The Complexity of Determining if a Nursing Home Transfer is Avoidable at Time of Transfer

Running title: Avoidable transfers from nursing facilities

Kathleen T. Unroe[1,2], MD, MHA, Jennifer L. Carnahan[1,2], MD, MPH, Susan E. Hickman[3], PhD, Greg A. Sachs[1,2], MD, Zachary Hass[4], PhD, Greg Arling[4], PhD

[1]Indiana University School of Medicine [2]Regenstrief Institute [3]Indiana University School of Nursing [4]Purdue University School of Nursing

Funding: The OPTIMISTIC demonstration project is supported by the U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services [Funding Opportunity 1E1CMS331082–04–00].

Address correspondence to:
Kathleen T. Unroe, MD, MHA
Indiana University Center for Aging Research
1101 West 10th Street
Indianapolis, IN 46202-3012
kunroe@iu.edu
Phone: 317-274-9227 | Fax: 317-274-9307

Word count: Abstract 267, Main text 3468, Tables 3, Figures 0

Impact Statement:
We certify that this work is novel clinical research. The potential impact of this research on clinical care or health policy includes contributing to the understanding of potentially avoidable hospitalizations which remain a hot policy topic. These nursing facility to hospital transfers are tied to quality metric and reimbursement mechanisms, but with little research to support underlying causal factors. Facilities and providers are designing and implementing interventions to reduce these transfers and a greater understanding of these complex transfer events can guide these initiatives.

This is the author's manuscript of the article published in final edited form as:
Unroe, K. T., Carnahan, J. L., Hickman, S. E., Sachs, G. A., Hass, Z., & Arling, G. (2018). The Complexity of Determining Whether a Nursing Home Transfer Is Avoidable at Time of Transfer. Journal of the American Geriatrics Society, 66(5), 895–901. https://doi.org/10.1111/jgs.15286

Abstract

Objectives: To describe the relationship between nursing facility patient risk conditions and signs and symptoms at time of acute transfers and the diagnosis of conditions associated with potentially avoidable acute transfers (pneumonia, urinary tract infection, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD) or asthma, dehydration, or pressure ulcers).

Design: The Optimizing Patient Transfers, Impacting Medical Quality, Improving Symptoms: Transforming Institutional Care (OPTIMISTIC) project clinical staff collected data on patients who transferred to the emergency department (ED) or hospital as part of a demonstration project to reduce potentially avoidable hospital transfers. Cross-tabulations were used to identify associations between patient risk conditions or symptoms and hospital diagnoses or death. Mixed effect logistic regression models were used to describe the significance of risk conditions, signs, or symptoms as predictors for potentially avoidable hospital diagnoses or death.

Setting: 19 Indiana nursing facilities.

Participants: 1174 long stay nursing facility patients who experienced 1931 acute transfers from November 2014 to July 2016.

Measurements: Patient symptoms, transfers, risk factors, and hospital diagnoses.

Results: We found that 44% of acute transfers were associated with one of six potentially avoidable diagnoses. Symptoms prior to transfer did not discriminate well among hospital diagnoses. Symptoms mapped into multiple diagnoses and most hospital diagnoses had multiple associated symptoms. For example, over two-thirds of acute transfers of patients with history of CHF and COPD were for reasons other than exacerbations of those two conditions.

Conclusions: Although widely recognized that many transfers of nursing facility patients are potentially avoidable, determining "avoidability" at time of transfer is complex. Symptoms and patient risk conditions were only weakly predictive of hospital diagnoses.

Keywords: nursing home; transfers; avoidable hospitalizations

Introduction

Transfer events are associated with risks for nursing facility patients during both the transition and subsequent hospitalization (1), as well as significant costs to Medicare (2-4). High rates of these transfers are considered to be potentially avoidable resulting in high cost, low value (if not harmful) health care utilization.

The term potentially avoidable hospitalizations (PAH) is associated with conditions that may be prevented entirely or managed within the facility (5-7). Research on PAHs has relied on administrative Medicare claims data, which include discharge diagnoses determined at the end of the hospitalization or Emergency Department (ED) visit (8-11). Walsh and colleagues (9) used expert panel review in addition to claims data to identify five conditions considered potentially preventable with better care in the nursing facility. The five conditions – pneumonia, congestive heart failure (CHF), urinary tract infection, chronic obstructive pulmonary disease (COPD)/asthma, and dehydration – are also on the commonly used list of Ambulatory Care Sensitive conditions (12, 13). Centers for Medicare and Medicaid Services (CMS) is targeting PAHs through a nursing facility payment demonstration initiated in 2016, adding infected pressure ulcers/cellulitis to this list of five conditions (14).

