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Hospital discharge and readmission

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INTRODUCTION

Discharging patients from the hospital is a complex process that is fraught with challenges and involves over 35 million hospital discharges annually in the United States [1]. The cost of unplanned readmissions is 15 to 20 billion dollars annually [2,3]. Preventing avoidable readmissions has the potential to profoundly improve both the quality of life for patients and the financial wellbeing of health care systems.

Researchers in the field of Transitions of Care evaluate the effectiveness of various approaches to improve the discharge process. One classification scheme to categorize these interventions is to consider them as: pre-discharge interventions (patient education, discharge planning, medication reconciliation, scheduling a follow-up appointment); post-discharge interventions (follow-up phone call, communication with ambulatory provider, home visits); and bridging interventions (transition coaches, patient-centered discharge instructions, clinician continuity between inpatient and outpatient settings) [4].

This topic presents an overview of the discharge process, determination of the appropriate next site of care, and review of interventions to reduce the likelihood of unplanned readmissions and adverse events after discharge. Much of the discussion relates to structures of care available in the United States; there is significant variability in the availability of services and types of facilities across geographic areas.

APPROPRIATENESS FOR DISCHARGE

The medical necessity of continued hospitalization is primarily determined by the presence of an acute health condition of sufficient severity that ongoing diagnostic or therapeutic intervention, or careful monitoring, is required.

However, patients often appropriately remain in the hospital even when these criteria are met, due to the lack of a suitable alternative setting to provide necessary care or other social factors.

Premature discharge or discharge to an environment that is not capable of meeting the patient's medical needs may result in hospital readmission. In addition, early hospital discharge may not lead to overall cost-savings if it results in the need for more intense subsequent health care utilization, including emergency department or nursing facility visits, as indicated by one observational study comparing patients who received hospital care from a primary care physician with care by a hospitalist [5].

DETERMINING THE POST-DISCHARGE SITE OF CARE

When it has been determined that a patient is medically ready for discharge, the health care team must determine the most appropriate setting for ongoing care. Determinants of the appropriate site of care involve medical, functional, and social aspects of the patient's illness. The patient’s acute and chronic medical conditions, potential for rehabilitation, and decision-making capacity must be taken into account [6].

Input is needed from multiple sources to determine the most suitable discharge plan. Involved parties often will include the patient, family or other loved ones, case manager, nurse, physician, physical and occupational therapist, social worker, and insurer.

In order for the patient to be deemed safe and ready for discharge to home or to a non-acute environment (rehabilitative, transitional, or chronic care), a provider must take into account a number of factors beyond the medical determinants. These factors include:

- Patient cognitive status
- Patient activity level and functional status
- The nature of the patient's current home and suitability for the patient's conditions (eg, presence of stairways, cleanliness)
- Availability of family or companion support
- Ability to obtain medications and services
- Availability of transportation from hospital to home and for follow-up visits
- Availability of services in the community to assist the patient with ongoing care

Discharge home — Approximately three-quarters of hospitalized patients are able to return to their home environment following discharge [7]. For discharge home, patients, with help from family or other caregivers if available, should be able to:

- Obtain and self-administer medications
- Perform self-care activities
- Eat an appropriate diet or otherwise manage nutritional needs
- Follow up with designated providers

Specific insurance benefits and availability of services in the community may also influence whether or not the patient may be safely discharged home. Home services, such as visiting nurses or infusion providers to administer intravenous infusions, may allow selected patients, who would otherwise need nonacute residential care, to manage their care needs at home.

Discharge to another care facility — If discharge to the outpatient setting is not appropriate, the team must then arrange transfer to another inpatient facility for ongoing care. Determining the most appropriate inpatient setting of care for ongoing treatment involves determining the patient's needs and matching needs with the capabilities of potential sites of care.

One model to help accomplish this involves assessing a set of parameters that describe generic clinical characteristics (medical and surgical issues, mental and emotional status, physical functioning, and environment) that are largely independent of the patient's specific diagnosis [8]. Components of this model are shown in a table (table 1). These needs are then matched with the services offered at different types of facilities. (See 'Types of care facilities' below.)

Once it is decided that discharge to an alternate facility is necessary, referrals are made to facilities that are felt to be potentially appropriate, and the patient is screened for acceptance. The patient must consent to transfer to an accepting facility; if the patient or family declines, then negotiation ensues to find an acceptable discharge placement.

Types of care facilities — The severity of functional impairments and the need for assistance with activities of daily living (ADLs) often determine whether a patient can be safely managed at home or requires care at a skilled nursing facility (SNF) or extended care facility (ECF). In making this determination, particular attention is paid to need for supervision in ADLs and safety awareness.

Medicare in the United States identifies three categories of health facilities:

- Acute care hospitals

- Exempt hospitals (inpatient rehabilitation hospitals [IRFs] and long-term acute care hospitals [LTACs])
- Nursing facilities (SNFs and ECFs)

Functional capabilities of each of these facilities are shown in a table (table 2) and outlined briefly here:

- Inpatient rehabilitation facilities – To meet certification criteria, IRFs must admit 75 percent of patients for 1 of 13 specified diagnoses such as stroke or major trauma. Patients must require multidisciplinary therapy (eg, physical therapy, occupational therapy, speech therapy, orthotic or prosthetic services) and be able to participate in intensive treatment. Physician supervision is provided at least three days per week.

  The patient's stay at the IRF may continue as long as there is continued progress and the ability to participate in and benefit from at least three hours of therapy per day.

- Long-term acute care hospitals – LTACs must maintain an average length of stay ≥25 days and patients must require daily monitoring and complex medical interventions. Patients may include those with complex wounds, chest tubes, ventilatory dependency, or multiorgan failure. LTACs are more likely to take complex medical patients than IRFs and are less widely geographically distributed than IRFs, although the number of LTACs in the United States more than doubled between 1997 and 2006 [9].

- Skilled nursing facilities – SNFs, transitional care units (TCUs), and subacute units provide similar services. TCUs are hospital-based and therefore have more ready access to hospital-based services.

