Hospital Readmission of Skilled Nursing Facility Residents
A Systematic Review

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ABSTRACT
Hospital readmission of patients discharged to skilled nursing facilities (SNFs) is common and costly with increasing public attention over the past decade, particularly in light of the new health care environment surrounding the advent of the Affordable Care Act. The purpose of the current systematic review is to critically examine prevalence, predictors, and costs of hospital readmission of SNF residents found in the medical literature. Individual resident, facility, and intervention factors predicting hospital readmission of SNF residents were studied. Despite the heterogeneity of the reviewed articles’ data sources and study designs, the existing literature asserts that hospital readmission of SNF residents is associated with individual resident and facility characteristics. Implementation of promising intervention programs can promote quality of care and reduce hospital readmission of SNF residents.


Once older adults are hospitalized due to acute illness, they are vulnerable to functional decline and may become newly and more disabled. It has been suggested that reduced functional reserve can explain the occurrence of new or additional disability during and after hospitalization (Yoo, Kim, Geng, Shin, & Nakagawa, 2014). The consequence of interactions between the effects of hospitalization and aging leads to additional tiers in the cascade toward dysfunction and disability (Fried et al., 2009). The “traction effects” (Kim et al., 2014, p. 75) cross functional domains and lead to reduced functional reserve, which results in functional decline at postacute care, leading to higher vulnerability to acute illness and subsequent hospital readmissions (Fried et al., 2009; Kim et al., 2014).
Approximately 1.7 million (5%) Medicare beneficiaries sought postacute care at skilled nursing facilities (SNFs) in 2012 (Medicare Payment Advisory Committee [MedPAC], 2014). Concerns exist regarding the increase in Medicare spending on SNF care in the past decade (MedPAC, 2014), as the 30-day hospital readmission rate from SNFs has increased from 16% in 2000 to 24% in 2011 (Centers for Medicare & Medicaid Services [CMS], 2013). Medicare spent $14.3 billion on hospital readmissions from SNFs in 2011 (CMS, 2013).

Hospital readmission from SNFs is considered harmful because SNF residents experience disruptions to their care plans, stress, and adverse health outcomes. Hospital readmission from an SNF has a higher risk of mortality and multiple hospitalizations than hospital readmission from the community (Allen et al., 2011). Potentially avoidable conditions accounted for 40% of hospital readmissions from SNFs (Saliba et al., 2000).

Medicare has been shifting health policy under the Affordable Care Act (ACA, 2010) by linking reimbursement to clinical capabilities, such as 30-day hospital readmission rate, for certain health conditions since 2012 (CMS, 2014a). Medicare also plans to expand its implementation to surgical and more health conditions in 2015 (CMS, 2014c).

Little is known about the contributing factors of hospital readmission from SNFs. Moreover, the underlying individual resident and facility factors of hospital readmission from SNFs have not been evaluated extensively. Recent literature on hospitalization of nursing home residents was limited to mostly long-term care residents, who are distinct from short-stay SNF residents in terms of clinical, service, and facility characteristics (Grabowski, Stewart, Broderick, & Coots, 2008).

The purpose of the current review was to systemically explore what SNF residents (i.e., patients 65 and older) and SNF factors contribute to hospital readmission and what interventions reduce hospital readmission from SNFs. Prevalence of all-cause hospital readmission at 30 and 90 days and 1 year were documented. Cost of hospital readmission, predictors, and appropriateness of hospital readmission were also reviewed.

METHOD
Data Sources and Search Strategy
An electronic search, limited to English-language articles with an available abstract, was conducted of the MEDLINE, ISI Web of Knowledge, and EBSCO-CINAHL databases from inception through August 7, 2014 (Figure).

A research librarian assisted in the formation of a search strategy. The MEDLINE search used the combined medical subheading (MeSH) terms hospitalization AND skilled nursing facility with the query limited to clinical trials and randomized controlled trials. The ISI Web of Knowledge and EBSCO-CINAHL databases were searched for articles and reviews that matched the terms hospitalization AND skilled nursing facility. Three additional articles were selected from the authors’ libraries. Reference lists of the articles reviewed were searched for potentially relevant trials; however, no additional studies were identified.

Articles that studied patients 65 and older transitioning between hospitals and SNFs in either direction were included. Included studies were not required to have a comparison group. There was no preferred study design beyond the limitations to the MEDLINE search described above.

Data Extraction
The authors abstracted data from each study to a standardized collection instrument, including study type, population, and results in evidence tables. Reviewers additionally abstracted information about study methods and scientific rigor, including study location and primary outcome.