The definition of PAHs is critical as metrics related to both overall and preventable hospitalization rates are used for quality reporting and increasingly tied to reimbursement. Nursing facility to hospital transfer rates are used to determine participation in bundled payment arrangements, accountable care organizations, and hospital referral networks. In response to pressures to reduce avoidable transfers, nursing facilities have been implementing a range of tools and programs to address this issue (15).

The current evidence around PAHs is predicated on the assumption that patients who end up with certain hospital diagnoses have modifiable symptoms and risk conditions in the nursing facility prior to the transfer that would be responsive to intervention (8). In some analyses, patient and facility characteristics have been associated with a higher risk for PAHs (3, 9, 16). In addition to patient risk factors or conditions, symptoms experienced by patients in the nursing facility presumably should be linked to specific, predictable diagnoses arrived at in the hospital or ED.

There are numerous contributors to PAHs including communication breakdowns between staff, providers, patients and families, worsening of a chronic disease due to inadequate monitoring, lack of recognition of acute change in status, lack of equipment or staff resources at the facility, lack of physician or provider presence, or failure to elicit goals of care (17, 18). There is less information available about the patient's symptoms prior to the transfer and whether comorbid conditions are predictive of a PAH diagnosis.

The analyses presented in this paper leverage data collected as part of a Centers for Medicare and Medicaid Services (CMS) funded demonstration project based at Indiana University named Optimizing Patient Transfers, Impacting Medical Quality, and Improving Symptoms: Transforming Institutional Care (OPTIMISTIC). OPTIMISTIC is focused on reducing potentially avoidable hospitalizations through a multi-component intervention delivered by project registered nurses (RNs) and nurse practitioners (NPs) (19, 25). The intent of analyses presented here are to: 1) Determine the association between presenting signs and symptoms prior to transfer and a hospital diagnosis considered potentially avoidable; and 2) determine the association between known patient risk conditions and diagnoses.

Methods

The OPTIMISTIC demonstration project is approved by the Indiana University-Purdue University Institutional Review Board.

Setting

Data collection occurred between November 2014 and July 2016 in 19 Indianapolis area nursing facilities participating in OPTIMISTIC. A project RN is assigned to each nursing facility to implement the OPTIMISTIC clinical model, supported by project NPs(19, 20, 21). These staff document clinical encounters and root cause analyses in a database for monitoring the intervention. The OPTIMISTIC intervention is designed to reduce avoidable hospitalizations and involves both direct patient care and support of nursing facility staff. The OPTIMISTIC interventions during the time period of these analyses were not focused on specific conditions, but on broader based approaches to quality improvement. A more complete description of the model has been previously published (18).

Sample

The sample consisted of 1174 long stay nursing facility patients who experienced 1931 acute transfers to the hospital or ED November 2014-July 2016. There were a total of 2226 acute transfers during that time period of which 295 were excluded for the following reasons: they transferred to another setting from the hospital (n = 95); their hospital discharge status was unknown (n = 54); and their transfers originated outside of the nursing facility or that information was unknown (n = 146). If a patient died in the hospital, they were included in the analysis although it was impossible to link their symptoms to a PAH or non PAH diagnosis.

Patients were eligible for OPTIMISTIC if they had been in the facility greater than 100 days or indicated on the Minimum Data Set (MDS) that they had no plan for discharge. Enrollment was passive; patients or their surrogate decision makers could opt-out of participation and less than 1% chose to opt out.

Procedures

OPTIMSTIC RNs were trained in Interventions to Reduce Acute Care Transfers (INTERACT) tools (22, 23). When an OPTIMISTIC patient transferred, RNs performed a root cause analysis. Upon transfer back, RNs and NPs collected data related to the ED visit or hospitalization. Follow up data on hospital diagnoses were available only for those returning to the facility; patients who died in the hospital were analyzed as a separate group as we had access to presenting signs, symptoms, and risk factors but not hospital diagnoses.

Data Collection Tools

The OPTIMISTIC project Transfer Tracking and QI Form is completed as close to the time of transfer as possible by the OPTIMISTIC RNs and includes documentation of known risk conditions, a description of signs and symptoms (from a drop down list provided by CMS), and a rating of avoidability based on clinical judgment. The Transition Visit form, including hospital diagnoses, is completed by NPs on return to the facility. Patient characteristics were obtained from the Minimum Data Set 3.0 assessments.