  To qualify for Medicare coverage in these facilities, patients must have a "qualifying event" that includes a three-night hospital stay and must require skilled nursing or rehabilitation for at least one hour daily five days a week. Medicare SNF benefits last 100 days without a new qualifying event and most SNFs do not accept high-cost patients for admission.

- Extended care facilities – ECFs provide long-term custodial care reimbursed through Medicaid, long-term care insurance, or personal finances. In order to qualify for Medicaid, a patient must have exhausted his or her assets, require assistance with a least three ADLs, and require skilled nursing supervision (medication management). Medicaid does not cover therapy services or skilled care, aside from the Medicare copayment.

- Home-based services – Availability of home-based services is highly variable. Multiple domains may be addressed by home-based care, including services provided by Medicare-

certified home health agencies, private duty nursing services, hospice, infusion services, clinician home visit programs, hospital-in-the-home, and telemedicine.

ELEMENTS OF THE DISCHARGE PROCESS

Discharge planning — Discharge planning is the development of an individualized discharge plan for the patient, prior to leaving the hospital, to ensure that patients are discharged at an appropriate time and with provision of adequate post-discharge services [10]. Such planning is a mandatory part of hospital accreditation [11].

Discharge planning is a complex process that seeks to determine the appropriate level of services required by the patient and then match the patient to an appropriate site of care [12]. This process ideally begins at the start of the hospitalization. The hospital case manager should be involved as soon as it is clear that the patient will require services at home or transfer to an alternative level of care.

The impact of discharge planning on outcomes appears to be limited. A 2010 systematic review identified greater patient satisfaction and small decreases in length of stay and readmission rates with discharge planning, while mortality rates were unchanged [10]. A study that examined discharge planning for patients with heart failure measured chart documentation of discharge instructions and patient reports of the discharge planning they had received [13]. No correlation was found between readmission rates and the chart-based measure, and only a small correlation was noted for lower readmission rates with highest versus lowest quintile on the patient-reported measure (22.4 versus 24.7 percent).

Medication reconciliation — Medication reconciliation, or medication review, is the process of verifying patient medication lists at a point-of-care transition, such as hospital discharge, to identify which medications have been added, discontinued, or changed relative to preadmission medication lists. Performing an accurate medication reconciliation is a critical element of a successful discharge transition. It also provides an opportunity for clinicians to ensure that patients understand what medications they are taking, how to take them, and why they are taking them. Most studies included in a 2012 systematic review showed that medication reconciliation was associated with a decrease in actual and potential adverse drug events [14].

The first step is having an accurate medication list at hospital discharge, which depends on the following:

- Having an accurate preadmission medication list.

- Having an accurate list of medications being taken by the patient at the time of discharge.
- Having knowledge of what medication changes were made during hospitalization and the reasons for the changes. As examples:
  - Was a proton-pump inhibitor (PPI) initiated for stress ulcer prophylaxis and therefore no longer required, or is ongoing PPI therapy necessary for treatment of an ulcer?
  - If a different agent from the same class as one taken prior to admission was substituted during the hospitalization, was there a clinical indication for making that change or was this a therapeutic substitution made based on the hospital's formulary preference? If a therapeutic substitution, then the discharge medication should revert to the medication that the patient was taking prior to hospitalization.

Once an accurate discharge medication list is generated, the clinician needs to communicate this information effectively to the patient or and/or caregivers. An observational study of patients aged 64 or older who were discharged home after hospitalization showed that the majority of patients did not understand the new dosing of medications they were taking or the reasons for medication changes [15]. At discharge, nurses had reviewed all medications with the patients, but there was no formal process. The absence of a rigorous system puts patients at increased risk for medication adverse events. In a systematic review of 26 studies, the medication reconciliation process consistently reduced medication discrepancies, as well as actual and potential adverse drug events [14]. The most effective interventions targeted high-risk patients and had intensive pharmacy staff involvement.

A 2023 meta-analysis of 25 randomized trials of over 15,000 hospitalized adults, followed from 1 to 20 months, demonstrated that medication review was likely to reduces the risk of hospital readmissions [16]. Medication reconciliation also is likely to have an important impact on reducing adverse drug events [17,18]. As such, we routinely conduct a medication reconciliation for each patient who is discharged from the hospital and review the medication list with the patient and/or caregiver.

Discharge summary — The primary mode of communication between the hospital care team and aftercare providers is often the discharge summary, raising the importance of successful transmission of this document in a timely fashion. Unfortunately, for clinicians not linked by electronic medical record systems, the discharge summary reaches the primary care provider by the time of the first follow-up visit in only 12 to 34 percent of such visits, and even then often lacks key information [19]. One large, single-center, retrospective study found that a delay in completion of the discharge summary was associated with higher rates of readmission [20]. There was an increase in readmission if the discharge summary was not completed within three

days after discharge (odds ratio [OR] 1.09, 95% CI 1.04-1.13), and the risk continued to increase for every additional three days to complete the discharge summary.

Even when the discharge summary is available, information exchange at discharge may be poor, as demonstrated by a study of information exchange between 471 skilled nursing facilities (SNFs) and their two largest referral volume acute care hospitals which showed that key information at the transition of care was often missing, delayed, and difficult to use [21].

Important elements in the discharge summary, as mandated by the Centers for Medicare and Medicaid Services, are [22]:

- The outcome of the hospitalization
- The disposition of the patient
- Provisions for follow-up care including appointments, statements of how care needs will be met, and plans for additional services (eg, hospice, home health assistance, skilled nursing)

This minimal content should be augmented by information critical to the aftercare providers. Utilizing a template for discharge summaries is helpful to ensure inclusion of relevant information [23]. A suggested list of items that should appear in a discharge summary is shown in a table (table 3). An essential component is identifying those laboratory or other tests for which final results remain pending at the time of discharge [24,25].