Outcomes
Prevalence of all-cause hospital readmission in 30- and 90-day and 1-year periods were main outcomes. Cost of hospital readmission, predictors, and appropriateness of hospital readmission were secondary outcomes.

The initial search identified 689 articles. Four authors (J.W.Y., S.J., T.B., A.K.) reviewed all abstracts and excluded 649 articles that were irrelevant. Each of the remaining articles underwent full review, and those not meeting the inclusion criteria were excluded for the following reasons: (a) included facilities other than hospitals or SNFs; (b) was not an original study; (c) was a duplicate study; (d) was an outdated publication (i.e., more than 15 years old); (e) did not specify the certain time period of hospital readmission; and (f) did not analyze prevalence or predictor of hospital readmission. Differences of opinion were resolved by discussion among the authors. Of the remaining 43 articles, 28 were excluded upon review. Fifteen articles met all inclusion criteria. The 15 included studies had quality ratings (Shekelle, Woolf, Eccles, & Grimshaw, 1999) ranging from Ib to III, indicating evidence from a randomized controlled trial (Ib), controlled without randomization trial (Ia), quasiexperimental trial (Ib), and nonexperimental descriptive study (III).
RESULTS
Resident Factors of Hospital Readmission From Skilled Nursing Facilities

Prevalence, Reasons, and Cost of Hospital Readmission. Two large studies using a nationwide minimum data set (MDS) measured all-cause 30-day hospital readmission rate and its cost (CMS, 2013; Mor, Intrator, Feng, & Grabowski, 2010) (Table 1). Prevalence of all-cause 30-day hospital readmission was found to increase over time: 18.2% (2000), 23.5% (2006), and 24.8% (2011). Septicemia accounted for the most common (13%) and costly (21%) index medical diagnosis (CMS, 2013). Pneumonia was the second most common (7%) and costly (6%) index medical diagnosis (CMS, 2013). Cost for hospital readmission sharply increased from $4.3 billion (fiscal year [FY] 2006) to $14.3 billion (FY 2011) (CMS, 2013). One study, using health record review, reported an 18% 30-day hospital readmission rate (Ouslander, Diaz, Hain, & Tappen, 2011a). In another study, congestive heart failure (CHF), renal failure, and urinary tract infection (UTI) were the most common index medical diagnoses of hospital readmission (Ouslander et al., 2011a). Another study examined 90-day hospital readmission rates by acute medical illnesses and found the following: 11% were readmitted for UTI, 46% for pneumonia, and 58% for CHF (Hutt, Ecord, Eilertsen, Frederickson, & Kramer, 2002) (Table 1).

Predictors of Hospital Readmission. A recent study evaluated Medicare’s postacute care transfer policy, which led to immediate decline in hospital length of stay, using multiyear (1999-2005) MDS data (Unruh, Trivedi, Grabowski, & Mor, 2013). One-day reduction in hospital stay increased 30-day hospital readmission in certain medical diagnoses (e.g., acute myocardial infarction with major complications and kidney infection or UTI without major complications), but not in all medical diagnoses (e.g., acute myocardial infarction without major complications, CHF, or kidney infection or UTI with major complications) (Unruh et al., 2013). Two studies examined SNF individual clinical predictors of 30-day hospital readmission (Dombrowski, Yoo, Neufeld, & Tarshish, 2012; Marcantonio et al., 2005). More complex
<table>
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<tr>
<th>Study</th>
<th>Data Source</th>
<th>N</th>
<th>Period</th>
<th>Study Design</th>
<th>Level of Evidence</th>
<th>Outcomes</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMS (2013)</td>
<td>MDS, EDB, and NCH</td>
<td>3.3 million</td>
<td>FY 2011</td>
<td>Observation/retrospective</td>
<td>III</td>
<td>30-day hospital readmission, reasons and cost</td>
<td>Prevalence, 24.8%. Septicemia accounted for the most common (13%) and costly (21%) index medical diagnosis. $14.3 billion for hospital readmission (FY 2011).</td>
</tr>
<tr>
<td>Dombrowski, Yoos, Neufeld, &amp; Tarshish (2012)</td>
<td>Medical record review</td>
<td>100</td>
<td>May to September 2009</td>
<td>Observation/retrospective</td>
<td>III</td>
<td>Predictor of 30-day hospital readmission</td>
<td>More complex comorbidity, solid tumor, functional impairment, pressure ulcers, and laboratory findings (e.g., hemoglobin, albumin) were predictors of 30-day hospital readmission.</td>
</tr>
<tr>
<td>Ouslander, Diaz, Hain, &amp; Tappen (2011a)</td>
<td>Medical record review</td>
<td>2,398</td>
<td>May 2007 to May 2009</td>
<td>Observation/retrospective</td>
<td>III</td>
<td>30-day hospital readmission</td>
<td>Prevalence, 18%. CHF, renal failure, and UTI were most common index medical diagnoses.</td>
</tr>
<tr>
<td>Li, Glance, Yin, &amp; Mukamel (2011)</td>
<td>MDS and OSCAR</td>
<td>960,644</td>
<td>January to September 2008</td>
<td>Observation/retrospective</td>
<td>III</td>
<td>30- and 90-day hospital readmission</td>
<td>Black patients were more likely to be rehospitalized than White patients at 30 days (18.6% vs. 14.3%, respectively) and 90 days (29.5% vs. 22.1%, respectively).</td>
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comorbidity and patients with solid tumor, functional impairment, pressure ulcers, and certain abnormal range of laboratory findings (i.e., hemoglobin and albumin) were positive predictors of 30-day hospital readmission (Dombrowski et al., 2012). Patients with delirium were more than twice as likely to be rehospitalized than patients without delirium (30% vs. 13%).

