 1.5).[3]

Among pediatric asthma patients, access to a pediatrician decreased the likelihood of a 72-hour return ED visit (OR 0.64).[8] In a separate study of general pediatric patients, access to a pediatrician decreased the likelihood of a return visit to the ED by almost 30 percent.[9] Adherence to discharge instructions and prescription regimens was an issue among patients who did not have a PCP. These patients were almost 40 percent less likely to adhere to their assigned discharge instructions and about 10 percent less likely to adhere to their prescribed antibiotic regimen.[10]

Poor Comprehension or Health Literacy

Seven studies cited poor patient comprehension or health literacy as a risk factor for discharge failure. Many studies cited the high prevalence of poor patient comprehension.[11-13] Although poor patient comprehension may be considered a discharge failure in and of itself, we did not find any studies that associated poor patient comprehension with other outcomes. It has been speculated that poor patient comprehension leads to lower adherence to prescription medication regimens.[12]

Educational level was identified as a risk factor for several discharge failures. Among young trauma patients with alcohol problems, lack of a high school diploma was a risk factor for loss to 1-year followup (OR 1.41).[14] Patients with less than 9 years of education were at risk for difficulty understanding discharge instructions.[15] In a study of asthma patients, those with a high school education were more likely to be reachable for telephone followup (RR 1.5).[3]

Race/Ethnicity

Five studies cited race/ethnicity as a risk factor for ED discharge failure. Studies had mixed results regarding which racial groups were more at risk for discharge failure. In one study, African Americans and Hispanics were at risk for missing PCP followup appointments.[16] These two groups were more likely not to follow up due to difficulty in making PCP appointments.[16] They were also at risk for prescription nonadherence, hospital readmission (among hospitalized patients), and ED revisits.[4,5,7] ED revisits occurred among asthma patients, pediatric psychiatric patients, and adult psychiatric patients.[4,5]

In another study of asthma patients, black patients were less likely to be reachable for telephone followup (RR 0.6),[3] which can be a risk for ED revisits. However, a separate study found that whites were at risk for 72-hour return visits to the ED.[1]

Medical Factors

Behavioral/Mental Health Problems

A total of 10 articles identified patients with a behavioral/mental health problem as being at risk for discharge failure. These specific conditions included alcohol dependence,[1,17-19] drug use,[17-19] and psychiatric illness.[5,17-20] Alcohol was associated with an OR of 1.39 for 72-hour return.[1]

Psychiatric illness was associated with an OR of 1.95[21] for 72-hour return in one study and an OR of 1.35 in another study.[1]

Patients receiving mental health services at the time of their ED visit were at greater risk for 6-month return (OR 2.63).[5] A history of psychiatric hospitalization (OR 2.52), suicidal (OR 2.04) or disruptive behaviors (OR 2.85), and more than two diagnoses (OR 2.01) were also associated with higher rates of 6-month return.[5] In Australia, 26 percent of frequent ED users had drug/alcohol problems, while 19 percent had psychosocial problems.[18] Patients with psychiatric illness or alcohol abuse were at increased risk for death postdischarge.[22]

Interestingly, among patients age 65 years and older, alcohol use was associated with a lower percentage of 30-day ED returns (OR 0.29) and frequent ED use (OR 0.38).[23] Overall, behavioral/mental health problems were risk factors for frequent return ED visits,[18,23] as well as return visits at 48 hours,[19,23] at 72 hours,[1] and at 28 days.[20] They were also risk factors for frequent use of emergency medical services[17] and death.[22]

Physical or Cognitive Impairment

Several studies identified impaired physical or cognitive function as a risk factor for discharge failure. All of these studies were among patients age 65 years and older or 75 years and older. Patients with physical or cognitive dysfunction were at risk for ED revisits at 1, 3, 6, and 12 months after discharge[24,25]; frequent ED use (defined in one study as 3 visits in 6 months)[23]; hospital admission after ED discharge[26]; and difficulty comprehending discharge instructions.[27] Furthermore, patients with delirium superimposed on dementia were significantly less likely to comprehend their discharge diagnosis (OR 0.13), instructions for returning to the ED (OR 0.18), and followup instructions (OR 0.09) compared with patients without cognitive impairment.[27]

ED return visits within 1, 3, 6, and 12 months were most likely among patients age 75 years and older with physical/cognitive dependence.[24,25] In addition, among patients in this age group, dependence on transportation (OR 2.03) and use of a community nurse (OR 2.68) were risk factors for hospital admission.[26] Loss of ability to perform activities of daily living was also a risk for hospital admission (85% vs. 49%) among this age group.[28]

Among patients age 65 and older, lack of needed help at home predicted frequent ED use (OR 3.35).[23] If prior ability to mobilize and discharge ability to mobilize are documented, 7-day ED revisit is less likely among this group.[29] Finally, those 65 years and older who had delirium superimposed on dementia were at risk for difficulty comprehending discharge instructions (OR 0.13).[27]

Medical Conditions

A variety of conditions were identified as risk factors for discharge failure. These included asthma, heart disease, depression, hypertension, and other comorbidities.

Among patients at Veterans Affairs (VA) hospitals, a high Charlson Comorbidity Index increased the risk of ED return (hazard ratio [HR] 1.11).[30] Having a history of cardiomyopathy increased the risk for 72-hour return (8.4% vs. 4.4%).[31] Among those age 65 years and older, having heart disease (OR 1.45) or depression (OR 1.77) increased the risk for 30-day return and

frequent ED visits (3x in 6 months), respectively.[23] Among those older than 65, hypertension and ischemic heart disease predicted ED revisit within 3 months.[29]

Among pediatric asthma patients, severity of asthma attack predicted clinic followup (OR 2.0),[32] 72-hour ED return (OR 1.17),[8] and subsequent hospitalizations.[33]

Patients with chronic health conditions were at risk for 72-hour returns[7] and increased EMS use.[17] Patients with exacerbation of chronic conditions were at risk for death.[22] In one study, 48-hour returns were most associated with patients whose chief complaint was dyspnea, abdominal pain, or vaginal bleeding.[34]

Other Factors

Age

A total of 11 articles identified age as a risk factor for discharge failure. Many of these articles defined advanced age as older than 65 years, although there was some variation. Most of these studies identified advanced age as a risk factor for ED revisits, both within the 72-hour time window and within 28 days.[20] Outcomes for which advanced age is a risk factor include clinic appointment followup, comprehension of discharge instructions, and adherence to medication regimens (OR 1.003 for each year of age).[20]

One study found that patients age 65 years and older were not at risk for 72-hour returns.[1] Because of correlation to other risk factors, age may be a surrogate for other conditions, rather than an independent risk factor. In another study, being older than 75 years was a risk for hospital readmission.[35] In Hawaii, older age was associated with increased likelihood of ED revisit (RR 1.08).[36] Older patients are at greater risk for 72-hour return.[31]

Younger age was also associated with ED discharge failure. One study reported a quarter of the children who returned to the ED were younger than 1 year, and the younger the child, the higher the likelihood of returning.[37] Another study found patients ages 2-6 years and those age greater than 12 years were less likely to attend followup (OR, 0.71; 95% CI, 0.56-0.90 and OR, 0.62; 95% CI, 0.47-0.83, respectively) (all models $p < .0001$).[32] Younger children and those with indices of more severe acute or chronic asthma were more likely to have ED revisits and hospitalizations.[33] Among pediatric asthma patients, younger patients (2-7 years) were at risk for 72-hour return ED visit (OR 1.28).[8] Among pediatric patients, children younger than 2 years were at risk for 48-hour return (RR 1.28).[38]

In one study, patients ages 18-31 years (OR 1.65, 95% CI, 0.98-2.78) showed a tendency toward an increased risk of loss to followup.[14] In a study of asthma patients, pediatric patients were more likely to have telephone followup (RR 2.5).[3] Effective followup may mitigate readmission risk.