Several initiatives involving computer-based innovations to improve the discharge summary process [26] or notification of pending tests at discharge [27] have been explored, but issues involving cost and end-user adoption need further consideration. An initiative involving audit and feedback of discharge summaries was successful in improving discharge summary completeness [28]. The Office of the National Coordinator for Health Information Technology (ONC) supported a pilot project to develop standardized data sets for transitions of care between acute and post-acute care sites and to measure the impact of those exchanges on health care service utilization [29].

Patient instructions — At the time of discharge, the patient should be provided with a document that includes language and literacy-appropriate instructions and patient education materials to help in successful transition from the hospital.

These documents should be brief, focused on critical information to the patient, and primarily directed at what the patient needs to understand to manage his or her condition after discharge.

One model for patient materials, developed by the National Patient Safety Foundation, is called "Ask Me 3" [30]:

- (1) What is my main problem? (ie, why was I in the hospital?)
- (2) What do I need to do? (ie, how do I manage at home, and what should I do if I run into problems?)
- (3) Why is it important for me to do this?

Discharge information, both written and verbal, should be reviewed with the patient/family or other informal caregivers with an emphasis on assessing and ensuring comprehension. In one interview study of patient perception and understanding of discharge instructions, among discharged patients aged >65 years who felt that they had good understanding of their discharge instructions, 40 percent were unable to accurately describe the reason for their hospitalization and 54 percent did not accurately recall instructions about their follow-up appointment [31].

Ideally, hospital staff should know who is responsible for performing the patient education. However, in a multisite study of over 600 internal medicine residents, over one-third reported they were unsure which member of the multidisciplinary team was primarily responsible for discharge education [32]. Participants recommended clarifying roles and improving communication among team members.

Teach back — Teach back is a technique by which the provider asks the patient or caregiver to explain the recently taught concept in the patient's own words [33]. This technique permits the provider to identify and correct any misunderstandings in real time, with the intent of preventing adverse events related to inadequate comprehension of discharge information. While the teach back method has been validated in teaching a patient a new skill (eg, administering insulin or changing a dressing), teach back has not been widely studied as a mechanism for reducing readmissions.

Educating and preparing patients/family or other informal caregivers to be adequately knowledgeable and ready to perform care tasks required after discharge should be started prior to the day of discharge. Teach back may be used iteratively, starting early on in the hospitalization, to build knowledge, attitudes, and skills more effectively. In one study, teach back was done with heart failure patients over a three-day period. Day 1 focused on knowledge aspects (eg, "What medications do you take?" "What is your understanding of heart problems?"). Day 2 focused on attitude aspects (eg, "Why is it important to watch your diet or weigh yourself daily?"). Day 3 focused on behaviors and skills (eg, "How are you going to be able to take your medications daily or get to your follow-up appointments?"). In this small trial, a reduction was

seen in readmission rate and length of second hospital stays for patients who were readmitted [34].

Discharge checklist — Checklists provide an effective mechanism for ensuring that discharge communications (the discharge summary and direct communication with both aftercare providers and patients/families/other caregivers) reliably incorporate all key elements. In 2005, a multi-institutional group created a discharge checklist containing a number of elements that are either required or optional during the preparation of the patient for discharge. This checklist has been endorsed by the Society of Hospital Medicine (table 4) [35]. Its effectiveness has not been studied.

READMISSION

Decreasing the rate of hospital readmissions has been targeted as a high priority for United States health care reform [36]. The US government passed legislation (under the Affordable Care Act's Hospital Readmission and Reduction Program [HRRP]) applying financial penalties for excess readmissions of Medicare patients [37]. Readmission rates have declined. In 2003, almost 20 percent of Medicare patients who were discharged from a hospital were readmitted within 30 days. The readmission rates declined from 21.5 percent in 2007 to 17.8 percent in 2015 for targeted conditions (ie, a set of specific diagnoses measured by Medicare), and from 15.3 to 13.1 percent for non-targeted conditions [38]. Despite concerns about the validity of readmissions as a quality metric, readmission rate is now also used as a high-stakes measure for Medicare Accountable Care Organizations (ACOs), for some state Medicaid programs, and for skilled nursing facilities (SNFs), inpatient rehabilitation facilities, long-term acute care hospitals, and Home Health Agencies.

Although there was some concern that hospitals would avoid readmissions and penalties by admitting patients to a different status (observation status instead of inpatient status), Data from 2007 to 2015 show that while the period after the legislation was passed was associated with an abrupt decline in readmission rates, there was no similar associated increase in observation status utilization [38]. However, some data suggest that, in the same period that readmission rates declined for some populations, mortality rates rose [39]. In a study of 115,245 heart failure patients from 2006 to 2014, while readmission rate was observed to decrease, 30-day and one-year mortality rates increased significantly.

Avoidable versus unavoidable readmissions — Many hospitalizations are not avoidable. Readmissions may represent progression in the natural history of the patient's underlying disease, a separate problem that is unrelated to the initial admission, or the consequence of

patient inability to follow through with a portion of a discharge plan (eg, the patient is unable to fill prescriptions). Some readmissions are likely preventable, although the proportion of readmissions that are preventable is uncertain [40]. A systematic review of 34 studies, most based on retrospective chart review, found the median proportion of preventable readmissions was 27 percent but ranged from 5 to 79 percent [41]. A subsequent observational study including 1000 general medicine patients readmitted within 30 days of discharge to 12 US academic medical centers found that approximately 27 percent were considered potentially avoidable, defined as those with a greater than 50 percent chance that the readmission could have been avoided [42]. Factors most strongly associated with potentially preventable readmissions included emergency department decision-making regarding the readmission (adjusted odds ratio [OR] 9.13, 95% CI 5.23-15.95), failure to relay important information to outpatient providers (adjusted OR 4.19, 95% CI 2.17-8.09), discharge of patients too soon (adjusted OR 3.88, 95% CI 2.44-6.17), and lack of goals of care discussions among patients with serious illnesses (adjusted OR 3.84, 95% CI 1.39-10.64). One-half of potentially preventable readmissions were felt to be linked to interventions that could have been provided during the initial hospitalization. Additionally, one study using Medicare data for over 200,000 patients with heart failure or pneumonia found initial admission rates contributed more to the regional variation in readmission rates than did other factors including case mix, discharge planning, hospital size, or number of primary care or specialist physicians [43].

