A Descriptive Analysis of a Nursing Home Clinical Information System with Decision Support

by Gregory L. Alexander, PhD, RN

Abstract

Clinical information systems are absent in most nursing homes. Therefore, the vast numbers of elderly people who reside in the facilities are not reaping the benefits that these systems are thought to have, including better management of chronic conditions, greater efficiencies, and improved access to information. It is important for early adopters of nursing home information systems to share experiences to foster implementation of other systems and improve design and evaluation of these systems. The purpose of this study is to describe the activity of clinical decision support alerts and associated triggers during an analysis of an information system implemented in three nursing homes. The proportion of triggers used for each active alert in each alert category is described across resident diagnoses within the nursing home decision support system during six months of data collection.

Key Words

Nursing home, technology, clinical decision support, quality of care

Introduction

Leading healthcare organizations have stressed the importance of integrating information technology (IT) into healthcare systems to improve provider practices, increase the quality of patient care, and reduce medical errors.[1, 2] One missing link plaguing the deployment of technology into healthcare is how to incorporate practical, usable clinical information systems into the work environment of providers.[3] This missing link is most evident in the organizational structure of nursing homes.[4]

Clinical IT systems are absent in most nursing homes; however, a few homes are implementing highly sophisticated technology into their workflow to support resident management, enhance clinical support services, and improve administrative oversight.[5, 6] Describing the experiences of early adopters of clinical IT provides detail about successes and failures for those who adopt these systems later. Sharing this knowledge results in convergence of IT design and practice, better management and rollout of information systems in these settings, more effective IT leadership, and better-defined strategies for technology evaluation, system use, and outcome measurement.[7]

Improvements in nursing home care quality cannot be expected until IT is implemented that provides accurate measures of the actual care provided to residents.[8] Clinical data stored in an information system assists us to define the type of care documented and perhaps delivered to residents of the nursing home. Analyses of alert and trigger frequencies in decision support systems have important implications. For example, triggers or alerts with higher frequencies would be an important focus during implementation if limited resources were available to address the alerts; additionally, alerts or triggers associated with more positive resident outcomes would also be an important focus for quality and risk management oversight. The purpose of this study was to describe the activity of clinical decision support alerts and associated triggers using data gathered during an analysis of an information system called OneTouch Technology (now Optimus EMR, Inc.) that was implemented in three nursing homes. The proportion of triggers for each active alert in each alert category is described across resident diagnoses within the nursing home decision support system during six months of data collection.

Within this study, an alert is defined as a clinical decision support mechanism that automatically sends an automated message to an end user; the trigger is the mechanism, (including logic) that generates the alert sent to the end user as notification of a potential patient problem. Figure 1 illustrates the relationships between the alerts (automated messages) and triggers (set of rules that negotiate clinical assessments) that generate clinical alerts if a rule is satisfied. Alert categories included the following:

- dehydration
- constipation
- skin integrity
- weight loss
- weight gain
- decline in condition
- improvement in condition

A trigger is a predetermined criterion within the resident assessment data that is used to make a clinical alert active. Table 1 describes the clinical alerts and associated triggers within the resident assessment data in the OneTouch system at the time of this evaluation. Triggers are used by clinicians to identify new resident conditions or changes in existing conditions. In response, alert frequencies may rise if triggers are repetitively used or fall if triggers are not selected by the staff. Rising alert frequencies can lead to alert fatigue, resulting in decreased user responsiveness to the alerts.

In this study, alerts and triggers can indicate either positive (improvement in condition) or negative (decline in condition) resident changes. For example, in this decision support system, a dehydration alert is sent to a provider if an episode of bowel incontinence, fever, insufficient fluid intake, or emesis is reported within a 24-hour period (Table 1). Additionally, a dehydration alert is issued if 25 percent or more of food is left uneaten at meals. In contrast, some alerts in this system are based on significant changes documented by providers on successive clinical assessments rather than episodic events. A decline in condition alert is sent to an end user if the ability to make decisions declines over two successive minimum data set (MDS) assessments (see Table 1). MDS assessments are specialized assessments required to be performed at admission, quarterly, and in the event of a significant change in condition for any nursing home resident.