Male Sex

One study did not find male sex as a risk factor for 72-hour return.[1] Among pediatric asthma patients, male patients were less at risk for 72-hour return ED visit (OR 0.83).[8] In Singapore, among patients with closed-head injury, males were less likely to recall their discharge instructions (1.6 vs. 2.3%).[39] In a study of asthma patients, females were more likely to have telephone followup (RR 1.4).[3]

Visit Characteristics

A host of characteristics about the specific ED visit can put patients at risk for discharge failure. These characteristics include reasons for the visit, time of visit, and acuity of visit.

Patients with gastrointestinal symptoms were at increased risk for 72-hour return (OR 1.22),[1,7,31] and 28-day revisit (OR 1.745).[20] More specifically, vomiting (OR 1.98) and constipation (OR 2.47) were both risk factors for 28-day ED revisit. [20] Patients with neurologic symptoms were at risk for 72-hour return (OR 1.22).[1] Specifically, headache was a risk factor for 28-day ED revisit (OR 2.11).[20] Patients with genitourinary complaints also were at risk for 72-hour return (OR 1.33).[1] Specifically, renal colic was a risk factor for 28-day ED revisit (OR 2.43).[20] Dyspnea as a symptom was a risk factor for 72-hour return (12.0 vs. 5.6%).[31]

In addition, atypical presentation of unusual diseases was a risk factor for unanticipated death after ED visit.[22] While one study found dermatologic symptoms a risk for 72-hour returns (OR 2.16),[1] another one did not (0.8% vs. 5.2%).[31]

Among patients at least 65 years old, those who had an ED visit on a weekend were at risk for shorter time to ED return visit (OR 1.03).[37,40] Among pediatric patients, those with visits between 8 p.m. and midnight were more likely to return within 72 hours (OR 2.3).[37]

Patients with higher triage acuity were at risk for 72-hour returns, both adults (OR 1.33)[1] and children (OR 2.3).[37] More specifically, abnormal vital signs was a risk factor for unanticipated death after ED visit.[22]

The following visit characteristics predicted discharge failure in select populations:

- In Pakistan, fever (OR 1.59), low triage acuity (OR 2.11), and leaving against medical advice (OR 4.26) were risk factors for 48-hour ED return.[41]
- In Singapore, patients with asthma, epigastric pain, gastroenteritis, ureteral colic, minor head injury, or backache were at risk for unplanned ED returns.[42]
- Among pediatric patients, those with infectious disease (45%), respiratory-related ailments (16%), and trauma-related visits (16%) were at risk for 48-hour return.[38]
- Among patients age 65 years and older, those with abdominal pain, chest pain, or shortness of breath were more likely to revisit the ED within 3 months.[29]
- Among those at least 75 years old, triage severity (OR 2.18), allergy (OR 5.44), epistaxis (OR 3.39), abdominal pain (OR 5.72), skin infection (OR 6.37), and foot/toe swelling (OR 7.67) predicted 30-day ED return visit.[43]
- Lack of ED consultation with followup clinic physicians was associated with lower rates of attendance at followup appointments.[2]

Frequent ED Use

Seven articles identified frequent ED use as a strong risk factor for discharge failure. Varying definitions of frequent ED use were identified, including:

- ED readmission within the last month[23-25,36];
- A return visit to the ED within 90 days[30];
- Three or more ED visits per year[20]; and
- A return visit within 18 months. [4]

Despite differing definitions of frequent ED use, in all studies, frequent ED use was statistically associated with future ED readmissions. Previous ED visits was a predictor of return ED visits (OR 7.9).[20] Results were similar in Hawaii (OR 1.36), a relatively unique community due to the various islands.[36]

An urban academic hospital screened ED patients in an effort to predict potential readmissions. Patients older than 65 years who had a recent visit at the time of screening were three times more likely to later be readmitted to the ED within a 6-month period.[23] Similarly, among VA patients, a previous ED visit within the last 6 months increased the risk of ED return (HR 1.64).[30] Among psychiatric patients, frequent psychiatric ED use predicted future psychiatric admission.[4]

Miscellaneous

A variety of miscellaneous other risk factors predicted ED discharge failure, including several ED characteristics. Patients seen in teaching institutions were at high risk for 72-hour ED returns (OR 1.19).[1] Among those age 65 years and older, patients seen in EDs with limited resources (OR 0.93 for EDs with more resources), EDs without social worker (OR 0.91 for EDs with social worker), and small EDs (2-11 beds) were at risk for shorter time to ED return visit.[40]

Among psychiatric patients, not having a previous relationship to psychiatry services was a risk for not following up with an appointment (odds 1 out of 7).[44] Not being given a specific psychiatric diagnosis (substance abuse/mental health) was a risk for not following up with a psychiatric treatment facility (RR ~ 2.0).[45]

Among VA patients, a previous hospitalization within the last 6 months increased the risk of ED return (HR 1.76).[30] Among those age 65 years and older, previous hospitalization within 6 months increased the likelihood of 30-day return (OR 1.9) and frequent visits (OR 2.5).[23] Among psychiatric patients, previous psychiatric hospitalization predicted future psychiatric admission.[4]

Among blacks and Hispanics, difficulty making PCP appointments was a risk factor for not following up.[16] In addition, more than half (52%) of children who returned to the ED did so because they could not get a PCP appointment.[46] Compared with patients referred to PCP clinics, those referred back to the ED were more likely to follow up (83% vs. 53%).[47]

Patients who had a prescription for antibiotics were less likely to have nonadherence (OR 0.21) than those with a nonantibiotic prescription.[48] Other nonsignificant associations were that those with an adverse drug reaction (OR 1.84, NS) or two or more medications (OR 1.7, NS) were more likely to have nonadherence than those without a drug reaction and those receiving one

medication.[48] Rural patients were less likely to have ED revisits (RR 0.78) and PCP followup (OR 0.85) compared with nonrural patients.[36]

Lack of communication about the ED visit was found in 63 percent of pediatric clinic visits for asthma.[49] Among pediatric parents in Israel, parental age, gender, education, anxiety level, and time of day did not predict understanding of discharge instructions.[50] Among those age 65 years and older, being widowed increased the likelihood for 30-day return (OR 2.81).[23] Among those age 75 years and older, dependence on transportation (OR 2.03) and use of a community nurse (OR 2.68) were risk factors for hospital admission.[26]

In addition, diagnostic errors (OR 18.62) were associated with unscheduled returns in a group of ED patients in Spain.[31]

Screening Tools

We identified six screening tools that have been used to predict both hospital readmission and ED revisits.

1. Rowland Questionnaire

The most accurate of the screening tools we identified is the Rowland questionnaire. This questionnaire is used to identify older patients at risk for ED revisit. Components include:

- Assistance with walking,
- Assistance with dressing,
- Assistance with pension collection (UK study),
- Assistance with grocery shopping,
- Attendance at day center, and
- Receipt of Meals on Wheels.