Data Analysis

For purposes of this analysis, all hospital diagnoses (primary, secondary, or other) were included, collapsed into 15 categories. Patients who died in the hospital were analyzed

separately, with death as the outcome (diagnosis not available). If any of the six PAH diagnoses (pneumonia, dehydration, CHF, urinary tract infection, pressure ulcers/cellulitis, or COPD) appeared in either RN or NP data collection, the transfer was assigned that PAH diagnosis category. All signs and symptoms recorded by the RNs were coded into pre-defined categories. Symptoms were collapsed into categories by organ system **(see Supplemental Tables 3-4).**

Cross-tabulations were performed to assess the association between the six PAH diagnoses and the presenting symptoms and known risk conditions prior to the transfer. Mixed effects multiple logistic regression models were used (SAS Proc GLMMIX) to assess the significance of symptoms or risk conditions (1=present, 0=absent) as predictors for the outcomes of individual PAH diagnoses, any of the six PAH diagnoses, or death in the hospital. Each outcome was scored 1=present, 0=absent leading to the choice of logistic regression. Each outcome was modeled separately in order to assess the predictability of each, resulting in 16 logistic regression models: eight models with risk conditions as predictors and eight models with symptoms as predictors of the PAH diagnoses or death. Because transfers were clustered within facilities and facility characteristics such as staffing may contribute to hospital transfers, we treated the nursing facility as a random effect in all models. One set of models related risk conditions to PAH diagnoses or death and the other had symptoms as predictors. We started each model with predictors (symptoms or risk conditions found in Tables 2 and 3). Additional symptoms could enter the model through a forward stepwise elimination with a p-value of < .10. To assess the effect of transfers nested within patients, we tested three-level models with random effects for both patient and facility. The patient-level random effect was non-significant for six outcome models, one model did not converge, and in one model where the random

effect was significant it did not change the findings. The Area under the Receiver Operator Curve (C-statistic) was used to assess the predictive quality of the models. It ranges from 0.5 to 1.0 and summarizes a model's sensitivity (true positive rate) and specificity (true negative rate). A score of 1 is the most predictive model.

Results

Sample Characteristics

About one-third of the sample of 1174 patients were 85 years and older (34%); 63% were female; most patients were either moderately or totally dependent in the activities of daily living (ADLs). Nearly half were either moderately (38%) or severely (9%) cognitively impaired (24). (**Table 1**).

Patients had 1931 acute transfers during the study period. Sixty-four percent of patients had one transfer, 24% had two transfers and 16% had three or more transfers. Two-thirds of patients were admitted initially to the hospital, while 34% were discharged from the ED. Most (92%) of the patients in the sample transferred returned to the nursing facility and 8% died in the hospital. Forty-four percent of the cohort had one or more of the six PAH diagnoses associated with the hospital or ED stay. The most common of the PAH diagnoses (18%) was urinary tract infection, followed by pneumonia (13%), CHF (12%), COPD/asthma (11%), pressure ulcers or cellulitis (5%) and dehydration (3%).

Risk Conditions Associated with Transfers

At the time of transfer, OPTIMISTIC staff identified risk conditions that could have contributed to the transfer. The mean number of conditions per transfer was 2.97 (SD=1.57). The most common risk conditions were dementia (53.6%), diabetes (27.7%), history of falls

(26.8%), history of COPD or asthma (26.4%), and dementia related behaviors (25.4%) (**Table 2**). Nearly one quarter had been hospitalized within 30 days prior to the transfer event. Bivariate associations between risk conditions and PAH diagnoses show that, for most risk conditions, the percentage of transfers with no PAH diagnoses is as high or higher than transfers with a PAH diagnosis. For example, no PAH diagnoses were recorded for about half (51.6%) of transfers with a prior hospitalization in the past 30 days. While about 60% of patients with a prior diagnosis of heart failure had a PAH diagnosis associated with a transfer event, only about one-third of the time (32.6%) was the transfer associated with an acute heart failure exacerbation.