Research Question

Clinical IT in nursing homes is expected to facilitate management of chronic conditions, support the delivery of effective patient care, and improve efficiency by avoiding waste of equipment, supplies, and energy.[9] Potential uses of IT in nursing homes include the use of clinical decision support mechanisms at the point of care to make the most appropriate treatment options available for providers, increase accessibility of evidence-based protocols specific for nursing home residents, enhance data collection, and

allow more rigorous analysis of outcomes.[10] In this study, investigators sought to determine the frequency and types of triggers in active alerts in a clinical decision support system for residents with specified diagnoses during six months of data collection. The research question was as follows:

What is the proportion of triggers for each active alert in each alert category within and across resident diagnoses?

Background

A resident in a nursing home receives care from a multitude of providers including physicians, nurses, nurse's aides, medical technicians, physical therapists, dieticians, and others. All of these professionals provide necessary treatments, education, and assessments that are recorded in medical records. The motivation for developing clinical information systems in these settings is to allow multiple stakeholders to have access to patient information from anywhere in order to make the best possible decisions about resident care. The goal of the clinical information system with decision support is to facilitate multiple, coordinated, asynchronous interactions between providers while enhancing decision making through better artificial intelligence; to coordinate resident data from all the sources listed; and to organize the data to facilitate explicit decision support for computer-mediated evidence-based care.[11]

The data flow diagram in Figure 1 shows the relationships between the entities (persons, places, things, and events) in a nursing home clinical information system with decision support. A data flow diagram groups data into entities, or objects that exist and are distinguishable from other objects, lists the relationships between those entities, and illustrates how data is maintained and stored.

The rectangles in Figure 1 represent names of entities. The data flow, or the movement of data collected by each entity, is illustrated by the solid line between two entities; the name of the data flow is given above the line. In this study, the frequency of documentation of clinical assessment data, triggers, and alerts is evaluated. The staff provides important clinical data about residents that populate the electronic fields in the resident assessment. When the data is entered into the clinical information system, the internal decision support system negotiates the rules table, comparing the clinical data to evidence-based protocols that are part of the rules table. When the clinical data and evidence-based protocols don't match, an alert with a time and date stamp notifies the staff of the change in condition. In theory, these alerts should then prompt the staff to take action, which should be documented in care plans, daily progress notes, task lists generated by the staff to direct care delivery, interventions performed by staff members, and progress made toward resident goals.

Method

Selection and description of participants

The three nursing homes in this study were participants in a more comprehensive study to investigate the use of a point-of-care clinical information system (provided by the OneTouch Technology) to demonstrate how IT can improve quality of care.[12] All procedures were approved by the university's Institutional Review Board before the study began. Data obtained during this study included all patient care data recorded by the nursing home staff in each of the three facilities, starting six months after implementation and ending 12 months after implementation. Facility and resident characteristics are shown in Table 2.

The evaluation study used a stratified purposive approach to recruit facilities. Facility size was taken into account during the recruitment phase. Additionally, nursing home facilities representing profit, not-for-profit, and governmental ownership structures were represented. Resident characteristics of the facilities around the time of the study are described using Nursing Home Compare data downloaded from the Centers for Medicare and Medicaid Services national database during the first quarters of 2004 and 2005, as shown in Table 2.

Nursing home technology

The OneTouch system provided point-of-care technology that enabled healthcare providers to access and enter resident information outside of confined nursing stations. Few nursing homes have incorporated integrated clinical information systems into their clinical practices to support clinical practice, enhance clinical support between different providers (laboratory, physical therapy, social services, etc.), and provide better administrative oversight.[13] The point-of-care modules in the OneTouch system integrated specialized technology that facilitated electronic tracking of resident care, provided personal digital assistants for data entry, and used wireless remote technology to enable wider access to patient data and decision making. Benefits and limitations of this technology have been described previously, including the ability to track resident care back to providers and the ability to view resident care from many places in the facility.[14] At the time of this study, integrated systems used by the nursing home staff included clinical alerts, provider-to-provider messages, nurse assistant task lists, care plan items, treatments, electronic medication administration, and more.

