


# Management of Acute Changes in Condition in Skilled Nursing Facilities

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**OBJECTIVES:** To describe the presentation and management of acute changes in condition in skilled nursing facilities (SNFs) during implementation of a program designed to reduce unnecessary emergency department visits and hospitalizations.

**DESIGN:** Secondary analysis of data from a randomized controlled trial involving 264 SNFs.

**PARTICIPANTS:** One hundred thirty-three of the 264 participating SNFs that provided data on acute changes in condition: 55 in the intervention group, 78 in the control group.

**INTERVENTIONS:** During a 12-month period, intervention SNFs received training and support for implementation of the Interventions to Reduce Acute Care Transfers program. Control SNFs were offered training and implementation support after the end of the 12-month trial.

**MEASURES:** Project champions used a structured online tool to describe acute changes in condition that did not result in a hospital transfer within 72 hours of the change.

**RESULTS:** Most of the 7,689 episodes of acute change in condition reported involved multiple changes that were not disease specific. Ten percent resulted in hospital transfer between 72 hours and 7 days after the change. Five acute changes had odds ratios for transfer greater than 2 (mental status change, abnormal vital signs, bleeding, shortness of breath, and unresponsiveness). Most transfers were for reasons other than the initial change in condition.

**CONCLUSIONS:** A wide variety of acute changes in condition can be managed in SNFs without hospital transfer.

Most of these changes are nonspecific and multiple, and when they are associated with hospital transfer, the reasons for the transfer are most often different from the initial acute change in condition. These data highlight the multifactorial nature of acute changes in condition in the SNF population and suggest that disease-specific protocols and assessment tools may not be the most appropriate approach to managing acute changes in condition in the SNF setting. *J Am Geriatr Soc* 66:2259–2266, 2018.

**Key words:** acute change in condition; skilled nursing facilities

Skilled nursing facilities (SNFs) that care for people after an acute hospitalization, as well as long-stay residents, are under increasing pressure to manage acute changes in condition without hospital transfer. Financial penalties for high hospital readmission rates and the growth of value-based Medicare and Medicaid payment strategies provide incentives to reduce unnecessary hospital admissions, readmissions, and emergency department (ED) visits.<sup>1–3</sup>

Many factors contribute to hospital transfers in the SNF population.<sup>4–13</sup> Previous research has shown that many hospital transfers may be avoidable for a variety of reasons.<sup>7,8,10–20</sup> The Centers for Medicare and Medicaid Services (CMS) has defined diagnoses for which they consider hospital transfers from SNFs potentially avoidable.<sup>17</sup> Several types of interventions hold promise for reducing potentially avoidable hospitalizations for changes in condition related to these diagnoses.<sup>21–28</sup>

Diagnoses associated with hospitalizations and ED visits in the postacute and long-term care populations have been reported,<sup>7,8,15,17,18,29,30</sup> but no studies have examined the presentation and management of acute changes in condition in SNFs when implementing programs to reduce potentially avoidable hospital transfers. These data are clinically important, because the SNF population may not present with clear signs and symptoms related to a specific

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diagnosis. We therefore believe these data will be helpful to health professionals in SNFs in their efforts to improve care by identifying the most common acute changes in condition that were managed without hospital transfer and addressing them with educational and quality improvement activities. Understanding the nature of acute changes in condition that can be successfully managed without hospital transfer may also be helpful in developing clinical criteria and quality measures for programs such as those that CMS is testing to reduce hospitalizations of long-stay SNF residents.<sup>27,28</sup>

## METHODS

This is a secondary analysis of data from a randomized, controlled implementation trial of the Interventions to Reduce Acute Care Transfers (INTERACT) program. The main results of the trial and root cause analyses on transfers to the hospital have been reported.<sup>10–12,31,32</sup> The Florida Atlantic University institutional review board approved the trial as a quality improvement project. Six hundred thirteen SNFs recruited in collaboration with national organizations expressed interest in participation, 391 were screened for eligibility in online surveys and telephone interviews, and 264 eligible SNFs were randomly assigned to 1 intervention and 2 control groups. During the 12-month intervention period, each intervention facility received a start-up package of INTERACT tools and access to an online training program and participated in a series of webinars during a 10-week initial training program and monthly follow-up webinars. After the 12-month intervention period ended, interested facilities from the 2 control groups received the same training and support for INTERACT implementation.