Results from the mixed-effect logistic regression models (**Supplemental Table 1**) indicated that a PAH diagnosis was significantly less likely if the risk condition was a history of falls (Adjusted Odds Ratio (AOR)=.770) or behavioral problems (AOR=.576). Not surprisingly, a PAH diagnosis was significantly more likely when the contributing risk condition was a history of COPD (AOR=1.861), history of CHF (AOR=1.892), or history of recurring urinary tract infections (AOR=2.084). None of the captured risk conditions were associated with an increased likelihood of death in the hospital. The C-statistic for the model of having any PAH diagnoses was .664. The only individual PAH diagnoses with C-statistics above .70 were CHF (.760) and COPD (.789). Most of these risk conditions were associated with transfers for both PAH and non-PAH diagnoses.

Symptoms Prior to Transfer

There was a mean of 1.48 recorded symptoms per transfer (SD=.92). The most common symptoms experienced by patients prior to the transfer were behavioral or cognitive (31%), fall/trauma/fracture (18%), cardiovascular (17%), respiratory (16.2%), pain (11%), or infection

or immune system (10%), and gastrointestinal (GI) symptoms (9%) (**Table 3**). Bivariate associations indicate that the symptoms map into multiple PAH and non-PAH diagnoses; and the PAH and non-PAH diagnoses map back into multiple symptoms. For example, cognitive or behavioral or psychological symptoms, the most prevalent category, were about equally likely to be associated with transfers having PAH (32%) vs. non-PAH diagnoses (31%). . Even among symptoms associated significantly with a PAH diagnosis, a substantial proportion of transfers with these symptoms had non-PAH diagnoses. For example, 14% of non-PAH transfers had a cardiovascular symptom (vs. 19% of PAH) and 10% of non-PAH transfers had a respiratory symptom (vs. 24% of PAH). Falls/trauma/fractures was the only category of symptoms that was more strongly associated with transfers having non-PAH vs. PAH diagnoses (25% non-PAH vs. 10% PAH).

Results from the mixed effect logistic regression models (**Supplemental Table 2**) indicated that a PAH diagnosis was significantly more likely when patients had a respiratory symptom (AOR=2.118), infection/immune symptom (AOR=1.679), urinary symptom (AOR=2.020), or general symptom (AOR=1.643). Among the individual PAH diagnoses, a PAH diagnosis of pressure ulcers was significantly more likely with a pain or infection/immune system symptom (AOR=1.941; 3.104); a PAH diagnosis of CHF was more likely with a cardiovascular or respiratory symptom or abnormal labs (AOR=1.509; 2.431; 2.447); a COPD PAH diagnosis was more likely with a respiratory symptom (AOR=4.020); a dehydration PAH diagnosis was more likely with a cardiovascular symptom (AOR=2.8); a pneumonia PAH diagnosis was more likely with a respiratory or immune system symptom (AOR=4.789; 2.362); and a urinary tract infection PAH diagnosis was more likely with a urinary symptom or general

symptom (AOR=6.732; 1.699). Death in the hospital was significantly more likely with a respiratory symptom or GI symptom, but less likely with a non-cognitive neurologic symptom (AOR=2.118; 1.727; 0.109). The pneumonia PAH model was the only model with a C-statistic at .700 or higher.

Discussion

Nursing facilities are increasingly challenged, and incentivized, by hospital partners and payers such as Medicare to reduce avoidable transfers. Although it is widely recognized that many hospital transfers of nursing facility patients are potentially avoidable, the determination of "avoidability" in the nursing facility is complex. In this sample, patient risk conditions were not predictive of whether the transfer event would be associated with a specific PAH diagnoses, and symptoms prior to transfer were only weakly associated with a PAH diagnosis. These findings raise questions about the ability of nursing facilities to proactively identify and target patients with an acute change in condition who may end up being categorized as having had a potentially avoidable transfer after observation, diagnostic testing, and treatment in the ED or hospital setting.

Despite these challenges, it is possible to reduce hospitalizations. An independent evaluation of the OPTIMISTIC clinical model found a 40% reduction of potentially avoidable hospitalizations and a 25% reduction in all-cause hospitalizations in comparison to a matched control group (25). The OPTIMISTIC clinical model (www.optimistic-care.org) did not explicitly target certain conditions but rather focused on broad-based quality improvement with multiple components, including INTERACT tools (23) designed to recognize and initiate timely treatment for an acute change in status and structured advanced care planning (26). Although the

OPTIMISTIC clinical intervention has been successful, it is resource-intensive because it requires specially trained, full-time professionals in the facility.