Clinical alerts and triggers

Automated clinical alerts in the OneTouch system assist in identifying when a resident might be experiencing constipation, dehydration, a skin integrity change, weight loss, weight gain, or other changes in condition. Each alert mechanism has a specific alert calculation. Alert calculations incorporate triggers selected by the staff during a resident assessment that defines current clinical conditions (see Table 1). Triggers are identified and alerts become active when data collected by the nursing home staff at the point of care are combined with detailed data elements from resident assessment data into a relational database. Immediate access to this database through electronic information displays and system reports can be used to manage resident care activities more quickly and efficiently.

Data collection procedures

Resident data were collected during the six-month period noted in Table 2 at each of the nursing homes. The data from each of the nursing homes were received on a preformatted hard disk and loaded into an Access (v. 2003) database for analysis. Before data were provided for analysis, all resident and facility identifying information was removed; fictitious unique facility and resident identifiers were assigned in the dataset to replace nursing home and resident names.

Statistics

The OneTouch dataset was queried daily for six months to identify the types of alerts activated and triggers selected for each facility. While controlling for specific categories of alerts and the primary resident diagnosis, descriptive statistics were used to identify trends in trigger frequencies for active alerts in each alert category during the six-month period. Each alert category and patient diagnosis was given a unique dummy-coded variable to allow them to be manipulated in the dataset. The frequencies and types of triggers associated with active alerts for each diagnosis type were determined and will be reported here. All statistical analysis was performed using SPSS version 14.0 and Excel.

Results

Alert activity at the facility level

Initial daily queries of active alert data were evaluated to observe patterns at the facility level. The investigator assumed that there would be significant variability among daily alert frequencies based on the diversity of care delivered to residents, changes in chronic conditions, and complexity of care.[15] However, contrarily, little to no variation in alert frequencies was noted during the analysis period in all three facilities.

In Facility A, during the first 10 days no active alerts or triggers were documented for dehydration, decline in condition, weight loss, or weight gain; conversely, on a consistent daily basis there were 136

constipation alerts, three skin integrity alerts, and 40 improvement in condition alerts. Similarly from day 21 of the fourth month to the last day of the sixth month, all alert counts were the same. From day 11 of the first month to day 20 of the fourth month, there was variable activity in all alert categories.

There was frequent variability in Facility B beginning day one of the first month and continuing to day 25 of the second month, when suddenly all daily alert totals for each category became consistently the same. In Facility C, total active daily alerts remained consistent during the entire six-month period of data collection. In facility C no active alerts occurred for the entire period for skin integrity, dehydration, or decline in condition. Consistently, daily active alert totals were 83 and 18 throughout the six months.

As a result, only active alerts and associated triggers from day 11 of the first month to day 20 of the fourth month in Facility A and day 1 of the first month to day 24 of the second month in Facility B were included in this analysis, for a total of 155 days of alert activity. Since no variability in the alerts was noticed in Facility C, data from that facility were not used. For more results and discussion of alert frequencies and potential reasons for these findings, see other studies by this investigator.[16–18] The remainder of this section discusses the trigger frequencies associated with these active alerts and the types of resident diagnoses they were associated with.

Trigger frequencies by resident diagnosis

A total of 172 residents with eight primary diagnoses were included in this analysis (see tables 3–10). The largest category (52 percent) included 89 residents who had ventilation pneumonitis as their primary diagnosis. These residents had nearly 17,000 triggers selected by the staff during the 155 clinical days considered in this evaluation (see Table 3). The most frequent trigger within this category was related to the amount of food left uneaten, which resulted in an active dehydration alert. The proportion of food left uneaten was vigilantly documented by the staff; this trigger, which was associated with the dehydration alert, was in the top two of all triggers for every resident diagnosis. Its use ranged from 39.73 in residents with ventilation pneumonitis (Table 3) to 21.92 percent in residents with osteoarthritis (Table 9).

A large number of residents in the sample had neurological issues. Residents with Alzheimer's disease (Table 4) represented 7.5 percent of cases. Dietary intake, continence, positioning, and emotional level were some of the most frequent triggers selected for this group of residents. Other important triggers, although selected less frequently in this class of residents, were the changing level of locomotion on and off the unit and the ability to walk in corridors.