Readmissions and length of stay — With efforts to decrease length of stay for hospitalized patients over the past two decades, a reasonable concern has been raised that early discharge, if premature, could increase rates of readmission. However, available evidence, while limited to observational studies, does not suggest that earlier discharge is associated with readmission.

In an observational study from 129 Veterans Affairs acute care hospitals in the United States, reviewing over four million medical admissions from 1997 to 2010 for patients with one of five diagnoses (heart failure, chronic obstructive pulmonary disease, acute myocardial infarction, community-acquired pneumonia, and gastrointestinal bleed), a decrease in 30-day readmission rates for all diagnoses (from 16.5 to 13.8 percent) occurred in conjunction with a decrease in length of stay (from 5.44 to 3.98 days) over the 14-year span of the study [44]. Another observational study, looking at the admissions of over 15,000 Medicaid beneficiaries who were hospitalized for chronic conditions (eg, coronary artery disease, congestive heart failure, chronic kidney disease), found that longer length of stay was associated with marginally increased risk (OR 1.03, 95% CI 1.02-1.04) for readmission [45].

Factors that may affect readmission — Several factors that increase the likelihood of readmission may be modifiable, especially those that relate to clinician or system level issues.

Such factors include:

- Premature discharge
- Inadequate post-discharge support
- Insufficient follow-up
- Therapeutic errors
- Adverse drug events and other medication related issues
- Failed handoffs
- Complications following procedures
- Nosocomial infections, pressure ulcers, and patient falls

Therapeutic error — Medical errors are a major contributor to preventable readmissions. Among medical errors, issues related to medication use are frequent. Adverse events, most commonly medication-related, have been estimated to occur in approximately 20 percent of patients following discharge [46,47]. Approximately two-thirds of such adverse events were determined to be either preventable or ameliorable.

Examples of these types of errors include:

- Patients sent home without prescriptions for necessary medications
- Patients receiving duplicate prescriptions for medications they have at home labeled with a different name (eg, generic and proprietary names)
- Inadequate monitoring and follow-up for drug side effects

However, preventing therapeutic error post-discharge is challenging. In a randomized trial involving two tertiary care hospitals, an intervention involving pharmacist medication reconciliation at hospital discharge, pharmacist counseling, low-literacy aids, and post-discharge follow-up phone calls did not prevent clinically important medication errors, which occurred in one-half of patients in both control and intervention groups [48]. Almost a quarter of these errors were serious, while 13 percent led to readmission or emergency department visits.

Failed handoffs — Poor information transfer from hospital-based providers to primary care providers occurs commonly. This may contribute to multiple adverse consequences, including the need for readmission, temporary or permanent disability, or death [19,46,47]. Tests that are pending at discharge often fail to be communicated to providers who are seeing the patient for follow-up [24,25,49]. Representative studies include the following:

- In one study, 41 percent of discharged patients had a test pending at discharge. Almost 1 in 10 patients potentially required an intervention, but almost two-thirds of aftercare

providers were unaware that a test was outstanding [24].

- In another study, tests pending at the time of discharge were mentioned in discharge summaries only 25 percent of the time, and the list of pending studies was complete only 13 percent of the time [49].

- Tests ordered on the day of discharge represent 7 percent of tests performed during hospitalization but account for 47 percent of tests that are never reviewed; processes are needed to assure review of pending tests [50].

- Almost one-third of tests recommended by the hospital-based team for follow-up were not obtained by the aftercare provider; such tests were recommended for about one-quarter of discharged patients [51].

Direct communication from hospital provider to aftercare provider is uncommon, and there are no clear or widely accepted standards about this communication. A meta-analysis revealed that only 12 to 34 percent of discharge summaries had reached aftercare providers by the time of the first post-hospitalization appointment [19]. Additionally, discharge documentation often contained inaccuracies (eg, discharge medications) or did not include some of the important information (eg, test results, follow-up plans).

Absent or delayed follow-up — The optimal time interval between hospital discharge and the first follow-up visit to a primary care or subspecialty provider is unknown. Many factors will contribute to this decision including the severity of the disease process being followed, the perceived ability of the patient to provide adequate self-care, and psychosocial and logistical factors. Among Medicare beneficiaries requiring readmission within 30 days of discharge, only 50 percent had seen a clinician for a follow-up visit [2].

Several studies have evaluated the association between rates of readmission and scheduled outpatient follow-up post-hospitalization. However, these studies are often complicated by two issues: many patients are readmitted prior to their scheduled follow-up visit and many of these studies exclude patients without established outpatient providers. Additionally, none of these studies are randomized trials.

A number of studies affirm that patients who are scheduled or seen for post-hospital follow-up are less likely to be readmitted [47,52-54].

- A study of Medicare patients hospitalized for heart failure in 225 hospitals found that rates of readmission within 30 days were highest for patients discharged from the quartile of

hospitals with the lowest percentage of patients seen for follow-up within seven days of discharge [52].

- Another observational study in a single academic primary care practice found that, compared with patients in a faculty primary care practice, those in resident primary care practices had lower rates of timely post-discharge follow-up and higher rates of readmission, although there were also socioeconomic differences in the patient populations [55].

- In a retrospective cohort study of 450,746 patients with acute myocardial infarction, congestive heart failure, or chronic obstructive pulmonary disease (COPD) conducted in Ontario Canada, a follow-up visit with a primary care physician or relevant specialist within seven days of discharge was associated in adjusted propensity score weighted analysis with lower rates of readmission at 90 days for those with congestive heart failure and COPD (28.2 versus 30.2 percent and 21.9 versus 23.0 percent, respectively) and 90-day mortality among those with congestive heart failure (7.16 versus 8.20 percent) [56]. There were no significant benefits for patients with acute myocardial infarction.