The limits of using information on hand at the time of transfer to predict avoidability – such as patient risk conditions or symptoms during the acute change in condition – have implications for both clinical practice and further research. PAHs, as determined by retrospective information such as Medicare claims data, appear to be responsive to multi-component quality improvement efforts. The ability to narrow the scope of these interventions, i.e. – reduce the intensity or investment required to implement PAH reduction programs, may be limited if we cannot predict which hospital transfers or patients warrant more intense preventive interventions. Further, the use of claims data as an arbiter of avoidability has inherent limitations.

The nursing facility population is largely a frail population. In our sample, nearly one-half of the patients involved in these transfers had moderate to severe cognitive impairment and two-thirds needed help in getting in and out of bed. Prior research suggests that patients and surrogates, particularly in the setting of advanced dementia, often prefer a treatment plan focused on comfort and avoiding hospitalization (27) and these goals should be at the center of decision making about transfers. However, goals are not captured in administrative Medicare claims data. Qualitative data suggests that the systematic advance care planning used as a core intervention in OPTIMISTIC was responsible in part for the reduction in all-cause hospitalizations (25). Fall prevention programs, behavioral interventions, and polypharmacy reduction are other interventions that are not disease specific but could impact both PAH and non-PAH acute transfers.

There are multiple limitations to this study. First, we did not have access to Medicare claims data and thus cannot replicate previous work using complete ICD-9 or ICD-10 diagnostic codes. Our diagnoses are based on RN and NP review of hospital discharge summaries upon return to the facility and thus we do not have access to diagnoses related to patients who died. However, this limitation also approximates "real life" where medical decisions about acute transfers are often reliant on facility staff's assessment of a patient's condition and risk. Also, we included multiple transfers per patient when they occurred. To control for the effects of multiple transfers we included an indicator variable for hospitalization in the last 30 days in our logistic regression analysis. Further, we recognize that factors specific to a nursing facility can influence transfers, including staffing and level of medical presence, and clustering of specific patient populations. These potential confounders were not included in our analyses. In order to take into account inter-facility variation and to assess average relationships across the facility sample, we included facility as a random effect in our regression modeling and tests of statistical significance. The generalizability of findings is limited by the location of the study sample in a single metropolitan area. Finally, our findings were influenced by the context of the national demonstration where facilities were engaged in a successful, multi-year project to reduce hospital transfers. Building on the success of OPTIMISTIC and other national demonstration projects in reducing hospital transfers (25), CMS has launched a second stage of the project, which is intended to further reduce avoidable transfers by focusing on PAH diagnoses and creating novel Medicare Part B payment codes to support care in place. In addition, during the time period of our study, nursing facilities locally and nationally were

focusing efforts on reducing hospital transfers (28). Our findings should be generalizable to nursing facilities engaged in efforts to reduce hospital transfers.

Conclusion

PAHs of nursing facility patients result in increased burdens to frail patients and expose them to unnecessary risks. Reduction of PAHs continues to be an important focus of policymakers, nursing facilities and their health system partners. Our findings of the difficulty of predicting the avoidability of hospital transfers with information available at the time of transfer, including patient risk conditions and symptoms, highlights the difficulty of designing very targeted interventions to reduce PAHs in this setting. Multi-component, comprehensive quality improvement efforts have been successful in reducing PAHs. Continued work is needed to understand true avoidability of these transfer events.

Acknowledgements

Conflict of Interest: Authors have no conflicts of interest to report.

Author Contributions: The authors would like to acknowledge John Price, MS, for support in data preparation, Hui Sun for her data analysis support, and Sobia Khan for support in manuscript preparation.

Sponsor's Role: The content is solely the responsibility of the authors and does not necessarily represent the official views of the CMS Innovation Center and the CMS Medicare-Medicaid Coordination Office. The investigators retained independence in the conduct of this research.