Eighteen residents in this study had experienced cerebral vascular accidents (CVAs) (Table 5). Amount eaten at meals (28.79 percent), urinary continence (21.58 percent), and hydration status (5.87 percent) were the most frequently selected triggers for residents with CVAs. Twenty residents with a dementia diagnosis (Table 6) had 9263 triggers selected during the study period; 29 percent were for bladder incontinence, which related to the skin integrity alert. Bladder incontinence was also the most frequently selected trigger (26.89 percent) in residents with osteoarthritis (Table 9). Bladder incontinence is another assessment parameter that seems to be monitored closely. Bladder incontinence was the second most frequent trigger selected in residents with Alzheimer's disease, hypertension, cerebral vascular accidents, pneumonia, and depressive disorders.

A smaller number of residents (seven) in this study were experiencing a depressive disorder (Table 7). Again, dietary intake at meals and bladder incontinence were observed most frequently by the staff for residents with this diagnosis. The staff also documented other individualized assessments in this group of residents, including the ability to make decisions, performance of personal hygiene measures, and increased or decreased dressing, which all related to the clinical alert of improvement or decline in condition.

A wider range of assessments were selected by the staff for the 11 residents who had a primary diagnosis of hypertension (Table 8). Although the majority of the triggers indicated that residents left their meals uneaten and were incontinent, other important information documented for these residents

included locomotion, walking and transferring activities, changes in behavioral symptoms, amount of toilet use, and ability to make decisions.

The most frequent triggers selected in the residents with osteoarthritis were related to bladder and bowel incontinence, the maintenance of turning and repositioning programs, and mobility (Table 9). Emotional levels, personal hygiene, and ability to make decisions were also part of these residents' individualized assessments.

For the residents with pneumonia (Table 10), dietary intake, continence, mobility, and maintenance of proper positioning accounted for the majority of computerized triggers selected. Less frequently, assessments regarding changes in their overall condition and self-care abilities were documented.

The percentages of weight gain and weight loss were documented less frequently for residents under each diagnosis. Weight loss and gain was documented in the system as a percentage of total weight. Weight loss of 3.5 percent of the resident's total body weight over 30 days or 7 percent over 180 days resulted in an active alert. Weight gain of greater than 3.5 percent of the resident's total body weight over 30 days or 7 percent over 180 days resulted in an active alert.

Discussion

Anecdotal evidence during the evaluation and implementation of the decision support system indicated that the nursing home staff accepted the technology, although some staff members did not.[19] Important factors shaping use of the system included staff perception of how the system functioned, resources available to assist with trouble-shooting of system problems, equipment availability, and preparation for the process change. In regard to system functioning, staff members indicated they were not always aware of where alert messages existed in the system and how to address them once they found them. For example, the staff members were not able to tell which triggers were responsible for activating an alert; therefore, they did not know how to respond appropriately to an active alert. Resources and equipment availability were important for maintaining integrity of the data. Staff members indicated if there was not enough equipment, they didn't document care given. Finally, the staff was frustrated and confused by the lack of standardization of terminologies during the conversion process, which in some facilities resulted in necessary care being omitted. In decision-support systems, accuracy of alerts is dependent on data integrity, responsiveness to resident needs, and consistent documentation about resident assessments and care delivered. Therefore, it is vital to conduct ongoing evaluation of these systems to determine the effect of usage on resident care outcomes.

By far, the most frequently documented assessment parameters were related to dietary intake, continence, hydration status, and maintenance of positioning programs. Given the percentages of residents and their conditions reported in the Nursing Home Compare dataset for 2004 and 2005 (Table 2), finding greater documentation of these types of assessments is not really that surprising. During the time this study was conducted, a significant number of incontinent residents were present, including low-risk residents who lost control of their bowel or bladder (30–80 percent), while very few residents (1–10 percent) had a catheter inserted and/or left in their bladder. Another contributing factor was that large numbers of residents experienced mobility problems and required more help performing their activities of daily living (see Table 2). Residents with these types of needs require more help getting to and from meals that provide adequate nourishment and prevention of dehydration.