In each of the participating facilities, facility leadership selected a project champion and co-champion who were responsible for implementation of INTERACT and for submitting data to the project team. The majority of champions and co-champions were experienced licensed nurses. In addition to hospitalization tracking and root cause analyses of transfers, champions were trained in how to complete a structured online tool (the Change in Condition without Transfer (CIC) tool). They were asked to complete the tool on a sample of episodes of acute changes in condition that resulted in a nursing evaluation using the INTERACT SBAR tool but that did not result in a hospital transfer within 72 hours of the change. The CIC tool described the acute changes in condition using lists of general changes in condition, new signs and symptoms, and abnormal diagnostic test results similar to those listed in the INTERACT quality improvement review tool (Supplemental Figure S1). The CIC tool enabled the champions to describe the nature of the acute change in condition; how the change was managed; whether there was a hospital transfer between 72 hours and 7 days after the change; and if so, the reason(s) for the transfer (again selected from the reasons listed on the INTERACT quality improvement review tool). Images of the online CIC tool from the training webinar are included in Supplemental Figure S2. The project team, in consultation with the project Data Safety Monitoring Board, selected the 72-hour and 7-day time-periods based on experience in the SNF setting. A 72-hour period suggests that the initial identification and management of the acute change in condition had delayed a transfer, and if a transfer

related to this change occurred after 72 hours, in most cases, the transfer would have occurred within a 7-day period if the reason for the transfer was related to the initial acute change. To minimize response burden, the CIC tool contained only drop-down options for treatment options, categorized as change in medication, intravenous fluid, non-pharmacological intervention (e.g., local care for skin wounds, heat or ice for pain, support stockings, changes in diet or fluid intake (increase or restriction), and other major care plan changes (e.g., more frequent vital sign monitoring, including weight and neurological assessments, physical therapy, specialty consultation, and behavioral interventions for agitated behaviors).

## RESULTS

One hundred thirty-three SNFs completed a total of 7,689 CIC tools, with a mean of 58 and median of 36 per facility (range 1–322). During the 12-month intervention period, 55 intervention SNFs submitted 3,429 CIC tools, and during the 12-month postintervention period, 78 control SNFs submitted 4,260 CIC tools. Data from intervention and control SNFs were combined for the purposes of these analyses. Table 1 shows baseline data on the characteristics of the participating SNFs and their residents that submitted and did not submit CIC tools. SNFs that submitted CIC tools had a significantly higher census and a higher proportion of black residents and of residents with higher acuity and complete ADL dependence than SNFs that did not submit CIC tools.

Most CIC tools had multiple changes in condition selected; 2,206 (29%) indicated 1 change, 1,625 (21%) indicated 2 changes, 3,192 (41%) indicated 3 or more changes; 666 (9%) did not identify a general change in condition, new symptom or sign, or abnormal diagnostic test result. The most commonly reported general changes in condition were in function and mental status (Figure 1A). Examples of these changes are provided on the INTERACT early warning “Stop and Watch” tool and include talks or communicates less; overall needs more help; agitated or nervous more than usual; tired weak, confused, or drowsy; and help with walking, transferring, or toileting more than usual. The most commonly reported new symptoms and signs were pain, abnormal vital signs, and cough (Figure 1B), and the most common abnormal diagnostic test results were X-ray, urinalysis or urine culture, and complete blood count (Figure 1C). Supplemental Table S1 illustrates the various combinations of changes in condition reported.

Table 2 lists the initial management strategies used for the different changes in condition and diagnostic test results. Of the four treatment options listed on the CIC form, change in medication was the most common treatment provided to manage an acute change. Overall, medication changes were ordered in 4,554 (59%) of the 7,689 episodes and in more than 60% of the episodes for each of the various changes in condition and abnormal diagnostic test results, except for skin changes (58%), bleeding (38%), and falls (27%). Nonpharmacological interventions were used in 3,975 (52%) of the episodes and intravenous fluid in 441 episodes (6%), and other major changes in care plan were implemented in 1,654 (22%).