The Rowland questionnaire had 88 percent sensitivity, 72 percent specificity, and 98 percent negative predictive value of ED revisit at 14 days.[51]

2. Triage Risk Stratification Tool (TRST)

The TRST is used to assess the risk of ED revisit within 1 year among older patients. The components of the TRST are:

- Cognitive impairment,
- Difficulty walking,
- ED visit within the last month or hospitalization in the last 3 months,
- Use of more than five medications, and
- Health care professional recommendation for added assistance.

The TRST has been shown to have a negative predictive value of 67 to 84 percent.[24,25]

3. Identification of Seniors at Risk (ISAR)

Similarly, the ISAR is a screening tool for risk of ED revisits among older patients. Its components include:

- Presence of home help,
- Increased dependency for activities of daily living,
- History of hospital admissions in the last 6 months,
- Visual problems,
- Memory problems, and
- Polypharmacy (more than three drugs).

The ISAR had low specificity but a high negative predictive value (70% to 89%). Overall, the ISAR was able to predict 30-day ED return (area under the curve [AUC] 0.63) and multiple (3 times) future ED revisits (although poorly).[23-25]

4. Runciman Questionnaire

The Runciman questionnaire is used to predict reinjury in older patients after initial injury. Components include:

- Memory deficit,
- Soft tissue injury,
- Extent of mobility,
- Assistance with shopping,
- Assistance with dressing,
- Use of furosemide, and
- Use of walking device.[52]

5. Hegney Tool

The 8-item Hegney screening tool is used to assess a variety of complications after ED discharge in patients over 70 years old. The tool includes:

1. Falling in the last week,
2. Requiring home help,
3. Having a predicted need for more help after the ED visit,
4. Living alone,
5. Being hospitalized in the last 6 months,
6. Having vision problems,
7. Caring for someone at home, and
8. Taking more than three medications.

The performance of this tool was not assessed. Use of the Hegney tool was coupled with a care coordination team. Together, the screening tool and care coordination team were associated with a 16 percent decrease in re-presentation to the ED.[53]

6. Complex Model

Finally, among those age 75 years and older, a complex model of patient/visit characteristics has been shown to be a poor predictor of 30-day ED return (AUC <0.65).[43]

Interventions

Overall, a host of interventions have been tested to improve the discharge process. These interventions can be divided into several broad categories:

1. Discharge instructions/education,
2. Telephone followup,
3. ED-made appointments,
4. Prescription assistance,
5. Transportation assistance,
6. Care coordination,
7. Care bundles,
8. Drop-in group appointments, and
9. Housing assistance.

In general, efforts aimed at discharge instruction education/simplification, telephone followup, and ED-made appointments tended to be successful. Care coordination efforts had mixed results; some studies using a bundle of interventions resulted in decreased subsequent ED utilization, while others resulted in an increase. Specifically, care coordination coupled with a risk screening process achieved greater success than efforts aimed at a more general population.

The interventions we identified in the literature for improving the ED discharge process are listed in Appendix D. Some of the most common ones are discussed below.

Discharge Instructions and Education

Eleven studies[8,9,11,39,54-60] evaluated the effectiveness of interventions related to ED discharge instructions and education, with mixed results. The interventions involved various modalities of verbal or written discharge instructions and education about the acute medical condition.

Among pediatric patients, computer-generated, diagnosis-specific discharge instructions seem to increase knowledge[59] and understanding of diagnosis and treatment (92% who received information sheets vs. 82% who did not).[54] However, enhanced discharge instructions/education did not translate into decreased 72-hour revisits (OR 0.99[8] and OR 0.93[9]) or better followup for regular care within 7 days (7% before use of discharge teaching tool vs. 6% after).[55]

Among adults, simplified computerized discharge instructions increased patient understanding (discharge instruction comprehension score 4.36 vs. 4.08 in original study with standard instructions)[57] and followup adherence (36% preintervention vs. 26% postintervention).[58] This was especially true among the geriatric population (medication knowledge 43% experimental group vs. 17% control group).[56] Printed instructions and verbal reinforcement did not seem to make a difference among head injury patients (score not reported).[39]

Table 2 summarizes findings from the literature included in the scan that related to discharge instructions and education.

Table 2. Discharge instructions and education

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Pediatrics					
Lawrence, et al.,[9] 2009	Computer-generated diagnosis-specific discharge instructions	Pediatric	Urban academic ED	72-hour returns	Unchanged. OR 0.93 [0.64-1.37]
				Medically necessary 72-hour return	Unchanged. 13% vs. 15%
Waisman, et al.,[54] 2005	Diagnosis-specific printed discharge instructions	Pediatric	Israeli urban tertiary	Understanding treatment	Increased. 92% vs. 82%
				Understanding diagnosis	Unchanged. 73% vs. 72%
Isaacman, et al.,[59] 1992	Standardized discharge instructions Standardized verbal instructions	Pediatric with otitis media	Urban tertiary ED	Knowledge of discharge information	Increased. Number not available
Guttmann, et al.,[8] 2007	Preprinted discharge instructions Various	Pediatric asthma	152 EDs in Canada	72-hour returns	Unchanged. OR 0.99
Patel, et al.,[60] 2009	Verbal reinforcement of discharge instruction by bilingual discharge facilitator	Pediatric gastroenteritis		Recall of 7 warning signs/symptoms	Increased. 4.5 vs. 3.0 symptoms
Petersen, et al.,[55] 1999	Asthma discharge teaching tool (Asthma 1-2-3 Plan)	Pediatric asthma	Tertiary academic ED	7-day followup	Unchanged. 7% vs. 6%
				Instruction to follow up with pediatrician	Increased. 81% vs. 54%
Adults					
Primary Author	**Additional Interventions**	**Population**	**Setting**	**Outcome Evaluated**	**Findings**
Jolly, et al.,[57] 1995	Simplified printed discharge instructions	Adult	Urban tertiary ED	Discharge instruction comprehension score	Increased. 4.36 vs. 4.08
Vukmir, et al.,[58] 1993	Computerized discharge instructions	Adult	Urban tertiary ED	Followup compliance	Increased. 36% vs. 26%
Hayes, et al.,[56] 1998	Geriatric-based computer-generated discharge instructions	>60 years old	Rural ED	Medication knowledge	Increased. 43% vs. 17%
Heng, et al.,[39] 2007	Printed discharge instructions Verbal reinforcement	Head injury	Singapore	Discharge instruction recall	Unchanged. Number not available

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Review Article					
Samuels-Kalow, et al.,[11] 2012	Various	All	Varies	Various	Mixed

A comprehensive review from 2012[11] summarized many of the conceptual issues and interventions in this category. The authors divided ED discharge into three domains:

- Content (diagnosis and disease-specific information, worsening and improving symptoms, medications, and followup),
- Delivery (written instructions with verbal reinforcement, in the patient's native language), and
- Comprehension (assessment and explanation as needed).

They suggest that before patients are discharged from the ED, emergency health providers effectively communicate crucial information, verify comprehension, and tailor teaching to areas of confusion or misunderstanding to ensure patient safety in the home environment.

An important gap in our understanding of how to meaningfully improve ED discharge instructions is the lack of a standardized tool to assess those most in need of assistance with comprehension and to identify the most effective ways to meet those needs.