The consistent maintenance of a positioning program to ensure that skin remained intact was also frequently not documented by the staff, resulting in more frequent skin integrity alerts. One consistent observation across the facilities is the decline of the percentage of high-risk residents with pressure ulcers from year one to year two (Table 2). The purpose of this study was not to empirically test the effect of clinical information systems on resident outcomes; however, it is certainly worth noting that increased reminders to all staff members at the point of care regarding positioning draws attention to these

important programs, resulting in better maintenance and decreased pressure sore development. This would be consistent with findings from other related studies.[20]

An additional factor that might have contributed to the documentation of positioning was the significant numbers of residents that were being restrained in these facilities, as high as 12 percent (Table 2). Restraining residents limits their ability to move about and reposition themselves independently; it also prevents them from getting up and going to the bathroom. Therefore, in facilities that have high numbers of residents that are physically restrained, incontinence, positioning, and hydration will be more frequently assessed and a greater number of triggers will be documented by the staff for these conditions.

The opportunity to develop other types of clinical alerts exists for this clinical decision support system, including the development of an alert and triggers associated with resident pain levels. At the time of this study, no alerts or triggers were being used in the OneTouch system to identify when a resident was experiencing increased pain or relief from preexisting pain. In these facilities 20 to 40 percent of the short-stay residents were experiencing moderate to severe pain; less frequently, the longer term residents were experiencing painful episodes (3–14 percent; see Table 2). The ability to document and improve awareness of resident pain through better decision support would lead to earlier intervention and a better quality of life for nursing home residents.

Limitations

This study has limitations. The small number of nursing homes included in the study, all of which are located in one state, affects generalizability. However, as stated, very few nursing homes have implemented such systems; therefore, the significance of this project lies in describing how early adopters of clinical information systems with decision support are using these systems and how the data can be used to describe resident care.

Another limitation lies in the assumptions made about the clinical information in the decision support system captured in this study. Because of the lack of variability, an assumption was made by the investigators that something was happening in the facilities during those periods affecting the quality of the decision support data, and therefore some periods were not included. Based on anecdotal evidence, causes of this lack of variability included poor clinical documentation resulting in loss of data integrity, lack of existing in-house clinical IT support to educate users about the function of triggers and location of alert messages, and alert fatigue or poor response to alerts caused by constant electronic end-user messaging to the staff. Anecdotal evidence from observations and interviews of staff members at the time of this study indicate that there was concern about these causal factors and their effect on the system.

Conversely, another assumption was made that when there was variable data, the quality of the decision support system was intact. Researchers assumed that the variability of assessments increased as documentation changed between assessments and as effective clinical responses occurred to the procedures performed by care providers. For example, the most frequent trigger chosen (29 percent) was bladder incontinence for residents with dementia in Facility B, while in comparison, the Facility A staff used this trigger much less frequently (6 percent). These assumptions cannot be proven since the investigators were not physically present when all the data were collected. One remedy for this situation was to describe the makeup of the resident population physically present in the facilities using the Nursing Home Compare dataset as discussed. The frequency of documented triggers appears to align with potential problems likely to be experienced by high percentages of residents according to the nursing home quality measures.

Conclusion

The analysis of nursing homes that are early adopters of clinical information systems with decision support provides significant details on how these tools are being used for resident care. These assessments

inform developers how providers use the current system and identify potential areas of future development, which leads to greater convergence between system design and practice. Linking the designers and the users of nursing home information systems is a critical step in creating information structures that are practical and usable in these settings.