**Table 1. Nursing Facility and Resident Characteristics**

Characteristic	Submitted CIC Form, n = 133	Did Not Submit CIC Form, n = 131	P-Value
<b>Nursing Facility</b>			
Rural, %	11.3%	15.3%	.34
For profit, %	63.9%	58.8%	.39
Non-profit, %	35.3%	38.2%	.63
Number of certified beds, mean±SD	146.8±66.4	128.3±64.5	.02
Occupancy rate, mean±SD	0.89±0.14	0.88±0.16	.73
Proportion of resident days long-stay, mean±SD <sup>1</sup>	0.65±0.12	0.63±0.15	.16
Registered nurse hours per day, mean±SD	0.78±0.32	0.81±0.35	.42
Overall quality rating of 4 or 5 <sup>2</sup>	56.4%	58.8%	.70
Number of all-cause hospitalizations per 1,000 resident-days, mean±SD <sup>3</sup>	3.37±1.35	3.36±1.42	.97
Number of potentially avoidable hospitalizations per 1,000 resident-days, mean±SD <sup>3</sup>	0.95±0.67	1.00±0.73	.27
Number of emergency department visits without admission per 1,000 resident-days, mean±SD <sup>3</sup>	1.89±1.04	1.96±1.18	.34
Readmission rate, mean±SD	0.20±0.17	0.20±0.17	.83
<b>Resident</b>			
Age, mean±SD	80.6 (11.1)	80.8 (10.8)	.62
Female, %	64.4%	65.7%	.24
White non-Hispanic, %	79.6%	85.8%	.048
Black non-Hispanic, %	16.3%	9.8%	.02
Hispanic, %	1.7%	1.4%	.49
Asian/other, %	2.3%	3.0%	.49
Hierarchical Care Category score, mean±SD <sup>4</sup>	1.48 (1.24)	1.40 (1.18)	.02
Dual Medicare–Medicaid status, %	31.8%	29.9%	.51
Complete activity of daily living dependence, %	23.6%	18.9%	.02
Severe cognitive disability, % <sup>5</sup>	10.2%	9.2%	.29
Terminal diagnosis, %	4.2%	4.6%	.65