References

1. Boockvar KS, Liu S, Goldstein N, et al. Prescribing discrepancies likely to cause adverse drug events after patient transfer. Quality & safety in health care. 2009;18(1):32-36.
2. Mor V, Intrator O, Feng Z, et al. The revolving door of rehospitalization from skilled nursing facilities. Health Aff (Project Hope). 2010;29(1):57-64.
3. Mkanta WN, Chumbler NR, Yang K, et al. Cost and Predictors of Hospitalizations for Ambulatory Care - Sensitive Conditions Among Medicaid Enrollees in Comprehensive Managed Care Plans. Health Serv Res and Managerial Epi. 2016;3:2333392816670301.
4. Office of Inspector General, DHSS. Medicare Nursing Home Resident Hospitalization Rates Merit Additional Monitoring OEI-06-11-00040. Nov, 2013.
5. Feng Z, Coots LA, Kaganova Y, et al. Hospital and ED use among Medicare beneficiaries with dementia varies by setting and proximity to death. Health Aff (Project Hope). 2014;33(4):683-690.
6. Ouslander JG, Maslow K. Geriatrics and the triple aim: defining preventable hospitalizations in the long-term care population. J Am Geriatr Soc. 2012;60(12):2313–8
7. Ouslander JG, Lamb G, Perloe M, et al. Potentially avoidable hospitalizations of nursing home residents: frequency, causes, and costs. J Am Geriatr Soc. 2010 Apr;58(4):627–635.
8. Spector WD, Limcangco R, Williams C, et al. Potentially avoidable hospitalizations for elderly long-stay residents in nursing homes. Med Care. 2013;51(8):673-681.
9. Walsh EG, Wiener JM, Haber S, et al. Potentially avoidable hospitalizations of dually eligible Medicare and Medicaid beneficiaries from nursing facility and Home- and Community-Based Services waiver programs. J Am Geriatr Soc. 2012;60(5):821-829.
10. Segal M, Rollins E, Hodges K, et al. Medicare-Medicaid eligible beneficiaries and potentially avoidable hospitalizations. Medicare Medicaid Res Rev. 2014;4(1).
11. Wysocki A, Kane RL, Golberstein E, et al. The association between long-term care setting and potentially preventable hospitalizations among older dual eligibles. Health Serv Res. 2014;49(3):778-797.
12. Harrison MJ, Dusheiko M, Sutton M, et al. Effect of a national primary care pay for performance scheme on emergency hospital admissions for ambulatory care sensitive conditions: controlled longitudinal study. Br Med J. 2014;349:g6423.
13. Rosano A, Loha CA, Falvo R, et al. The relationship between avoidable hospitalization and accessibility to primary care: a systematic review. Eur J Public Health. 2013;23(3):356–360
14. Centers for Medicare and Medicaid Services. Initiative to reduce avoidable hospitalizations among nursing facility residents. Baltimore, MD: http://innovation. cms. gov/initiatives/rahnfr/(5 September 2015). 2015.
15. Daras LC, Wang JM, Ingber MJ, et al. What Are Nursing Facilities Doing to Reduce Potentially Avoidable Hospitalizations? J Am Med Dir Assoc. 2017 May 1;18(5):442-444. doi: 10.1016/j.jamda.2017.02.007.

16. Li Y, Cai X, Glance LG. Disparities in 30-Day Rehospitalization Rates Among Medicare Skilled Nursing Facility Residents by Race and Site of Care. Med Care. 2015;53(12):1058-1065.
17. Gillespie SM, Gleason LJ, Karuza J, et al. Health care providers' opinions on communication between nursing homes and emergency departments. J Am Med Dir Assoc. 2010;11(3):204-210.
18. Unroe KT, Nazir A, Holtz LR, et al. The Optimizing Patient Transfers, Impacting Medical Quality, and Improving Symptoms: Transforming Institutional Care approach: preliminary data from the implementation of a Centers for Medicare and Medicaid Services nursing facility demonstration project. J Am Ger Soc. 2015;63(1):165-169.
19. Walsh EG, Wiener JM. Hospitalizations of Nursing Home Residents: Background and Options. Washington DC: Office of the Assistant Secretary for Planning and Evaluation, US Department of Health and Human Services. 2011.
20. Nazir A, Unroe KT, Buente B, Sachs G, Arling G. "OPTIMISTIC Transition Visits: A Model to Improve Hospital to Nursing Facility Transfers." Ann Longterm Care, August 2016.; 24(7).
21. OPTIMISTIC: Transforming Care. Empowering Nursing Facilities to Transform Care. Indianapolis, IN: http://www.optimistic-care.org/. 2017.
22. INTERACT. Lead with Quality. Lake Elmo, MN: http://www.pathway-interact.com/contact-us/. 2017.
23. Ouslander JG, Lamb G, Tappen R, et al. Interventions to reduce hospitalizations from nursing homes: evaluation of the INTERACT II collaborative quality improvement project. J Am Geriatr Soc. 2011 Apr;59(4):745-53. doi: 10.1111/j.1532-5415.2011.03333.x. Epub 2011 Mar 15.
24. Thomas KS, Dosa D, Wysocki A, Mor V. The minimum data set 3.0 cognitive function scale. Med Care. 2015 Mar 11.
25. Ingber MJ, Feng Z, Khatutsky G, et al. Initiative To Reduce Avoidable Hospitalizations Among Nursing Facility Residents Shows Promising Results. Health Aff (Project Hope). 2017;36(3):441-450.
26. Hickman S, Unroe KT, Ersek M, et al. "An Interim Analysis of an Advance Care Planning Intervention in the Nursing Home Setting." J Am Geriatr Soc., 2016.
27. Mitchell SL, Teno JM, Kiely DK, Shaffer ML, Jones RN, Prigerson HG, Volicer L, Givens JL, Hamel MB. N Engl J Med. 2009 Oct 15;361(16):1529-38. doi: 10.1056/NEJMoa0902234. PMID: 19828530.
28. Brennan N. (2017). https://blog.cms.gov/2017/01/17/data-brief-sharp-reduction-in-avoidable-hospitalizations-among-long-term-care-facility-residents/. [Blog].