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Notes

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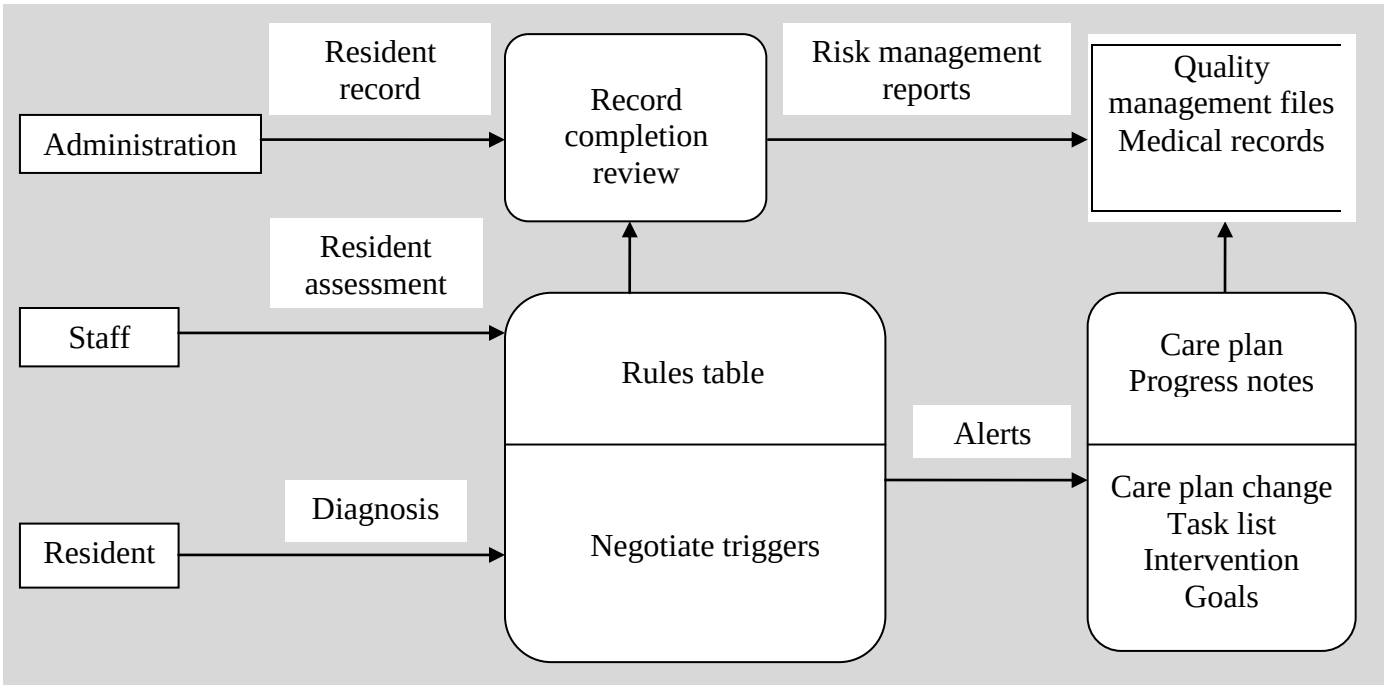
Table 1
Alert Calculations

Alert Type	Triggers
Dehydration	Diarrhea reported within last 24 hours Weight loss of 3 or more pounds reported over last 7 days Dehydration reported within last 24 hours Insufficient fluids reported within last 24 hours Fever reported in last 24 hours Vomiting reported in last 24 hours 25% or more of food left uneaten at most meals reported twice within last 48 hours
Constipation	Regular bowel movement not reported within last 48 hours Constipation reported within last 24 hours Fecal impaction reported within last 24 hours
Skin integrity	Resident reported as comatose Decisions of daily life reported as severely impaired Bowel movements reported as incontinent twice in last 48 hours Bladder voiding reported as incontinent twice in last 48 hours Resident has a diagnosis of diabetes mellitus Resident has a diagnosis of peripheral vascular disease Resident has a diagnosis of dementia—other than Alzheimer's Resident has an antibiotic-resistant infection Resident has edema Resident has an infection of the foot Turning and repositioning program is ordered but has not occurred within last 6 hours
*Decline in condition	Decision making on the last †MDS was answered as a 0 or 1 and has increased to a 2 or 3 based on today's data Sad or anxious on the last MDS was answered as a 0 or 1 and has increased to a 2 based on today's data The sum of the answers for behavior symptoms, ‡E4Ab–E4Eb on the last MDS, has increased based on today's data §ADL's G1Aa – G1Ja on the last MDS have increased based on today's data Bowel or bladder continence on the last MDS, ‖H1a or H1b, was answered as a 0, 1, or 2 and either has increased to a 3 or 4 based on today's data, or an indwelling catheter was inserted Stability of conditions, ¶J5a, was unchecked on the last MDS but based on today's data would be checked Weight loss, #K3a on the last MDS, was answered as no but would be answered with yes based on today's data