By contrast, other studies have not found that scheduled outpatient follow-up decreases readmissions.

- One retrospective study of nearly 5000 hospital discharges from the general medicine service at the Mayo Clinic hospitals found no difference in 30-day hospital admission, emergency department visits, or mortality comparing patients who had documentation of a scheduled follow-up appointment (median six days after discharge) with those who did not [57]. This study, however, did not document whether those patients had actually attended the follow-up appointments or whether attending the follow-up visit resulted in changes in outcomes.

- In another study of 3661 patients aged ≥65 years, there was no protective effect on readmission for patients who had a follow-up office visit within seven days after discharge [58].

Higher-risk patients — Efforts to prevent readmissions can be targeted to patients known to be at a higher risk for readmission, including those at higher risk for adverse events post-discharge.

Risk factors for readmission — Several studies have suggested there are clinical and demographic parameters that may increase the risk of readmission. Risk factors may vary depending on the interval between discharge and readmission. A cohort study at a single

institution found that risk factors for early readmissions (within one week after discharge) were somewhat different than risk factors for later readmissions (between 8 and 30 days after discharge) [59].

Clinical factors include the following:

- Use of high-risk medication (antibiotics, glucocorticoids, anticoagulants, narcotics, antiepileptic medications, antipsychotics, antidepressants, and hypoglycemic agents) [47,60-64]
- Polypharmacy [65,66]
- More than six chronic conditions [67]
- Specific clinical conditions (eg, advanced chronic obstructive pulmonary disease, diabetes, heart failure, stroke, cancer, weight loss, depression, sepsis) [64,66,68-78]

Demographic and logistical factors include:

- Prior hospitalization, typically including unplanned hospitalizations within the last 6 to 12 months [79-82]
- Black race [64,83]
- Low health literacy [84]
- Reduced social network indicators (eg, being alone most of the day with limited or no family or friend contact by phone or in person) [82]
- Lower socioeconomic status [85-87]
- Discharge against medical advice [66]

Screening tools — Studies have found that clinical providers are not able to accurately predict which patients will require readmission [54]. Screening for increased risk may help health care providers and organizations target resources to patients most likely to be rehospitalized. Several tools have now been developed and validated as methods for predicting readmission risk. However, there are several caveats to the use of screening tools:

- Given the variability of resources, patient demographics, and case mix, it will be necessary to adjust risk prediction models for local factors.

- There will be patients with very advanced disease or complicated social situations for whom no intervention will prevent readmission. Often efforts to decrease hospitalization are most effectively directed towards those patients with intermediate levels of risk for whom interventions might be successful [88].

- A guiding principle for using risk assessment is understanding how to implement interventions that target the risks identified.

No screening tool will be perfectly accurate. Efforts to develop prediction models for patients at high risk for readmission have yielded only fair discriminative ability [89,90]. In a 2006 systematic review of 26 models developed to predict readmission, only one model focused on the prediction of preventable readmissions [91], a concept that is itself fraught with issues regarding the definition of "preventability" [41].

Screening tools that have been developed to identify patients at risk of readmission are of two types: risk scores and risk identifiers. Examples of both include:

- **LACE index** – The LACE index is a commonly used tool to identify patients at risk of readmission (not specifically potentially preventable readmission) [92] and has similar discriminating ability to other models. This model incorporates the patient's **L**ength of stay, the **A**cuity of the patient's admission, the degree of **C**omorbid illness (as measured by the Charlson Comorbidity Index), and the number of times the patients has been to the **E**mergency department in the last six months. The advantage of this model is the limited number of factors it includes. A limiting feature of LACE, however, is that the length-of-stay element cannot be calculated accurately until the last day of the hospitalization, limiting its real-time use.

- **HOSPITAL score** – The HOSPITAL score is another model specifically developed to identify avoidable readmissions. Using a computerized validated algorithm, the HOSPITAL score (calculated by points assigned for **H**emoglobin <12 g/dL, discharge from the **O**ncology service, or **S**odium <135 mEq/L at discharge; having a **P**rocedure during the hospital stay; and **I**ndex admission **T**ype: nonelective, number of hospital **A**dmissions in the previous year, and **L**ength of stay ≥5 days) identifies patients at high risk of 30-day potentially avoidable readmissions [93]. It was externally validated in a cohort study including over 117,000 patients discharged from nine hospitals across four different countries with moderately high discrimination.

- **8Ps** – Another tool for identifying patients at higher risk for readmission is the 8Ps Risk Assessment Tool, proposed by the Society of Hospital Medicine [69,94]. The 8Ps Risk Assessment Tool identifies risk factors for adverse events post-hospital discharge. The eight risk factors are similar to those clinical, demographic, and logistical factors described above. The 8Ps are a risk identification system rather than a risk score, however, with the intent being that each risk identified will be matched with a risk-specific intervention.

Discharge against medical advice — Patients who are discharged against medical advice (AMA), also known as self-directed discharges, are at high risk for readmission [95,96]. In a large retrospective cohort study conducted in the United States, patients with an AMA discharge were more likely to experience 30-day hospital readmission compared with routine discharge (25.6 versus 11.5 percent), and AMA discharge was an independent predictor of readmission across a wide range of diagnoses [97].

Patients who leave AMA should be informed regarding the disease-specific risks associated with premature discharge and the increased risk of death and readmission. Given the difficulty in engaging these patients with the medical community, efforts should be made to arrange appropriate post-hospitalization follow-up in the hope of facilitating their access to medical care after hospitalization. Discharge medications should be provided, where feasible and appropriate, and encouragement to reengage in care should be offered.

INTERVENTIONS TO REDUCE READMISSION

Efforts to re-engineer the discharge process to assure a safe transition involve such issues as improved clinician communication, patient education, information technology systems, involvement of community-based providers, and arrangements for prompt follow-up [4]. Such interventions have the potential to substantially improve patient care and reduce health care expenditures.