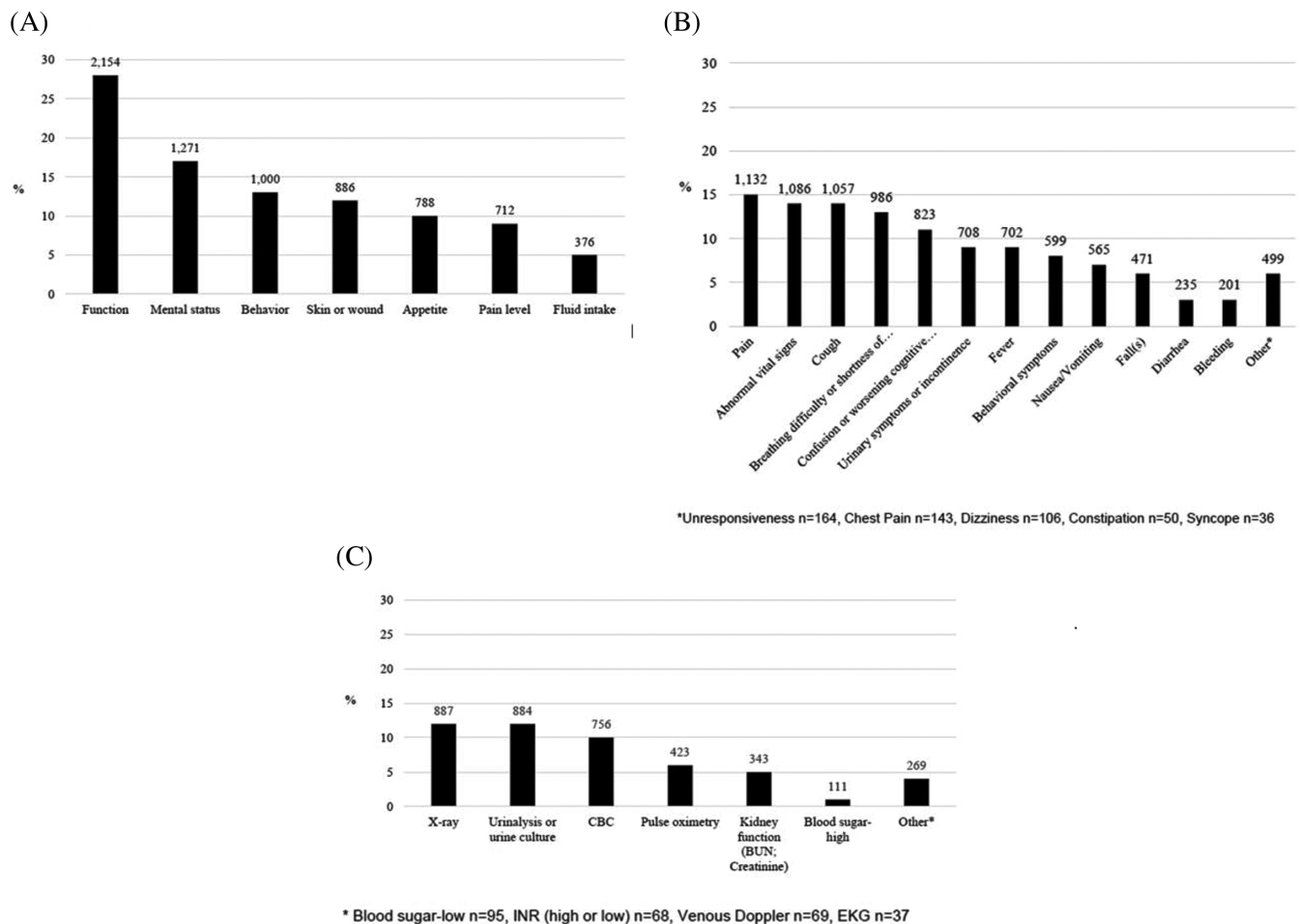
<sup>1</sup>>100 days.<sup>2</sup>From 2012 Nursing Home Compare data.<sup>3</sup>Measured during intervention period (March 2013 – February 2014).<sup>4</sup>Measure of acuity; ranges 0.12–13.52; 1<sup>st</sup> percentile 0.30, median 0.95, 99<sup>th</sup> percentile 5.80.<sup>5</sup>Minimum Data Set–derived Cognitive Performance Scale score of 5 or 6.

CIC = change in condition form; SD=standard deviation.

Of the 7,689 episodes of acute change in condition, 778 (10.1%) were associated with transfer to the hospital between 3 and 7 days after the change was initially evaluated, and 96 (1.2%) were associated with death within 7 days. Figure 2 illustrates the percentage of changes in condition associated with hospital transfer. The odds ratios (ORs) for transfer associated with most of the changes in condition were greater than 1, and for the majority of them, the 95% confidence interval did not cross 1 (indicating statistical significance; Table 3). Five changes had ORs greater than 2 (mental status change, abnormal vital signs, bleeding, shortness of breath, unresponsiveness (which had the highest OR (3.83))). Four changes had ORs less than 1, with 95% confidence intervals that did not cross

1, indicating they were less likely to be associated with a transfer, including skin conditions and wounds, cough, urinary symptoms or incontinence, and abnormal urinalysis and culture.

Medication changes were the most common intervention for the acute changes in condition, ordered in 52% of cases, followed by nonpharmacological interventions in 47%, intravenous fluids in 6%, and other major care plan changes in 22%. Nonpharmacological interventions were more commonly associated with transfers (in 18% of episodes) than were changes in medication (10%) or intravenous fluid (7%) or other changes in care plan (12%) (Supplemental Figure S3). As would be expected, transfer to the hospital was more common when 3 or 4 changes were



**Figure 1.** Changes in condition reported (based on 7,689 change in condition forms; more than 1 change could be reported per form). Percentage and number with (A) each general change in condition, (B) new signs and symptoms, and (C) abnormal test results.