Race also played a predictor role of hospital readmission. Using 1-year observation of an MDS, Black patients were more likely than White patients to be rehospitalized at 30 days (18.6% versus 14.3%) and 90 days (29.5% versus 22.1%) (Li, Glance, Yin, & Mukamel, 2011) (Table 1).

Facility Factors of Hospital Readmission From Skilled Nursing Facilities

A study using a multi-year MDS reported that hospitals with an associated on-site SNF reduced 30-day hospital readmission by 1.2%, whereas hospital discharge increased by 10% (Rahman, Foster, Grabowski, Zinn, & Mor, 2013). Another study limited to SNF residents with CHF using two states' MDS reported that Nursing Home Compare (i.e., a nursing home grading system rated and operated by CMS) was modestly associated with 90-day hospital readmission (Unroe, Greiner, Colon-Emeric, Peterson, & Curtis, 2013). Nursing Home Compare has a five-star quality-rating system based on overall, health inspection, staffing, and quality measures (CMS, 2014b). Unadjusted 90-day hospital readmission was lower among nursing home facilities with higher overall quality ratings (Unroe et al., 2013). However, in multivariate analysis, this modest association between Nursing Home Compare and 90-day hospital readmission resolved (Unroe et al., 2013). In a study that assessed the association between SNF admission volume and 30-day hospital readmission, a study using a multi-year MDS reported that high-volume (i.e., ≥108 admissions) facilities had lower 30-day hospital readmission (14%) than low-volume (i.e., <45 admissions) facilities (16%) (Li, Cai, Yin, Glance, & Mukamel, 2012).

In another study that examined the effect of Medicaid bed policy on hospital readmission of SNF residents, the policy was associated with increased 30-day hospital readmission of SNF residents by 1.8% (Grabowski, Feng, Intrator, & Mor, 2010) (Table 2). One study using a multi-year MDS reported that hospital readmission of SNF residents with an associated on-site SNF reduced 30-day hospital readmission by 1.2%, whereas hospital discharge increased by 10% (Rahman et al., 2013). Another study limited to SNF residents with CHF using two states' MDS reported that Nursing Home Compare (i.e., a nursing home grading system rated and operated by CMS) was modestly associated with 90-day hospital readmission (Unroe et al., 2013). Nursing Home Compare has a five-star quality-rating system based on overall, health inspection, staffing, and quality measures (CMS, 2014b). Unadjusted 90-day hospital readmission was lower among nursing home facilities with higher overall quality ratings (Unroe et al., 2013). However, in multivariate analysis, this modest association between Nursing Home Compare and 90-day hospital readmission resolved (Unroe et al., 2013). In a study that assessed the association between SNF admission volume and 30-day hospital readmission, high-volume (i.e., ≥108 admissions) facilities had lower 30-day hospital readmission (14%) than low-volume (i.e., <45 admissions) facilities (16%) (Li, Cai, Yin, Glance, & Mukamel, 2012).

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Hospital Readmission of Skilled Nursing Facility Residents

A study (Berkowitz et al., 2013) found that innovative communications between providers and patients and family members, as well as among providers, reduced the prevalence of 30-day hospital readmission of SNF residents (10.2% versus 18.9%). The other study examined the effects of a geriatrics specialty service unit and found that geriatric rehabilitation unit patients had fewer hospital readmissions at 1 year (Kahu, Polak, Hazelett, Hsu, & Allen, 2005).