Overview — A 2011 systematic review of 43 studies, 16 of which were randomized trials, found that only 5 of the 16 randomized trials demonstrated significant decreases in readmission rates [4]. Four of the five successful studies involved several simultaneous interventions, including patient-centered discharge instructions and a post-discharge telephone call. A 2012 systematic review found that many types of interventions (including medication reconciliation, structured electronic discharge summaries, discharge planning, and facilitated communication between hospital and community providers) impacted favorably on outcomes including readmission rates [98]. However, due to heterogeneity in interventions, patient populations, and outcomes, it was not possible to identify which specific interventions had direct impact on measured outcomes. Successful interventions noted in this review overwhelmingly involved multifaceted interventions. A 2014 systematic review and meta-analysis of 42 randomized trials found that tested interventions prevented early readmissions [99]. The more effective interventions were those that were complex, multifaceted, and supported patients' capacity for self-care.

Many multidisciplinary initiatives, known as disease management programs, have targeted patients with specific chronic diseases to provide patient support, counseling, monitoring, and

medication oversight through the continuum of care, including ambulatory, hospital, and hospital discharge settings. Disease management programs involving patients with heart failure are reviewed separately. (See "Systems-based strategies to reduce hospitalizations in patients with heart failure".)

Patient education — In a 2021 meta-analysis of 19 trials from seven countries, patients randomized to receive communication interventions at hospital discharge, such as medication counseling or disease-specific education, had lower 30-day readmission rates when compared with those receiving usual care (9.1 versus 13.5 percent, risk ratio 0.69, 95% CI 0.56-0.84) [100].

Telephone call — Studies have looked at the impact of a telephone call from a member of the health care team following discharge on varying parameters of patient management. These calls have been initiated by various members of the care team, including:

- The discharging clinician
- A clinical pharmacist
- A clinician from the patient's primary care clinic

Such calls have been moderately effective at reducing emergency department visits [101] and improving follow-up with ambulatory providers [102] but demonstrated a trend towards reduced hospital readmissions in only one study [101]. A 2006 systematic review was unable to define a clear benefit from this type of intervention due to significant heterogeneity in the quality and design of this literature [103]. Interestingly, the optimal origin of the post-discharge telephone follow-up (hospital- or ambulatory-based) is also unknown. A systematic review of the literature examining the effect of a telephone follow-up initiated by the primary care provider showed no change in readmission rates, but the intervention did improve rates of post-discharge follow-up with the primary care practice [104].

Home visits — Home visits made by a number of different types of providers have been shown to reduce need for readmission. One trial illustrated that a single home visit by a nurse and pharmacist to patients discharged with a diagnosis of heart failure, with a goal of optimizing medication management, showed a trend towards an almost 50 percent reduced risk of unplanned readmission [105]. Other studies looking at this question did not have as dramatic an effect on reduction in readmission [106,107].

Telemonitoring — The use of telemonitoring devices for remotely monitoring various physiologic variables (eg, blood pressure, heart rate, weight, and oxygen saturation) has also been studied as a means for reducing readmissions.

In a trial of remote patient monitoring among 1380 patients at high risk of readmission, those in the intervention group, who were provided a blood pressure cuff, heart rate monitor, pulse oximeter, scale if they had a history of congestive heart failure, glucometer if they had diabetes mellitus, and a device for daily communication back to their team, had a lower risk of 30-day readmission (18.2 versus 23.7 percent; relative risk [RR] 0.77, 95% CI 0.61-0.98), and emergency department visits (8.6 versus 14.2 percent; RR 0.61, 95% CI 0.42-0.87) compared with patients randomized to usual care [108].

Telemonitoring has also been investigated specifically for heart failure; the efficacy in this population is discussed separately. (See "Systems-based strategies to reduce hospitalizations in patients with heart failure", section on 'Telemonitoring'.)

Medication management — Readmission may occur as a result of medication errors upon discharge. Medication management may prevent readmissions. One single-center randomized trial in 278 patients on high-risk medications or >three medications on discharge compared usual care with medication management by a pharmacist (face-to-face medication reconciliation, patient-specific medication care plan, discharge counseling, and post-discharge telephone calls) [109]. Patients who received medication management by a pharmacist were less likely to be readmitted or seen in the emergency department within 30 days of discharge. As in Project Reengineered Discharge (RED), this trial employed a composite endpoint of readmissions and emergency department visits [110]. Both trial results suggest that emergency department visit reduction was the larger driver of the primary outcome's composite elements. Both trials, however, demonstrate the impact of clinical pharmacists and the importance of medication reconciliation in care transitions of hospitalized patients at discharge. (See 'Therapeutic error' above.)

Multiple interventions — Given the complexity of transitions of care associated with hospital discharge, several studies have evaluated the effectiveness of multifaceted interventions. Each of these studies focused on a specific setting or patient population. Examples include:

- **Safety net hospitals** – A randomized controlled trial in 749 patients at a large academic safety net hospital evaluated a multidisciplinary team effort (a nurse to assist with discharge planning/preparation, a pharmacist to call the patient post-discharge, scheduled follow-up appointments prior to discharge, medication reconciliation, and a low-literacy discharge instruction booklet) to reduce readmissions and emergency department visits [110]. The rate of post-discharge hospital utilization was 31 percent for the intervention group compared with 44 percent for the control group. Patients in the intervention group were also more likely to follow up with their primary care provider.

However, a randomized trial in 700 patients ≥55 years old who spoke English, Spanish, or Chinese discharged from a safety-net hospital found no decrease in readmission or emergency department visits comparing usual care (review of discharge instruction, provision of 10-day supply of medication if needed, and social work assistance with discharge) with a nurse-led in-hospital discharge plan, low-literacy printed discharge instructions, and two follow-up telephone calls [111].