reported on the CIC tool than when 1 or 2 changes were reported. The odds of transfer were 2.0 to 2.5 times as high when 4 or more changes were reported on the same CIC tool than when 1 change was reported. (Supplemental Figure S4). The reasons listed for transfer were different from the initial acute change in condition for most changes. Supplemental Figure S5 illustrates the number and percentage of the 778 episodes that resulted in hospital transfer between 3 and 7 days after the acute change for which the same or a different change in condition was listed for the initial change and the reason for transfer. Bleeding, shortness of breath, increase in pain level, and high blood sugar were the most common changes in condition that resulted in transfer to the hospital for the same condition (in 60–87%). Supplemental Table S2 illustrates the reasons for transfer between 3 and 7 days associated with each initial acute change in condition, demonstrating that, when a transfer occurs, it may be associated with changes in condition different from the initial presentation. In addition to these changes in condition, staff listed family or resident preference as a reason in 152 (20%) and clinician decision in 409 (53%). These data are similar to data we reported on root cause analyses of 4,856 transfers, in which resident or family preferences were noted as a reason for transfer in 16% and clinician decision in 52%.<sup>10</sup>

## DISCUSSION

This is the first report that we are aware of to describe how acute changes in condition present and are managed in SNFs while implementing a program designed to reduce unnecessary hospitalizations. The large number of episodes that 133 SNFs from across the United States reported provide insight into how staff and clinicians try to reduce unnecessary hospitalizations. The clinical presentations of changes in condition, including new symptoms or signs and abnormal test results, have important implications for the design of protocols and assessment tools to assist SNF staff and clinicians in reducing hospital transfers.

Most of the episodes of acute change in condition reported had multiple clinical presentations, and most were nonspecific. It is likely that this likely represents the syndromic nature and atypical presentation of acute illness, as well as the high prevalence of multimorbidity in the SNF population. For example, functional decline, altered mental status, and behavioral symptoms were common presentations of the general acute changes in condition reported. These presentations make a presumptive diagnosis challenging because they could indicate a wide variety of underlying acute illnesses. Similarly, pain, abnormal vital signs, cough, and shortness of breath were common new symptoms and

Table 2. Management of Changes in Condition

Condition	N	Change in Medication	Intravenous Fluid	Nonpharmacological Intervention	Other Major Change in Care Plan
%					
General changes in condition					
Appetite	788	66	16	55	25
Behavior	1,000	64	7	54	24
Fluid intake	376	68	30	50	28
Function	2,154	62	12	53	23
Mental status	1,271	65	10	52	24
Pain level	712	70	5	55	22
Skin or wound	886	58	2	59	28
New symptoms or signs					
Abnormal vital signs	1,086	71	14	51	24
Behavioral symptoms	599	64	6	52	25
Bleeding	201	38	2	67	33
Breathing difficulty or shortness of breath	986	76	7	50	25
Confusion or worsening cognitive function	823	60	10	54	27
Cough	1,057	84	5	46	15
Diarrhea	235	66	13	52	21
Fall(s)	471	27	2	57	46
Fever	702	81	11	47	21
Nausea or vomiting	565	61	11	58	18
Pain	1,132	68	4	55	22
Urinary symptoms or incontinence	708	73	5	46	17
Other <sup>1</sup>	499	61	9	55	28
Abnormal diagnostic test results					
high blood sugar	111	80	13	56	28
Complete blood count	756	75	19	51	27
Kidney function (blood urea nitrogen, creatinine)	343	63	37	46	23
Pulse oximetry	423	74	11	59	29
Urinalysis or urine culture	884	85	8	38	16
X-ray	887	85	8	46	22
Other <sup>2</sup>	269	76	8	47	24

Data based on 7,689 Change in Condition forms. More than 1 change and more than 1 treatment could be reported per form.