Followup Telephone Calls

We identified 13 studies[21,61-72] that evaluated telephone followup calls to improve the discharge process. Overall, most of the studies found that telephone followup calls were effective. For example, they were effective at increasing patient satisfaction (95% found it useful, although there were no intervention comparators)[61,62] and management of asthma in children.[63,64] Compared with emails, telephone calls were more effective at reaching patients.[65] When used as a quality improvement tool, followup telephone calls reduced the incidence of errors among residents.[72]

Most studies used nurses to perform the calls. In the pediatric population, nurse practitioner telephone followup was more effective than resident physician followup. In one study, 43 percent of those called required clarification of discharge instructions.[61]

Table 3. Telephone followup

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Jones, et al.,[61] 1988	None	Adults	Academic ED	Patient care	42% required clarification of instructions; no control group
				Satisfaction	95% felt it was useful; no control group

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Shesser, et al.,[62] 1986	None	Various diagnoses	Urban academic ED	Patient satisfaction Men	Increased. 88% vs. 50%
				Women	Increased. 68% vs. 64%
Khan, et al.,[63] 2004	Asthma educator	Pediatric asthma	Australian pediatric ED	Asthma symptoms	Unchanged. Days of wheezing in last 3 months = 3 vs. 2
				Possess written asthma plan	Increased. 88% vs. 72%
Smith, et al.,[64] 2004	Telephone asthma coaching Monetary incentive	Low-income pediatric asthma	Urban tertiary ED	PCP followup in 15 days	Increased. 36% vs. 19%
				Asthma symptom improvement	Increased. 4.4 vs. 3.3 days/week
Goldman, et al.,[65] 2004	Telephone vs. email followup	Pediatrics	Canadian tertiary ED	Response rate	Telephone superior 87% telephone vs. 53% email
Nelson, et al.,[66] 1991	Nurse practitioner telephone followup	Pediatrics	Urban tertiary ED	Compliance with followup instructions	Increased. 79% vs. 61%
				Missed appointments	Decreased. 15% vs. 31%
				Inappropriate use of followup care	Decreased. 10% vs. 20%
Wong, et al.,[21] 2004	Followup call on day 1-2 Followup call on day 3-5	Adults with fever, respiratory, or GI conditions	Hong Kong	30-day ED revisit	Increased. 30% vs. 24%
				Disease improvement	Increased. 71% vs. 64%
O'Neill, et al.,[67] 2001	Nurse practitioner followup phone calls	Pediatric	Urban academic ED	None noted	Anecdotal decrease in complaints to medical director. Anecdotal decrease in unnecessary ED revisits.
Ezenkwele, et al.,[68] 2003	Telephone vs. email followup	All	Urban academic ED	Success of contact	Increased. 58% vs. 41%
				Median time of response	Decreased. 18 hours vs. 48 hours
Kim, et al.,[69] 2002	Telephone + pager vs. telephone only	Pediatric	Urban academic ED	Success of contact	Increased. 78% vs. 61%
Poncia, et al.,[70] 2000	Nurse telephone followup	Age >75	United Kingdom	None noted	23% of patients required home visit by PCP; no comparison group.

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Horne & Ros,[71] 1995	Telephone followup	Pediatrics	Urban academic ED	Successful contact	Successful contact in 68%. No comparison group.
Chern, et al.,[72] 2005	Resident followup	High-risk discharge	Taiwan academic ED	3-day ED return	Decreased. 4.9% vs. 10.1%
				Clinically significant adverse events	Decreased. 1.5% vs. 4.1%
				Hospital admission	Increased 3.4%
				Use of observation unit	Increased 4.3%

One study[70] evaluated the concept of followup for older patients discharged from the ED. The intervention was a followup phone call to assess patients' needs (age 75 years and older) and recommend appropriate actions. This study was descriptive, illustrating the percentage of patients needing various categories of further interventions. It is an interesting concept to consider, providing a gateway to other specific interventions.

Most care coordination interventions included the postdischarge phone call as a key component of the bundled intervention. One study done in a pediatric ED employed a nurse practitioner to follow up with the patient and family after discharge.[66] The population was predominantly poor, uninsured, and African American or Hispanic. The intervention was effective at improving adherence with primary care followup (79% vs. 61%) by scheduling appointments or reinforcing the importance of the appointment. However, the intervention did not change the rate of ED return.

A study from Hong Kong[21] demonstrated improved health outcomes (71% vs. 64% reporting disease improvement) among patients who received a postdischarge phone call from a registered nurse but also showed an increase in ED utilization (30% vs. 24% 30-day ED revisit). This paradoxical effect was thought to be due to increased sensitization of health needs. When asked, patients reported that the ED was a more convenient venue to receive care.

ED-Made Appointments

We identified nine articles that evaluated the effect of ED-made followup appointments on the discharge process.[2,73-80] Overall, most studies demonstrate higher adherence with outpatient followup if an appointment is made in the ED. However, this did not translate into improved rates of ED revisit, disease control, or quality of life.[76,79]

In an observational study conducted at an academic medical center, making a followup appointment from the ED resulted in a higher followup rate (65%) compared with just providing the clinic number (46%).[2] This was confirmed in another noncontrol study (76% followup for ED-made appointments),[74] as well as a randomized controlled trial of followup appointments (PCP or specialist) in which intervention patients were more likely to comply compared with

controls (59% ED-made appointment vs. 37% controls).[75] Appointments made for cardiac stress testing increased the likelihood of followup (72.5% vs. 56.1%, RR 1.29).[73]

Among children visiting the ED, an ED-made appointment, written reminders, mailed reminders, telephone reminders, and offers of work excuse, child care assistance, and transportation assistance were associated with a higher followup rate (Group 1, 52%) compared with ED-made appointment and written reminder (Group 2, 47%) or controls (Group 3, 24%).[77] Among children presenting to the ED with asthma, an ED-made PCP appointment increased the likelihood of followup (64% vs. 46%, OR 1.4) but did not change return ED visits, missed school or work, or percentage reporting daily use of a controller medication (58% vs. 54%) 4 weeks after the ED visit.[76]

Table 4. ED-made appointments

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Magnusson, et al.,[2] 1993	Group 1: Return to ED on specific day Group 2: ED-made clinic appointment Group 3: Clinic telephone number	Adults	Urban academic ED	Followup compliance	Higher in Group 2. Group 1: 51% Group 2: 65% Group 3: 46%
Richards, et al.,[73] 2007	ED-scheduled stress test vs. patient arranged	Chest pain	Canada	Completion of stress test	Increased. 72% vs. 56%
Vinson, et al.,[74] 2009	None	All	Community ED	Followup compliance	77%, no control group
				ED revisit (before appointment)	2.6%, no control group
Kyriacou, et al.,[75] 2005	None	Adults	Urban academic ED	Followup compliance	Increased. 59% vs. 37%
Zorc, et al.,[76] 2003	Assistance making PCP appointment	Pediatric asthma	Urban academic ED	Followup compliance	Increased. 64% vs. 46%
				Asthma-related ED visit	Unchanged. 53% vs. 48%
				Daily use of controller	Unchanged. 58% vs. 54%
Komoroski, et al.,[77] 1996	Group 1: ED-made appointment, mailed reminder, work note, child care assistance, transportation assistance, telephone followup Group 2: ED-made appointment, written reminder Group 3: Control	Pediatrics	Large ED	Followup compliance	Higher in Group 1. Group 1: 52% Group 2: 47% Group 3: 24%