- **Older patients** – A study evaluated the Care Transitions Intervention (CTI) program in which older patients were paired with a discharge nurse transition coach. The Transition Coach facilitated self-management by the patient or a family caregiver instead of providing direct care [112]. The coach encouraged the patient to maintain a personal health record, obtain timely follow-up appointments, provide self-care, and understand what to do if problems arise. The transition coach saw the patient before discharge and at home two to three days after discharge, followed by three telephone calls over the first 28 days post-discharge. This intervention reduced 30- and 90-day readmission rates (8.3 versus 11.9 percent and 16.7 versus 22.5 percent, respectively) with a cost savings of approximately $500/case.

  Components of the CTI program were implemented in the "real-world" setting of a sample of fee-for-service, English-speaking Medicare patients being discharged home for specific cardiac or respiratory conditions from six hospitals in Rhode Island [113]. Readmission rates within 30 days were lower for patients who received coaching compared with data from Medicare claims of an "external control group" of discharged patients with similar diagnoses who were not offered the intervention (OR 0.61, 95% CI 0.42-0.88).

  A randomized trial in six geriatric inpatient units in France evaluated the effect of a multimodal intervention (comprehensive medication review; self-management education focusing on medications, depression, and nutrition; and detailed communication around transition-of-care) on readmission and emergency department visits [114]. Rates for these outcomes were lower at three months (a secondary outcome), but not at six months (the primary outcome), for the group assigned to the intervention. The intervention included implementation by a geriatrician dedicated to the project and thus might not be readily reproducible outside of the research project.

- **High-risk patients** – A randomized trial in 239 older adult patients with heart failure compared assigned advanced practice nurses with usual care [115]. The designated transitional care partner met with the patient daily during the index visit and made a home visit the day after discharge and at least weekly thereafter over the first three months. At one year, there were 104 readmissions among intervention patients, compared

with 162 readmissions for control patients, resulting in a cost savings of USD $4845 per patient.

Similarly, a prospective study of a nurse-led transitional care program for heart failure patients being discharged from one US hospital compared 30-day readmissions, length of stay, and 60-day direct costs with heart failure patients concurrently discharged from other hospitals within the same health care system [116]. The program was associated with a 48 percent decrease in 30-day readmissions. However, it had little impact on direct costs to the health care system over 60 days and had a negative impact on hospital revenue under the existing Medicare reimbursement system.

However, a randomized trial in 1923 high-risk patients comparing usual discharge care (discharge instructions, prescriptions, counseling from the discharging physician, home care as needed, and recommendations for follow-up) with "virtual ward" care (care coordination plus direct care from an interprofessional team for several weeks after discharge) found no differences in readmission at one month, three months, six months, or one year after hospital discharge [117].

Similarly, in a trial of a multidisciplinary care-transition intervention among 800 hospitalized high utilizers of health care services (defined as patients having medically and socially complex conditions and at least one additional hospitalization in prior six months), hospital readmission rates 180 days after discharge were not lower among those randomized to the intervention compared with those who received usual care (62.3 versus 61.7 percent, respectively) despite high engagement with the intervention [118]. Intervention services included home visits, scheduling and accompanying patients to office visits, assisting with medication management, measuring blood pressure and blood sugar levels, and helping patients apply for social services and health programs.

CLINICIAN RESOURCES

Several program initiatives are underway to investigate and facilitate interventions to promote improved hospital discharge processes. These programs and their websites include:

- The National Transitions of Care Coalition – This site offers tool and resources for both patients and providers to help improve the safety of health care transitions. Many of the tools are offered in languages other than English.
- The Care Transitions Program – This site contains information about the Care Transitions Programs and also contains tools for implementing this program. Some

features are translated into Spanish and Russian.

- Project BOOST (Society of Hospital Medicine) – A step-by-step guide for implementing Project BOOST (Better Outcomes through Optimizing Safe Transitions). Project BOOST is a mentored implementation program designed to improve transitions from hospital to home. In a pre-post study evaluating this initiative, hospital units that participated in Project BOOST had reduced rates of readmission, with a mean absolute reduction of 2 percent [119]. Of note, readmission rates in comparison (control) units at the same institutions showed no change in readmission rates. The site also offers extensive information about quality improvement practices.

- Project RED (Re-Engineered Discharge) – Information on the key concepts and primary tools that are the foundation for the National Quality Forum's National Patient Safety Goal on safe discharge. Their toolkit is also available.

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5^{th} to 6^{th} grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10^{th} to 12^{th} grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topic (see "Patient education: Going home from the hospital (The Basics)")

SUMMARY

- The decision whether or not a hospitalized patient is appropriate for discharge requires evaluation of multiple factors involving medical, as well as psychosocial, logistic, and economic considerations. Instruments for determining suitability for discharge that have

been appropriately validated are not available. (See 'Appropriateness for discharge' above.)

- The need for ongoing hospitalization is determined by the clinical condition and need for ongoing diagnostic or therapeutic interventions. Multiple logistic factors beyond these clinical considerations will determine if the patient is safe to be discharged home or requires another setting. (See 'Determining the post-discharge site of care' above.)

- Discharge planning should involve the clinical staff and patient/family or other informal caregivers to develop a patient-centered plan. Critical elements in successful discharge transitions include performing an accurate reconciliation of medications, establishing timely follow-up, and developing an appropriately detailed discharge summary that is communicated to aftercare providers in a timely fashion. (See 'Elements of the discharge process' above.)

- Avoidable readmissions are difficult to define and may be related to therapeutic errors and failed handoffs. Identifying patients at increased risk for post-discharge adverse events and readmission may help target interventions to minimize this risk. Identifying systems issues which contribute to failed discharge transitions may shed light on opportunities to improve the safety of the discharge process for all patients. (See 'Readmission' above.)

- Several systems initiatives have shown promise in minimizing readmissions. These interventions include improved collaboration between the care team, patient, and aftercare provider prior to discharge; medication reconciliation; enhanced patient education and empowerment; home visits or telephone calls by clinical providers; remote monitoring; transitional care managers; and early post-discharge follow-up. Patient instructions should take into account the patient's cognitive status, health literacy, and other barriers to self-care. Multiple concurrent interventions may be more effective than single components. (See 'Interventions to reduce readmission' above.)