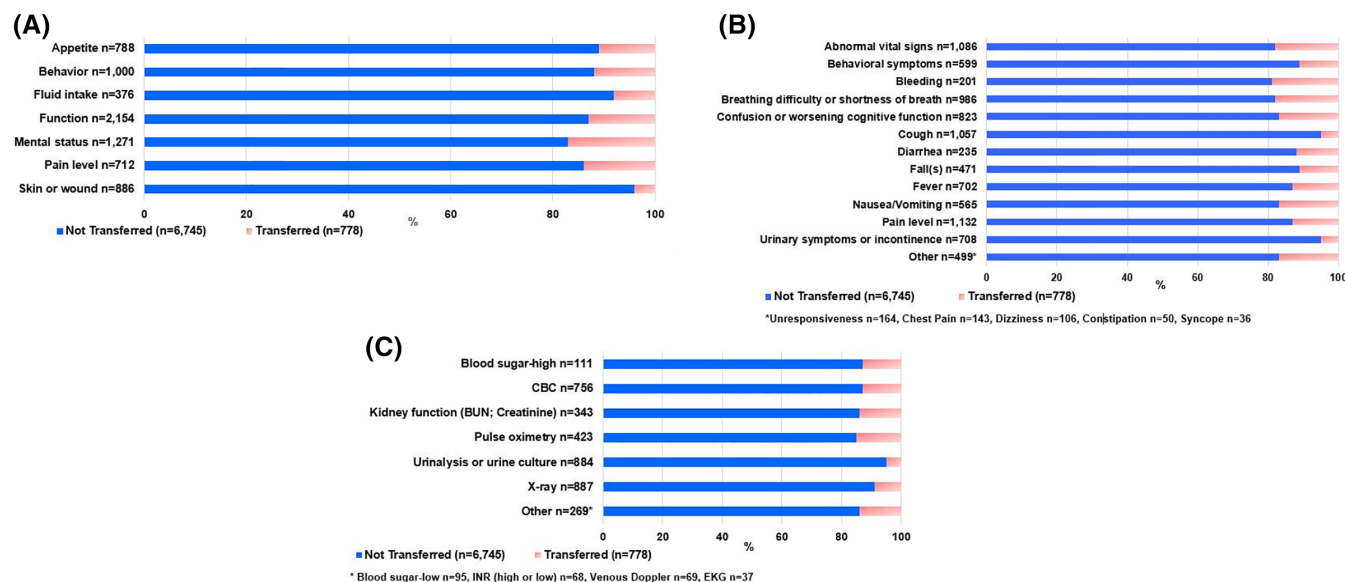
<sup>1</sup>Unresponsiveness, n = 164; chest pain, n = 143; dizziness, n = 106; constipation, n = 50; syncope, n = 36.

<sup>2</sup>Low blood sugar, n = 95; high or low international normalized ratio, n = 68; venous doppler, n = 69; electrocardiogram, n = 37.

signs. These presentations can also indicate a myriad of underlying conditions, alone or in combination, that require further evaluation. The fact that cough and shortness of breath were common symptoms highlights the importance of careful measurement of respiratory rate and pulse oximetry and assessing changes in these parameters while evaluating acute changes in condition in this population. Making a presumptive medical diagnosis in the context of these multiple nonspecific presentations and then using disease-specific protocols and assessments may result in limited clinical evaluation and an erroneous presumptive diagnosis. This is especially challenging when clinicians (physicians, nurse practitioners, physician assistants) are not available to perform the evaluation in person. For example, if an individual with a history of heart failure presents with shortness of breath, a disease-specific protocol may suggest an increase

in diuretic dose, whereas a more general approach to evaluation would consider other possibilities, such as respiratory infection and anxiety. Moreover, a disease-specific approach may limit the evaluation to the cardiovascular and respiratory examination and not include evaluation of changes in function, food and fluid intake, and altered mental status—all of which are critical to making a decision about optimal management and hospital transfer. The disease-specific approach may also neglect critical aspects of caring for the SNF population, such as identifying preferences for and goals of care, a focus on function and quality of life, and involvement of an interdisciplinary team.

The most common intervention noted was changes in medications. SNFs also frequently reported using nonpharmacological treatments and other care plan changes to manage acute changes in condition. This demonstrates a



**Figure 2.** Percentage of changes in condition that resulted in hospital transfer within 72 hours to 7 days after the change (based on 7,689 change in condition forms; more than 1 change could be reported per form). Percentage and number (transferred vs not transferred) with (A) each general change in condition, (B) new signs and symptoms, and (C) abnormal test results. See Table 3 for odds ratios.

thoughtful approach that can minimize the potential for polypharmacy and adverse drug effects. It is likely that episodes managed using medications reflect the use of antibiotics for presumed infections, analgesics for pain, and cardiovascular drugs for hypertension or exacerbations of heart failure.<sup>29,30</sup> These medication changes may be essential in managing the acute change in condition without hospitalization but may have the unintended consequence of adverse drug reactions common with these agents. Careful monitoring should be implemented when new medications are prescribed to manage an acute change in condition to minimize the risk of adverse drug effects and unnecessary hospitalizations.<sup>33,34</sup> The use of intravenous fluids was reported less frequently (6% of episodes). Although many SNFs indicate that they can administer intravenous fluids, lack of ability to initiate and maintain intravenous fluids has been cited as an important barrier to managing acute changes in condition without hospitalization in the SNF setting.<sup>7,16</sup>