Table 1: Characteristics of OPTIMISTIC Patients and Transfers

	Characteristics of Transferred Patients (N=1174)	N	% of Patients
Age	< 65	190	16%
	65-74	206	18%
	75-84	353	30%
	85 or Older	425	36%
Gender	Female	732	62%
Extensive or Total Dependence in ADLs	Bed Mobility	1019	87%
	Transferring	996	85%
	Toileting	1044	89%
	Eating	667	57%
Cognitive Functional Status (CFS scale)	Intact	353	31%
	Mildly Impaired	290	25%
	Moderately Impaired	442	39%
	Severely Impaired	59	5%
	Characteristics of Transfers (N=1931)		**% of Transfers**
Number of Transfers per Patient	One	749	39%
	Two	263	27%
	Three	82	13%
	Four or more	81	21%
Transfer Destination	ED Only	648	34%
	Admitted	1241	66%
Discharge Status	Transfer back to nursing facility	1785	92%
	Death in hospital	146	8%
Length of Stay in Facility at Time of Transfer	Fewer than 100 days	360	19%
	100-365 days	595	31%
	Greater than 365 days	976	50%
PAH Diagnoses	None of the PAH diagnoses	1058	55%
	Any PAH diagnosis	873	45%
	Individual PAH Diagnoses		
	UTI	344	18%
	Pneumonia	267	14%
	Heart failure	245	12%
	COPD/asthma	219	11%
	Pressure ulcers/cellulitis	106	5%
	Dehydration	60	3%

Note: transfers can have multiple diagnoses, percentages do not sum to 100%.
Note: 1785 transfers back + 146 died in hospital = 1931 total transfers
Note: Admitted refers to both inpatient hospitalization and observation stay

Table 2. PAH Diagnoses or Death in Hospital Associated with Patient Risk Conditions (N=1931 transfers)

Risk Conditions	**Transfers with risk factor (%)**	Pressure sores	Heart failure	COPD	Dehydration	Pneumonia	UTI	Any PAH	No PAH	**Died in hospital**
Dementia	1035 (53.6%)	4.4%	12.0%	8.9%	3.7%	12.0%	17.6%	42.5%	57.5%	5.8%
Diabetes	535 (27.7%)	7.1%	17.9%	13.6%	3.2%	15.5%	20.0%	50.5%	49.5%	8.2%
History of falls	518 (26.8%)	4.6%	11.2%	10.2%	3.5%	10.4%	18.0%	*40.5%	59.5%	6.4%
COPD or asthma	510 (26.4%)	5.7%	*19.4%	*31.2%	2.0%	*21.0%	18.2%	*58.4%	41.6%	10.2%
Behaviors, dementia	490 (25.4%)	*3.1%	*8.2%	8.4%	3.3%	*6.9%	15.7%	*35.5%	64.5%	*4.3%
Heart failure	457 (23.7%)	5.7%	*32.6%	17.9%	3.1%	18.4%	18.6%	*60.2%	39.8%	10.3%
Hospitalized in the past 30 days	434 (22.5%)	7.4%	*15.7%	11.5%	2.3%	13.4%	19.4%	48.4%	51.6%	7.4%
History of recurring UTI	304 (15.7%)	*9.9%	14.1%	9.9%	4.9%	14.1%	*40.1%	*60.2%	39.8%	5.9%
Invasive lines/tubes	218 (11.3%)	*12.8%	10.6%	9.6%	3.7%	18.8%	26.6%	54.1%	45.9%	7.3%
End stage renal disease	150 (7.8%)	6.0%	14.7%	9.3%	2.7%	14.0%	17.3%	44.7%	55.3%	10.7%
Dose change or new med within 48 hrs. of transfer	123 (6.4%)	3.3%	14.6%	11.4%	*5.7%	16.3%	13.0%	43.1%	56.9%	10.6%
Surgery in the last 3 months	77 (4.0%)	14.3%	18.2%	9.1%	0.0%	*11.7%	26.0%	42.9%	57.1%	6.5%
Recent C. Difficile infection	36 (1.9%)	8.3%	13.9%	8.3%	8.3%	27.8%	25.0%	61.1%	38.9%	8.3%
Stroke in last 3 months	23 (1.2%)	4.3%	8.7%	4.3%	0.0%	4.3%	13.0%	*21.7%	78.3%	8.7%
Cancer, on active chemo or radiation therapy	17 (0.9%)	0.0%	5.9%	11.8%	0.0%	11.8%	17.6%	29.4%	70.6%	17.7%
Other	803 (41.6%)	6.5%	11.3%	10.2%	2.9%	16.3%	18.4%	46.3%	53.7%	8.5%