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Topic 2790 Version 78.0

GRAPHICS

Model to categorize patient needs at discharge[1]

Patient profiles are divided into four broad domains: **Domain I: Medical/surgical issues** **Domain II: Mental status/emotions/coping** **Domain III: Physical functioning** **Domain IV: Living environment - physical, social, financial** Patient-specific elements within each domain, characterized by intensity (high-medium-low), are then determined to create a profile that can be matched to the capabilities of alternative sites of care.
Domain I. Medical/surgical issues
1. Clinical instability. The probability that the patient will need rapid intervention for an **U**nstable **C**linical **C**ondition (**UCC**).
2. Complexity of care. The probability that the patient will need a **C**omplex diagnostic or therapeutic **P**rocedure (**CP**).
3. The intensity of **N**ursing services (**RN**).
4. The intensity of **P**hysician services (**MD**).
Domain II. Mental status/emotions/coping
5. The extent of **C**ognitive **I**mpairment or **D**epression (**CID**).
Domain III. Physical functioning
6. The presence of a **W**indow of **O**pportunity for **R**ehabilitation during which rehabilitation services are most effective and outcomes are optimal at a time when the patient has the physical capacity to participat (**WOR**).
Domain IV. Living environment - physical, social, financial
7. Limitations on care options due to **M**edical **I**nsurance **C**overage (**MIC**).
8. Limitations on life-sustaining treatments/**A**dvanced **D**irective (**AD**).

Reference:

1. *Siebens, H. Applying the Domain Management Model in Treating Patients with Chronic Disease. Jt Comm J Qual Improv 2001; 27:302.*

Graphic 50380 Version 4.0

Capabilities of types of post-acute care hospital facilities

	Acute care hospitals	IRFs and LTACs	Medicare-certified facilities (SNFs, TCUs, subacute)		e f
			Hospital-based (TCU)	Community-based subacute and SNF	
Response to resuscitation*	Rapid	Rapid	Rapid	Slow	Sl
	Equipment and trained staff	Equipment and trained staff	Hospital level	Limited equipment and trained staff, "911"	
Access to complex diagnostic/therapeutic modalities	High	Moderate	High	Low	Lo
	Laboratory, imaging, IR	Radiograph, ultrasound, laboratory on site	Hospital level	Off-site radiograph and laboratory	
Availability of subspecialty consultants	High	Moderate	High	Low	Lo
	Full-range, subspecialties	Psych, Pain, Ortho, Neuro, PM&R	Hospital level	Psych, Hospice, Ophthalmology, Dental, Podiatry	
Intensity of RN services	High	Moderate	Moderate-low	Moderate-low	Lo
	12 hours/ patient/day (ICU)	Five to six hours/ patient/day	Three to four hours/ patient/day	Two to four hours/ patient/day	
Intensity of MD services	High	High	High	Moderate	Lo
	24-hour, on-site MD	24-hour, on-site MD	24-hour, on-site MD	Two to three times per week, rarely daily	
Intensity of rehabilitation services	High	High	Moderate	Moderate	Lo
	All modalities	All modalities	Most modalities	PT, OT, speech, rarely PM&R, low complexity	

IRF: inpatient rehabilitation facility; LTAC: long-term acute care hospital; SNF: skilled nursing facility; TCU: transitional care unit; ECF: extended care facility; IR: interventional radiology; PM&R: physical medicine

and rehabilitation; ICU: intensive care unit; RN: registered nurse; MD: doctor of medicine; PT: physical therapy; OT: occupational therapy.

* Response to resuscitation can be interpreted as a proxy for the facility's ability to cope with clinically unstable patients.

Graphic 66215 Version 3.0

Elements of discharge and summary

Dates of admission and discharge
Reason for hospitalization
Significant findings from history and exam
Significant laboratory findings
Significant radiological findings
Significant findings from other tests
List of procedures performed
Procedure report findings
Stress test report findings
Pathology report findings
Discharge diagnosis
Condition at discharge
Discharge medications
Follow-up issues
Pending test results
Information provided to patient and/or family, as appropriate

Source: O'Leary, KJ, Liebovitz, DM, Feinglass, J, et al. Creating A Better Discharge Summary: Improvement in Quality and Timeliness Using an Electronic Discharge Summary. J Hosp Med 2009; 4:219.

Graphic 69756 Version 1.0

Ideal discharge of the older adult patient: A hospitalist checklist

Data elements	Processes		
	Discharge summary	**Patient instructions**	**Communication to follow-up clinician on day of discharge**
Presenting problem that precipitated hospitalization	x	x	x
Key findings and test results	x		x
Final primary and secondary diagnoses	x	x	x
Brief hospital course	x		x
Condition at discharge, including functional status and cognitive status if relevant	x - functional status o - cognitive status		
Discharge destination (and rationale if not obvious)	x		x
Discharge medications:			
Written schedule	x	x	x
Include purpose and cautions (if appropriate) for each	o	x	o
Comparison with pre-admission medications (new, changes in dose/frequency, unchanged, meds should no longer take)	x	x	x
Follow-up appointments with name of provider, date, address, phone number, visit purpose, suggested management plan	x	x	x
All pending labs or tests, responsible person to whom results will be sent	x		x
Recommendations of any sub-specialty consultants	x		o
Documentation of patient education and understanding	x		

Any anticipated problems and suggested interventions	x	x	x
24/7 call-back number	x	x	
Identify referring and receiving providers	x	x	
Resuscitation status and any other pertinent end-of-life issues	o		

x: required element; o: optional element.

Derived and expanded from: Halasyamani L, Kripalani S, Coleman E, et al. Transition of care for hospitalized elderly patients: Development of a discharge checklist for hospitalists. J Hosp Med 2006; 1:354.

Graphic 54279 Version 6.0

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