The fact that only 10% of the episodes of acute change in condition were associated with hospital transfer within 3 to 7 days of the change and that 1% were associated with death demonstrates that many SNFs are capable of managing a wide variety of acute changes in condition without hospital transfer. The fact that most of these transfers were associated with different conditions than noted for the initial change in condition suggests that the individual did not respond to initial attempts at treatment or that his or her condition evolved or worsened over the initial 72-hour period. Inadequate management of acute changes in condition in the facility and complications that could worsen SNF quality measures (e.g., infection rates, falls, pressure ulcers) are potential unintended consequence of programs designed to reduce hospital transfers. To address this, we documented that implementation of the INTERACT program was not associated with adverse effects on multiple

measures of safety.<sup>35</sup> In addition, interviews with SNF staff indicated that all of the deaths reviewed that occurred during treatment of an acute change in condition were expected. Safe management of changes in condition without hospital transfer requires SNFs to have adequate numbers of well-trained nursing staff, primary care clinicians available, and rapid access to laboratory and pharmacy services to make the interventions feasible, safe, and effective.<sup>4,7,10,16</sup> Nurse practitioners teamed with physicians have been shown to be effective in reducing unnecessary hospitalizations.<sup>21,26,28</sup>

There are several important limitations of our data to consider when interpreting our results. First, this study involved a convenience sample of SNFs that were motivated to participate in an intervention trial with the goal of reducing hospital transfers. They all met basic criteria for availability of on-site clinician support and rapid availability of laboratory and pharmacy services.<sup>31</sup> Thus, our findings must be generalized carefully to SNFs that do not meet these criteria. Second, although we obtained data on several thousand transfers from more than 100 SNFs, we did not obtain a random sample of episodes of acute change in condition. Champions in each SNF selected the episodes they reported on, and they may have been biased in their selection. For example, if they preferentially selected lower-acuity episodes, our results may be biased toward healthier residents and lower rates of transfer. Third, physicians, nurse practitioners, and physician assistants were not involved in completing the CIC tools, which may have biased the reporting away from a diagnosis-oriented approach and overly emphasized the nonspecific, multiple factors reported in association with acute changes in condition. Fourth, the CIC tool allowed the champions to record multiple general changes, new symptoms and signs, test results abnormalities, and management strategies, which makes it difficult to attribute higher transfer rates to any single change in condition and may have biased



**Table 3. Odds of Hospital Transfer Associated with Various Changes in Condition**

Change in Condition	Odds Ratio (Confidence Interval)
<b>General changes in condition</b>	
Mental status	2.063 (1.739–2.446) <sup>1</sup>
Function	1.557 (1.333–1.818) <sup>1</sup>
Pain level	1.447 (1.152–1.816) <sup>1</sup>
Behavior	1.237 (1.006–1.521) <sup>1</sup>
Skin or wound	0.337 (0.239–0.474) <sup>1</sup>
Appetite	1.108 (0.876–1.402)
Fluid intake	0.777 (0.534–1.131)
<b>New symptoms or signs</b>	
Unresponsiveness	3.825 (2.707–5.405) <sup>1</sup>
Breathing difficulty or shortness of breath	2.227 (1.856–2.672) <sup>1</sup>
Abnormal vital signs	2.212 (1.853–2.640) <sup>1</sup>
Bleeding	2.074 (1.445–2.976) <sup>1</sup>
Confusion or worsening cognitive function	1.947 (1.594–2.377) <sup>1</sup>
Nausea or vomiting	1.861 (1.473–2.353) <sup>1</sup>
Fever	1.354 (1.072–1.709) <sup>1</sup>
Pain	1.317 (1.085–1.598) <sup>1</sup>
Cough	0.464 (0.352–0.611) <sup>1</sup>
Urinary symptoms or incontinence	0.453 (0.323–0.637) <sup>1</sup>
Diarrhea	1.179 (0.789–1.762)
Fall(s)	1.093 (0.811–1.472)
Behavioral symptoms	1.085 (0.830–1.417)
<b>Abnormal test results</b>	
Pulse oximetry	1.577 (1.193–2.084) <sup>1</sup>
Kidney function (blood urea nitrogen, creatinine)	1.443 (1.053–1.976) <sup>1</sup>
Complete blood count	1.363 (1.087–1.708) <sup>1</sup>
Urinalysis or urine culture	0.400 (0.291–0.551) <sup>1</sup>
High blood sugar	1.638 (0.939–2.857)
X-ray	0.848 (0.665–1.081)