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Boudreaux, et al.,[78] 2011	Various strategies to prevent psychiatric admission	Psychiatry	138 EDs	Observational survey study	72% of sites used ED-made appointments. 64% of sites used in-house case management. No control group.
Gorelick, et al.,[80] 2006	Group 1: Education, written care plan, instruction for followup with PCP Group 2: Group 1 + ED-made appointment Group 3: Group 1 + case management	Pediatric asthma	Tertiary pediatric ED	ED revisit in 6 months	No significant differences. Group 1: 38% Group 2: 39% Group 3: 36%
				Controller use	No significant differences. Group 1: 85% Group 2: 89% Group 3: 69%
				Quality of life score	No significant differences. Group 1: 75 Group 2: 77 Group 3: 78
Baren, et al.,[79] 2006	Group A: Control Group B: Free prednisone, transport voucher, telephone reminder for appointment Group C: Free prednisone, transport voucher, ED-made appointment	Asthma	9 EDs, mixed urban-rural	Followup with PCP	Higher in Group C. Group A: 42% Group B: 48% Group C: 65%
				ED revisits in 1 year	No significant differences. Group A: 0 Group B: 1 Group C: 1
				Hospitalizations in 1 year	No significant differences. Group A: 7 Group B: 12 Group C: 16
				Inhaled corticosteroid use	No significant differences. Group A: 44% Group B: 51% Group C: 44%
				Quality of life (shortness of breath in the last 2 weeks)	No significant differences. Group A: 28% Group B: 24% Group C: 36%

Prescription Assistance

We did not identify any studies that evaluated the effect of prescription assistance (dispensing medications before ED discharge, medication starters, vouchers) as a standalone intervention. We identified one commentary advocating for this intervention[81] and two studies that used prescription assistance as part of a bundle of interventions.[79,82] Theoretically, prescription assistance should increase medication adherence, prevent progression of disease, and decrease the rate of ED revisits.

The commentary focused on medications as part of a successful pediatric ED discharge process. The paper reports that approximately one-third of patients fail to obtain priority medications from a pharmacy after discharge from an ED. It makes the case for dispensing ED discharge medications from the ED's in-house outpatient pharmacy as a major convenience that overcomes this obstacle, improving the likelihood of medication adherence.[81] This intervention requires additional resources but is worth exploring in appropriate patients.

The bundle of interventions included free prednisone for asthma patients ages 2-59 years, along with transportation vouchers and appointment assistance. This bundle significantly increased the likelihood of PCP followup but did not change ED revisits, hospitalizations, asthma management, or quality of life.[79,82]

Table 5. Prescription assistance

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Yamamoto, et al.,[81] 2012	None	Pediatric	N/A	N/A; this is a review paper	Advocates for prescription assistance
Baren, et al.,[82] 2001	5-day prednisone supply free, transportation voucher, telephone reminder	Asthma	Tertiary urban ED	Followup with PCP	Increased. RR 3.1

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Baren, et al.,[79] 2006	Group A: Control Group B: Free prednisone, transportation voucher, telephone reminder for appointment Group C: Free prednisone, transportation voucher, ED-made appointment	Asthma	9 EDs, mixed urban-rural	Followup with PCP	Higher in Group C. Group A: 42% Group B: 48% Group C: 65%
				ED revisits in 1 year	No significant differences. Group A: 0 Group B: 1 Group C: 1
				Hospitalizations in 1 year	No significant differences. Group A: 7 Group B: 12 Group C: 16
				Inhaled corticosteroid use	No significant differences. Group A: 44% Group B: 51% Group C: 44%
				Quality of life (shortness of breath in the last 2 weeks)	No significant differences. Group A: 28% Group B:. 24% Group C: 36%

Transportation Assistance

None of the studies evaluated the effect of transportation assistance (to pharmacy, followup appointment, other related destination) on the ED discharge process, as a standalone intervention. Within a bundle of interventions, three studies have used transportation assistance.[77,79,82]

Among children visiting the ED, an ED-made appointment, written reminders, mailed reminders, telephone reminders, and offers of work excuse, child care assistance, and transportation assistance were associated with a higher followup rate (Group 1, 52%) compared with ED-made appointment and written reminder (Group 2, 47%) and usual care (Group 3, 24%).[77]

As mentioned in the section on prescription assistance, free prednisone for asthma patients ages 2-59 years, transportation vouchers, and appointment assistance increased the likelihood of PCP followup but did not affect ED revisits, hospitalizations, asthma management, or quality of life.[79,82]

Table 6. Transportation assistance

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Komoroski, et al.,[77] 1996	Group 1: ED-made appointment, mailed reminder, work note, child care assistance, transportation assistance, telephone followup Group 2: ED-made appointment, written reminder Group 3: Control	Pediatrics	Large ED	Followup compliance	Higher in Group 1. Group 1: 52% Group 2: 47% Group 3: 24%
Baren, et al.,[82] 2001	5-day prednisone supply free, transportation voucher, telephone reminder	Asthma	Tertiary urban ED	Followup with PCP	Increased. RR 3.1
Baren, et al.,[79] 2006	Group A: Control Group B: Free prednisone, transportation voucher, telephone reminder for appointment Group C: Free prednisone, transportation voucher, ED-made appointment	Asthma	9 EDs, mixed urban-rural	Followup with PCP	Higher in Group C. Group A:42% Group B: 48% Group C: 65%
				ED revisits in 1 year	No significant differences. Group A: 0 Group B: 1 Group C: 1
				Hospitalizations in 1 year	No significant differences. Group A:7 Group B: 12 Group C: 16
				Inhaled corticosteroid use	No significant differences. Group A: 44% Group B: 51% Group C: 44%
				Quality of life (shortness of breath in the last 2 weeks)	No significant differences. Group A: 28% Group B: 24% Group C: 36%

Care Coordination Based in the Emergency Department

We identified 16 studies that described care coordination as an intervention to improve the ED discharge process (see Table 7).[18,80,82-89] Care coordination involves a variety of interventions designed to help the patient transition to the home environment. These interventions might include assistance with outpatient appointments, medical insurance, prescriptions, housing, and other needs. A care coordinator, sometimes referred to as a case manager, often determines which of these interventions an individual patient requires. The background of the care

coordinator can vary between nurse and social worker. In some situations, having both the nurse and social worker can be complementary.[83]

The heterogeneity in the type of intervention, study population, and settings made it difficult to assess the success or failure of care coordination as a whole or of individual interventions. Overall, care coordination seems to improve a variety of intermediary outcomes (e.g., satisfaction, outpatient followup, quality of life) but does not consistently lead to a decrease in ED revisits or disease progression. The table below divides the articles into study and target population: overall, case reports without comparators, literature reviews, and studies in asthma patients.