**DISCUSSION**

The current review article represents the first comprehensive summary of the most recent studies on hospital readmission of SNF residents. Notable items that emerged from the review of the literature include:

- The prevalence of 30-day hospital readmission has increased from 18% to 24% over the past decade.
- Articles (9/15) focused largely on SNF resident factors of hospital readmission. Most (11/15) articles were published at the time the ACA (2010) was implemented, which reflects public attention to the nature and effects of hospital readmission of SNF residents.
- Acute medical illnesses accounted for most hospital readmissions (i.e., sepsis was the most common and costly diagnosis related to hospital readmission).
- Other than clinical predictors, race, hospital–SNF association, facility volume, and Medicaid bed-hold policy contributed to hospital readmission of SNF residents.

<table>
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<tr>
<th>Facility Factor of Hospital Readmission of Skilled Nursing Facility (SNF) Residents</th>
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<tr>
<td><strong>Study</strong></td>
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<tr>
<td>Rahman, Foster, Grabowski, Zinn, &amp; Mor (2013)</td>
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<tr>
<td>Unroe, Greiner, Colon-Emeric, Peterson, &amp; Curtis (2012)</td>
</tr>
<tr>
<td>Li, Cai, Yin, Glance, &amp; Mukamel (2012)</td>
</tr>
<tr>
<td>Grabowski, Feng, Intrator, &amp; Mor (2010)</td>
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</table>

Note: MDS = Minimum data set; OSCAR = online survey, certification and reporting; MedPAR = Medicare provider and analysis review.
Few interventions achieved the reduction of hospital readmission, but those that did improved communications among providers and focused on expertise in geriatrics clinical care.

Details on the Interventions to Reduce Acute Care Transfers (INTERACT) Project (Ouslander et al., 2009, 2011b) and other intervention studies focused on improving communication among providers were not included in the current review article; the INTERACT Project has been applied mainly to long-term care residents. The scope of the current review article was SNF residents who would be more vulnerable to acute medical illness and more often transferred to a hospital than long-term care residents.

Previous literature measured appropriateness or preventability of hospital readmission for long-term care residents (Intrator, Zinn, & Mor, 2004; Kayser-Jones, Wiener, & Barbaccia, 1989). Because of the distinctly different resident and facility characteristics, previous literature findings involving long-term care settings cannot be translated to SNF settings. For example, a recent increase in hospice care at long-term care facilities and nursing staff shortages are hindering aggressive care at long-term care facilities (Miller, Lima, Gozalo, & Mor, 2010). It is surprising that no further study has been reported since Saliba et al.’s (2000) on the appropriateness of hospital transfer of SNF residents.

RECOMMENDATIONS FOR HEALTH CARE PROVIDERS, ADMINISTRATORS, AND POLICY MAKERS

Identifying residents at risk for hospital readmission is an urgent task. In particular, Black patients and those with solid tumor, pressure ulcers, and previous nursing home stay need more attention. SNF residents at facilities with lower overall quality ratings and low-volume facilities may need more attention regardless of type of acute medical illness. Vigilant infection control at SNFs may reduce hospital readmission, as the most common medical diagnosis for hospital readmission was infectious disease (e.g., sepsisemia, pneumonia).

LIMITATIONS AND AREA OF FUTURE RESEARCH

Articles examining individual resident clinical factors were small studies (i.e., <1,000 residents) that used health record review onsite. In contrast, articles examining facility factors or resident service use were large studies (i.e., >1,000 residents) that used either or both MDS and Medicare inpatient claims. Most evidence is based on observational data (level of evidence, III). Only two con-

![Table 3](image-url)

**TABLE 3** Interventions of Hospital Readmission of Skilled Nursing Facility (SNF) Residents

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>N</th>
<th>Study Period</th>
<th>Study Design</th>
<th>Level of Evidence</th>
<th>Outcomes</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkowitz et al. (2013)</td>
<td>MDS and medical record review</td>
<td>624</td>
<td>May 2011 to February 2012</td>
<td>Intervention/prospective</td>
<td>IIa</td>
<td>30-day hospital readmission</td>
<td>ReEngineered Discharge (RED) project lowered 30-day hospital readmission by 31%.</td>
</tr>
<tr>
<td>Kauh, Polak, Hazelett, Hua, &amp; Allen (2005)</td>
<td>Medical record review</td>
<td>150</td>
<td>August 1999 to July 2000</td>
<td>Intervention/retrospective</td>
<td>IIb</td>
<td>1-year hospital readmission</td>
<td>Geriatric rehabilitation unit patients had fewer hospital readmissions at 1 year.</td>
</tr>
</tbody>
</table>

Note. MDS = minimum data set.
CONCLUSION

Hospital readmission of SNF residents is on the rise and costly. Diverse individual resident and facility factors are associated with hospital readmission of SNF residents. Few interventions achieved reduction of hospital readmission of SNF residents.

REFERENCES