Data based on 7,689 Change in Condition forms. More than 1 change and more than 1 treatment could be reported per form.

<sup>1</sup>Changes for which the confidence interval did not cross 1.

the reporting toward multiple changes, especially in sicker individuals.

Nevertheless, we believe the data presented have important implications for designing clinical programs, tools, and measures that address potentially avoidable hospital transfers, hospitalizations, and hospital readmissions. Programs and tools, and education related to them, should account for the multifactorial and nonspecific nature of acute changes in condition in the SNF population. Similarly, as CMS continues its focus on value-based care, regulations, surveyor guidance, and quality measures must account for the nature and progression of the clinical presentation of acute changes in condition so that health professionals working in SNFs are rewarded, not penalized, for efforts to reduce unnecessary hospitalizations and related complications and costs.

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**Conflict of Interest:** Dr. Ouslander has received support through Florida Atlantic University for research on INTERACT from the National Institutes of Health, CMS, Commonwealth Fund, Retirement Research Foundation, Florida Medical Malpractice Joint Underwriting Association, PointClickCare, Medline Industries, and Think Research. Dr. Ouslander and his wife had ownership interest in INTERACT Training, Education, and Management Strategies, LLC, which had a license agreement with Florida Atlantic University for use of INTERACT materials and trademark for training during the time of the study, and now receive royalties from Pathway Health, which currently holds the license. Dr. Ouslander serves as a paid advisor to Pathway Health, Think Research, and Curavi. Work on funded INTERACT research is subject to the terms of Conflict of Interest Management plans developed and approved by the Florida Atlantic University Financial Conflict of Interest Committee. Drs. Engstrom and Reyes receive support from the Florida Medical Malpractice Joint Underwriting Association and PointClickCare.

**Author Contributions:** Ouslander, Tappen: design, analyses, manuscript preparation. Engstrom: design, data collection, analyses, manuscript preparation. Reyes, Gray-Miceli: analyses, manuscript preparation. Rojido: data collection, manuscript preparation.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

**Supplemental Figure 1.** Section d. of the Interventions to Reduce Acute Care Transfers (INTERACT) Quality Improvement Tool includes a list of changes in condition on the INTERACT Quality Improvement Review Tool used for the online Change in Condition without Transfer Tool.

**Supplemental Figure 2.** Selected screen shots from the online Change in Condition without Transfer Tool, including instructions.

**Supplemental Table 1.** Various combinations of general changes in condition, new symptoms or signs, and abnormal test results reported on the CIC tools. The columns indicate the number of times other changes were reported in addition to the presenting change listed in the row line. For example, appetite change was noted in 788 of the episodes, and in 182 of these episodes a change in behavior was also noted.

**Supplemental Figure 3.** Treatments provided for changes in condition that did and did not result in hospital transfer between 3 and 7 days.

**Supplemental Figure 4.** Percentage of changes in condition, new symptoms, and abnormal diagnostic test results that resulted in hospital transfer between 3 and 7 days after the change according to number of changes reported (based on 7,689 change in condition forms; more than one change and more than one treatment could be reported per form). The odds of transfer were 2.0–2.5 times as high when 4 or more changes were reported on the same CIC tool as when 1 change was reported.

**Supplemental Figure 5.** Percentage of changes in condition that resulted in hospital transfer between 3 and 7 days after the change for which the same change in condition was listed for the initial change and the reason for transfer. The remainder of transfers occurred for reasons other than the initial change in condition that was evaluated (based on 7,689 change in condition forms; more than one change and more than one treatment could be reported per form). The various combinations of reasons noted for transfer are illustrated in **Supplementary Table 2**.