While care coordination reduced ED revisits in studies outside the United States,[84-86] it did not do so in the United States.[18,80,87,88] In fact, in some cases, the added assistance uncovered other health care needs or led patients to increase ED utilization.[18] Notably, the three studies that showed a decrease in ED revisits were not from the United States.[84,85,86] Care coordination did not change rates of alcohol or drug use among patients with substance dependence.[18] Among asthma patients, it did not improve controller use or quality of life in children.[88]

Care coordination did lead to increases in patient and provider satisfaction,[88,89] disease-related quality of life,[86,88] and outpatient followup with PCP/specialists,[18,82] as well as linkage to community care providers.[18]

Table 7. Care coordination based in the emergency department

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated
Phillips, et al.,[18] 2006[a]	Various	Frequent users	Urban tertiary ED	• ED revisits (increased) • ED length of stay (unchanged) • ED admission for observation (increased) • Housing stability (increased) • Primary care linkage (increased) • Community care engagement (increased) • Drug use (unchanged) • Alcohol use (unchanged)
Skinner, et al.,[84] 2009[b]	Various	Frequent users	Scotland	ED revisits (decreased)
Lee, et al.,[87] 2006[a]	Various	Frequent users	Urban tertiary ED	ED revisits (unchanged)
Corbett, et al.,[86] 2005[b]	Various	Older adult	Australia	ED revisits (decreased) Hospital admissions (decreased) Health-related quality of life (increased)

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated
Guttman, et al.,[88] 2004[a]	Nurse discharge plan coordinator (NDPC): Education, coordination of appointments, telephone followup, access to NDPC	Age >75	Canada	14-day ED return (unchanged: RR 0.79, 0.62-1.02) Satisfaction with discharge instructions (increased: 87% vs. 76%) Perceived well-being (increased: 64% vs. 59%)
Moss, et al.,[89] 2002[b]	Multidisciplinary care coordination team	Various high risk	Urban tertiary Australian ED	Hospital admission, same visit (decrease: 31% vs. 33%) Staff, patient, caregiver, and community service provider satisfaction (good; no controls)
Case Reports Without Comparators				
Walsh, et al.,[90] 2003[c]	Nurse case management	Adult	Urban tertiary ED	Case studies showing success
Sinclair, et al.,[91] 2000[c]	Acute home care referral	Mostly older adult	Canada	Deemed successful, no controls
Boudreaux, et al.,[78] 2011[c]	Various strategies to prevent psychiatric admission	Psychiatry	138 EDs	Observational survey study 72% of sites used ED-made appointments 64% of sites used in-house case management
Greene, et al.,[92] 2011[c]	Communication between ED provider and PCP			News article highlighting the challenges and importance of PCP communication
Rea, et al.,[85] 2010[c]	Multidisciplinary case management Risk assessment guide	Frequent users	Australian ED	ED revisits (decrease; no data or controls)
Literature Reviews				
Bristow, et al.,[83] 2002[b]	Literature review of nurse and social work case management	Adult	ED	Advocates for dyad model of case management
Sinha, et al.,[93] 2011[b]	Systematic review of case management	Geriatric	ED	15 positive studies 3 negative studies 8 characteristics of positive studies
Katz, et al.,[94] 2012[b]	Systematic review of care coordination	All	ED	23 studies with mixed results
Asthma				
Gorelick, et al.,[80] 2006[a]	Group 1: Education, written care plan, instruction for PCP followup Group 2: Group 1 + ED-made appointment Group 3: Group 1 + case management	Pediatric asthma	Tertiary pediatric ED	ED revisit in 6 months (no significant differences: Group 1, 38%; Group 2, 39%; Group 3, 36%) Controller use (no significant differences: Group 1, 85%; Group 2, 89%; Group 3, 69%) Quality of life score (no significant differences: Group 1, 75; Group 2, 77; Group 3, 78)

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated
Kelly, et al.,[95] 2007[c]	Asthma discharge management in relation to emergency departments (ADMIRE Project): variety of interventions	Asthma	32 EDs in Australia	Mixed success Barriers: access to PCP, hospital policies around supplying medications, access to education

[a] Study with negative results.
[b] Study with positive results.
[c] Study with mixed results or without a comparator.

Literature Reviews

Three studies provide comprehensive reviews of the literature surrounding care coordination. The first two found mixed results for care coordination but identified some opportunities. The third article makes an argument for the nursing + social worker model of care coordination.

A systematic review from 2012[94] summarized the effectiveness of care coordination. Care coordination was defined as the incorporation of information from previous visits, ED-based educational services for continued care, post-ED treatment plan, and transfer of information from ED to continuing care provider. The authors identified and reviewed 23 articles. They identified four challenges in summarizing the evidence:

1. Difficulty defining ED care coordination;
2. Heterogeneity of interventions with multiple outcomes;
3. Predominance of single-center studies that were difficult to generalize; and
4. Lack of a theoretical framework.

The authors found some positive influence of the care coordination model, but specific care coordination interventions were difficult to assess because their effectiveness depended on available resources. They concluded that effective methods of care coordination are possible with clearer understanding of the most important elements of the intervention, along with assessment of the costs versus benefits of the intervention.

The second systematic review[93] analyzed care coordination for older adults. They identified 18 articles that studied the impact of a Geriatric Case Management Model, 15 with positive results and 3 with negative results. The authors suggest that positive studies had eight characteristics in common:

1. Evidence-based practice,
2. Nursing clinical delivery,
3. Screening for high risk,
4. Focused geriatric assessment,
5. Initiation of care and disposition planning in the ED,
6. Interprofessional and capacity-building work practices,

7. Post-ED discharge followup with patients, and
8. Establishment of evaluation and monitoring processes.

The third literature review advocates for care coordination using a nurse and social worker (dyad model).[83] The authors present a structured review of the literature and suggest that this dyad care coordination model improves discharge planning for ED patients, decreases inappropriate admissions, lowers costs, and increases patient and staff satisfaction. However, the review was not systematic, and the presentation of evidence was not balanced.

Care Bundles

We identified five articles[77,79,80,82,88] that used a predetermined bundle of interventions to improve the ED discharge process. The individual studies are discussed in the different sections that involve the different interventions. The table below summarizes these studies.

Table 8. Care bundles

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Finding
Komoroski, et al.,[77] 1996	Group 1: ED-made appointment, mailed reminder, work note, child care assistance, transportation assistance, telephone followup Group 2: ED-made appointment, written reminder Group 3: Control	Pediatrics	Large ED	Followup compliance	Higher in Group 1. Group 1: 52% Group 2: 47% Group 3: 24%
Baren, et al.,[82] 2001	5-day prednisone supply free, transportation voucher, telephone reminder	Asthma	Tertiary urban ED	PCP followup	Increased. RR 3.1
Guttman, et al.,[88] 2004	Nurse discharge plan coordinator (NDPC): education, coordination of appointments, telephone followup, access to NDPC	Age >75	Canada	14-day ED return	Unchanged. RR 0.79, 0.62-1.02
				Satisfaction with discharge instructions	Increased. 87% vs. 76%
				Perceived well-being	Increased. 64% vs. 59%

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Gorelick, et al.,[80] 2006	Group 1: Education, written care plan, instruction for PCP followup Group 2: Group 1 + ED-made appointment Group 3: Group 1 + case management	Pediatric asthma	Tertiary pediatric ED	ED revisit in 6 months	No significant differences. Group 1: 38% Group 2: 39% Group 3: 36%
				Controller use	No significant differences. Group 1: 85% Group 2: 89% Group 3: 69%
				Quality of life score	No significant differences. Group 1: 75 Group 2: 77 Group 3: 78
Baren, et al.,[79] 2006	Group A: Control Group B: Free prednisone, transportation voucher, telephone reminder for appointment Group C: Free prednisone, transportation voucher, ED-made appointment	Asthma	9 EDs, mixed urban-rural	Followup with PCP	Higher in Group C. Group A: 42% Group B: 48% Group C: 65%
				ED revisits in 1 year	No significant differences. Group A: 0 Group B: 1 Group C: 1
				Hospitalizations in 1 year	No significant differences. Group A: 7 Group B: 12 Group C: 16
				Inhaled corticosteroid use	No significant differences. Group A: 44% Group B: 51% Group C: 44%
				Quality of life (shortness of breath in the last 2 weeks)	No significant differences. Group A: 28% Group B: 24% Group C: 36%

Group Meetings

We identified one study that used group appointments to improve post-ED care. A rural ED developed a group appointment model for low-income uninsured patients, called "Drop-in Group Medical Appointments" (DIGMA). Enrolled patients who were frequent ED users were scheduled for 1-hour group meetings with a multidisciplinary team of a family physician, nurse case manager, and behavioral health professional.[96] A total of 72 patients attended the sessions when needed and received additional one-on-one health sessions. They also had access to the nurse case manager via telephone if they needed further assistance outside of scheduled meetings.