Note: * indicates significant AOR ($p<0.05$) in a mixed effects logistic regression model with column header as response.

Note: 1785 transfers back + 146 died in hospital = 1931 total transfers

Note: * indicates significance ($p<.05$) in logistic regression model

Table 3. Prevalence of Symptoms Associated with PAH Diagnosis or Death in Hospital (N=1931 transfers)

Symptoms	**Transfers with symptom (%)**	Pressure sores	Heart failure	COPD	Dehydration	Pneumonia	UTI	Any PAH	No PAH	**Died in hospital**
Cognitive/Behavioral/Psych	600 (31.1%)	*20.8%	29.4%	33.8%	38.3%	33.7%	36.9%	31.7%	30.5%	36.3%
Fall/Trauma/fracture	349 (18.1%)	*9.4%	*7.8%	11.4%	10.0%	*5.2%	*8.7%	*9.6%	25.1%	*5.5%
Cardiovascular	320 (16.6%)	16.0%	*23.7%	19.6%	*35.0%	23.2%	15.1%	19.2%	14.4%	26.0%
Respiratory	312 (16.2%)	*8.5%	*30.2%	*37.0%	13.3%	*45.7%	*13.4%	*24.3%	9.5%	*30.8%
Pain	218 (11.3%)	*18.9%	9.0%	10.1%	6.7%	4.9%	11.1%	10.1%	12.3%	4.8%
Infection/Immune System	199 (10.3%)	*19.8%	*9.4%	13.2%	13.3%	*25.5%	13.1%	*14.7%	6.7%	13.0%
GI symptom	168 (8.7%)	5.7%	*4.1%	5.0%	11.7%	10.1%	10.5%	8.5%	8.9%	*13.7%
Non-Cognitive Neuro	106 (5.5%)	4.7%	3.3%	4.1%	8.3%	4.1%	6.4%	5.2%	5.8%	*0.7%
General	89 (4.6%)	6.6%	4.1%	3.2%	8.3%	8.2%	*7.3%	*6.4%	3.1%	6.2%
Heme/bleeding (non GI)	71 (3.7%)	7.6%	2.9%	3.7%	0.0%	0.8%	2.3%	2.7%	4.4%	1.4%
Abnormal labs	52 (2.7%)	4.7%	*4.9%	2.7%	6.7%	4.1%	3.2%	3.7%	1.9%	4.1%
Urinary	40 (2.1%)	1.9%	0.4%	0.9%	5.0%	2.3%	*7.0%	*3.1%	1.2%	1.4%
Renal/Fluid issue	31 (1.6%)	3.8%	2.0%	2.3%	1.7%	3.0%	1.5%	2.3%	1.0%	2.1%
Other	307 (15.9%)	20.8%	15.9%	12.3%	11.7%	15.4%	16.6%	15.9%	15.9%	15.8%
Number of transfers with diagnosis		106	245	219	60	267	344	873	1058	146
% of transfers with diagnosis		5.5%	12.7%	11.3%	3.1%	13.8%	17.8%	45.2%	54.8%	7.6%

Note: * indicates significant AOR ($p<0.05$) in a mixed effects logistic regression model with column header as response.

Note: Column percentages are being reported; for example, among the 106 transfers with a PAH diagnosis of Pressure Sores, 5.7% had a GI symptom, 4.7% abnormal tests, and so on.

Note: 1785 transfers back + 146 died in hospital = 1931 total transfers.