The intervention was more robust than traditional case management and improved patient relationships. The study showed a decrease in the rate of ED use from 0.58 visits per patient to 0.23 ($p<0.001$). Hospital charges dropped from $1,167 to $230 per patient ($p<0.001$). In addition, employment status improved from 4 patients employed to 14 out of the 36 enrollees.[96]

Table 9. Drop-in group appointments

Primary Author	Additional Interventions	Population	Setting	Outcome Evaluated	Findings
Crane, et al.,[96] 2012	Drop-in group appointments	Low income Uninsured Frequent users	Rural teaching hospital	ED utilization (visits/month)	Decreased. 0.58 vs. 0.23
				Hospital charges (charges per patient)	Decreased. $1,167 vs. $230
				Employment status	Increased. 39% vs. 11%

Housing Assistance

We did not identify any studies that specifically targeted housing assistance as a strategy to improve ED discharge. However, housing assistance is often a tool used as part of the care coordination intervention. We did identify one study that involved housing assistance for hospitalized homeless patients[97] that targeted adults with chronic medical illnesses. Compared with the usual care group, the intervention group had a relative reduction of 29 percent in hospitalizations, 29 percent in hospital days, and 24 percent in subsequent ED visits. We note that the inpatient setting affords much more time and greater resources than are usually available in an ED encounter.

Outcome Metrics

The ED discharge process requires objective measures (i.e., metrics) to evaluate the process' success or failure. Metrics are also important for evaluating the impact of any intervention implemented.

To align the metrics for the ED discharge process with the Re-Engineered Discharge (RED)[98] designed to improve the discharge process for hospitalized patients, our team will classify the selected metrics into the same four categories used with RED,[98] namely outcome metrics, financial metrics, process metrics, and completion of care plan details.

Our team is currently working on selecting the various metrics necessary to address the two components of the ED discharge tool, namely, screening and intervention.

Below are examples of candidate metrics that are being considered:

- Outcome metrics:
    - 72-hour ED return
    - ED visits per year
    - ED visits per month
    - ED visits per 3 months

- Patient comprehension of ED discharge instructions (drafted)
- Patient satisfaction with ED discharge process

- Financial metrics:
  - Cost of the 72-hour ED return visit
  - Costs of ED visits per year
  - Time/cost invested by case manager and/or social worker (undeveloped)

- Process metrics:
  - Percentage of followup phone calls made within 48 hours in high-risk patients
  - Percentage of patients completing postdischarge survey 30 days after discharge
  - Rate of patient outpatient clinic visits within 1 week of ED visit
  - Rate of discharged patients' medication compliance

- Completion of care plan details:
  - Percentage of ED discharge instructions with newly prescribed medications explicitly listed
  - Percentage of ED discharge instructions with general care explicitly listed
  - Percentage of ED discharge instructions with followup appointments explicitly listed

Ongoing Studies

On clinicaltrials.gov we identified three ongoing studies that appear relevant to this project:

1. Basel Discharge Communication Project (BACOP) (NCT01540266): This prospective observational study started in July 2011 in Basel, Switzerland, and is still recruiting. This project aims to determine whether their standardized discharge communication form is better than their procedures that are nonstandardized. The quality of these two processes are measured in terms of recall performance in chest pain patients 18 years and older.
2. Support from Hospital to Home for Elders (SHHE): A Randomized Controlled Study (NCT01221532): This study compared a group receiving usual care with a group receiving usual care plus a peridischarge intervention. In this study, usual care consisted of 10 days of prescription medication; discharge summary sent to a PCP; outpatient appointments made for the patient; and discharge plans reviewed between the patient and nurse. Usual care included a visit with a specialized in-hospital discharge nurse; development of a personalized discharge plan; two phone calls from a nurse practitioner (NP)/physician assistant (PA) after discharge; and additional calls from NP/PA, upon the patient's request, to help answer questions and assist with the patient's postdischarge care. According to the Study Record Detail for this project, the usual care and usual care plus intervention groups were assessed for differences in mortality and rates of rehospitalization and ED use 30, 90, and 180 days following discharge from the hospital. This randomized controlled trial at University of California, San Francisco, started July 2010 and was completed in July 2013.

3. Text Message Appointment Reminders (TAR) (NCT01676337): This is a randomized controlled trial at University of Southern California that started in July 2012 and is ongoing. This project proposes to administer and evaluate a text message-based appointment reminder system with the aim of promoting clinic appointment attendance after ED discharge. The outcome measures are adherence with scheduled appointments within 30 and 60 days postenrollment.

Summary

In summary, we present the results of an environmental scan around the ED discharge process. We have identified a conceptual framework and definition of a high-quality ED discharge, risk factors for a poor ED discharge, interventions that have been evaluated to improve the ED discharge process, and a variety of outcomes that have been used to evaluate the ED discharge process.

Based on our conceptual framework and the available literature, we define a high-quality ED discharge as one that contains three main characteristics:

1. Informs and educates patients on their diagnosis, prognosis, treatment plan, and expected course of illness. This includes informing patients of the details of their visit (treatments, tests, procedures).
2. Supports patients in receiving post-ED discharge care. This might include medications, home care of injuries, use of medical devices/equipment, further diagnostic testing, and further health care provider evaluation.
3. Coordinates ED care within the context of the health care system (other health care providers, social services, etc.).

Risk factors for a poor ED discharge are divided into a host of social and medical problems. Social factors include lack of or inadequate insurance, homelessness, low income, lack of a primary care provider, poor comprehension/health literacy, and race/ethnicity. Medical problems include alcohol dependence, drug dependence, psychiatric illness, physical or cognitive impairment, advanced/young age, male sex, and a host of medical conditions and chief complaints.

Interventions that have been evaluated to improve the ED discharge process can be divided into several broad categories:

1. Discharge instructions/education,
2. Telephone followup,
3. ED-made appointments,
4. Prescription assistance,
5. Transportation assistance,
6. Care coordination,
7. Care bundles,
8. Drop-in group appointments, and
9. Housing assistance.

In general, efforts aimed at improved discharge instructions, telephone followup, and ED-made appointments were successful. Efforts at care coordination had mixed results; some bundles of interventions resulted in decreased ED utilization, while others resulted in increased utilization. Specifically, care coordination that was coupled with a risk screening process tended to be more successful than efforts aimed at a more general population.

Finally, we identified a variety of measures that have been used to describe ED discharge failures:

1. ED revisits within specified timeframes: 48 hours, 72 hours, 7 days, etc…,
2. Frequency of ED revisits,
3. Frequency of EMS utilization,
4. Hospital admission after ED discharge,
5. Poor patient comprehension of discharge instructions,
6. Poor patient adherence to prescription medication regimens,
7. Poor patient compliance with primary care followup,
8. Poor patient compliance with specialist followup,
9. Management of specific conditions, such as asthma symptoms or care plan, and
10. Death after ED visit.

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Appendix A: Search Terms

Initial PubMed search terms and phrases were:

(emergency[title] OR emergencies[title]) AND (discharge[title] OR discharges[title] OR release[title] OR releases[title] OR transition[title] OR transitions[title] OR handoff[title] OR handoffs[title] OR “hand off”[title] OR “hand offs”[title] OR readmission[title] OR readmissions[title] OR recidivism[title] OR return[title] OR returns[title] OR rehospitalization[title] OR rehospitalizations[title] OR coordination[Title] OR coordinate[Title] OR instruction[Title] OR instructions[Title] OR followup[Title] OR follow-up[Title] OR (follow[Title] AND up[Title]) OR counseling[Title] OR counsel[Title] OR integrated[Title] OR plan[Title] OR interdisciplinary[Title] OR transdisciplinary[Title] OR (case[Title] AND management[Title]) OR (case[Title] AND manage[Title]) OR collaboration[Title] OR collaborations[Title] OR collaborative[Title] OR collaborate[Title])

Limits: Filters activated: Humans, English

Appendix B: Data Abstraction

Note: Review instructions appear verbatim as they were given to reviewers and have not been edited.

Outline for ED Discharge Literature Review Evaluation

Review Instructions

Each article should answer 1 or more of our literature review objectives.

What interventions can improve the ED Discharge process?

What are the risk factors for ED Discharge failure?

What outcomes (metrics) have been used to describe ED Discharge success/failure?

Please review each article and answer the relevant questions. If it is an article about an intervention, answer the interventions questions. If it is an article about risk factors, answer the risk factor questions. Etc… Generally speaking, intervention/risk factor articles will also have an outcome. Therefore, you will be answer the outcome question for those articles. Some articles will answer all 3 questions.

Generally speaking, we have tried to balance getting the critical information with the burden of data collection. This is NOT a formal data abstraction as per a systematic review. Focus on the big picture.

As you are reviewing the article in the Access database, hit “TAB” to navigate the boxes. If you hit “ENTER,” it will take you to the next article.

Appendix C: Risk Factors Related to ED Discharge Failures

Risk Factor	Number of References That Address the Risk Factor	Study ID Numbers*					
Age	11	ID: 3[32]	ID: 11[20]	ID: 13[33]	ID: 53[35]	ID: 81[36]	ID: 86[8]
		ID: 93[14]	ID: 101[37]	ID: 105[31]	ID: 118[38]	ID: 160[3]	
Behavioral health problems (e.g., substance abuse, mental illness)	8	ID: 11[20]	ID: 15[17]	ID: 34[1]	ID: 85[5]	ID: 96[22]	ID: 106[18]
		ID: 162[23]	ID: 208[19]				
Frequent user	7	ID: 6[24]	ID: 7[25]	ID: 11[20]	ID: 81[36]	ID: 87[30]	ID: 162[23]
		ID: 184[4]					
Health condition (e.g., asthma, pain)	11	ID: 3[32]	ID: 13[33]	ID: 15[17]	ID: 33[29]	ID: 39[7]	ID: 86[8]
		ID: 87[30]	ID: 96[22]	ID: 105[31]	ID: 162[23]	ID: 27[34]	
Male	4	ID: 34[1]	ID: 86[8]	ID: 88[39]	ID: 160[3]		
Miscellaneous	16	ID: 2[46]	ID: 34[1]	ID: 40[44]	ID: 45[16]	ID: 58[48]	ID: 59[49]
		ID: 81[36]	ID: 83[45]	ID: 87[30]	ID: 91[40]	ID: 105[31]	ID: 144[50]
		ID: 162[23]	ID: 168[47]	ID: 175[26]	ID: 184[4]		
No primary care provider	5	ID: 39[7]	ID: 62[9]	ID: 86[8]	ID: 112[10]	ID: 160[3]	
Patient comprehension/health literacy	7	ID: 16[11]	ID: 25[27]	ID: 54[13]	ID: 93[14]	ID: 160[3]	ID: 188[15]
		ID: 195[12]					
Physical/cognitive function	7	ID: 6 [24]	ID: 7[25]	ID: 25[27]	ID: 33[29]	ID: 162[23]	ID: 175[26]
		ID: 209[28]					
Race/ethnicity	6	ID: 34[1]	ID: 45[16]	ID: 49[6]	ID: 85[5]	ID: 160[3]	ID: 184[4]
Screening tools	6	ID: 6[24]	ID: 7[25]	ID: 46[43]	ID: 92[51]	ID: 103[53]	ID: 162[23]
Socioeconomic-related conditions (homelessness, low income, lack of or inadequate insurance)	6	ID: 34[1]	ID: 49[6]	ID: 85[5]	ID: 160[3]	ID: 184[4]	ID: 199[2]
Visit characteristics	13	ID: 11[20]	ID: 29[41]	ID: 33[29]	ID: 34[1]	ID: 39[7]	ID: 46[43]
		ID: 91[40]	ID: 96[22]	ID: 101[37]	ID: 105[31]	ID: 118[38]	ID: 185[42]
		ID: 199[2]					

* These numbers refer to the study ID numbers in Appendix E, not the reference numbers in the bibliography. The reference numbers for the full bibliographic information are provided in the title column in Appendix E.

Appendix D: Past Interventions Aimed To Prevent ED Discharge Failures

Intervention	Number of References That Use This Intervention	Study ID Numbers*					
Appointment	9	ID: 20[78]	ID: 69[74]	ID: 94[73]	ID: 99[79]	ID: 102[80]	ID: 116[75]
		ID: 146[76]	ID: 187[77]	ID: 199[2]			
Prescription assistance	3	ID: 18[81]	ID: 99[79]	ID: 120[82]			
Discharge instructions/education	11	ID: 16[59]	ID:62[9]	ID: 63[60]	ID: 86[8]	ID: 88[39]	ID: 117[54]
		ID: 173[55]	ID: 177[56]	ID: 194[57]	ID: 201[58]	ID: 202[59]	
Phone call followup	13	ID: 110[66]	ID: 122[65]	ID: 125[63]	ID: 130[64]	ID: 134[21]	ID: 140[68]
		ID: 153[69]	ID: 156[67]	ID: 163[70]	ID: 193[71]	ID: 210[61]	ID: 211[62]
		ID: 108[72]					
Transportation assistance	3	ID:99[79]	ID: 120[82]	ID:187[77]			
Care bundles	5	ID: 99[79]	ID: 102[80]	ID: 120[82]	ID: 123[88]	ID: 187[77]	
Care coordination based in the emergency department	16	ID: 10[94]	ID: 20[78]	ID: 24[92]	ID:36[93]	ID: 48[85]	ID: 66[84]
		ID: 89[95]	ID: 102[80]	ID:104[87]	ID: 106[18]	ID: 111[86]	ID: 123[88]
		ID: 145[90]	ID: 150[83]	ID: 154[89]	ID: 164[91]		
Housing assistance	1	ID: 64[97]					
Drop-in group appointments	1	ID: 5[96]					

* These numbers refer to the study ID numbers in Appendix E, not the reference numbers in the bibliography. The reference numbers for the full bibliographic information are provided in the title column in Appendix E.

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