	The highest stage of pressure ulcers, **M2a on the last MDS, was answered with stage None or stage 1 and based on today's data would be answered with stage 2 or higher Trunk restraints indicated as not used on the last MDS would be answered with used less than daily or used daily based on today's data Overall condition was answered with no change or improved on the last MDS and would be answered with deteriorated based on today's data
*Improvement in condition	Decision making on the last MDS was answered as a 2 or 3 and has decreased to a 0 or 1 based on today's data The sum of the answers for behavior symptoms, E4Ab–E4Eb on the last MDS, has decreased based on today's data ADL's G1Aa–G1Ja on the last MDS have decreased based on today's data Bowel or bladder continence on the last MDS, H1a or H1b, was answered as a 3 or 4 and either has decreased to a 0, 1, or 2 based on today's data, or an indwelling catheter was removed Overall condition was answered with deteriorated on the last MDS and would be answered with no change or improved based on today's data
Weight loss	Weight loss of equal to or greater than 3.5% of the resident's total body weight over period of 30 days or 7% over 180 days based on today's data
Weight gain	Weight gain of equal to greater than 3.5% of the resident's total body weight over period 30 days or 7% over 180 days based on today's data

*Will become active when any two of the triggers are selected
†Minimum data set
‡Behavior symptom alterability
§Activities of Daily Living Self Performance Rating
||Bowel continence or bladder continence
¶Conditions/diseases lead to instability
#Weight loss
**Pressure ulcer

Figure 1
Data Flow Diagram of Nursing Home Clinical Information System with Decision Support



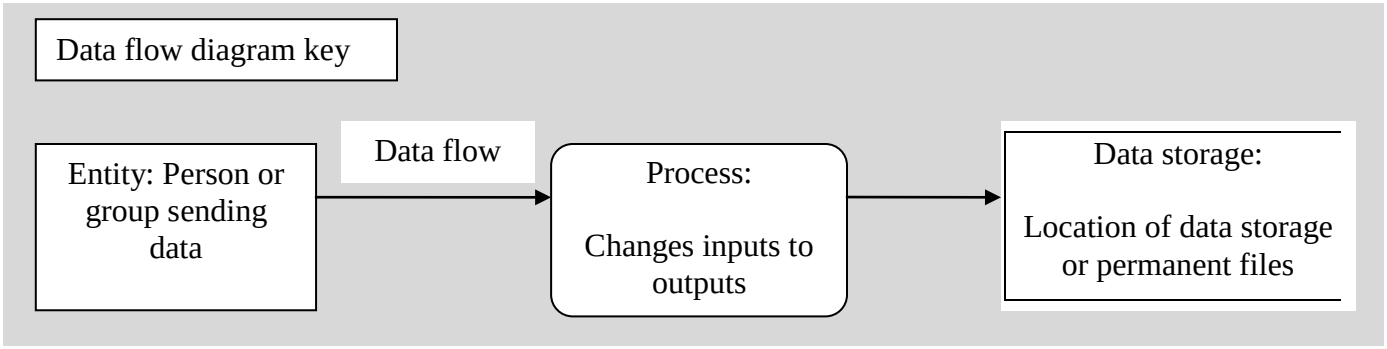


Table 2
Nursing Home Quality Measures (QM)

	Facility A*		Facility B**		Facility C***	
	%		%		%	
Bed size (Occupancy rate)	240 (95)		180 (68)		98 (96)	
Ownership	Nonprofit		Government		For Profit	
	2004	2005	2004	2005	2004	2005
High-risk residents who have pressure sores	14	4	13	5	20	9
Low-risk residents who have pressure sores	0	0	4	6	0	0
Residents who spend most of their time in bed or in a chair	3	2	6	8	1	3
Residents with a urinary tract infection	15	21	10	9	5	4
Residents who are more depressed or anxious	8	21	40	22	14	20
Low-risk residents who lose control of their bowels or bladder	75	80	30	40	51	75
Residents whose need for help with daily activities has increased	19	21	27	17	15	19
Residents whose ability to move about in and around their room got worse	9	22	22	25	23	20
Residents who were physically restrained	12	8	12	12	1	0
Residents who have moderate to severe pain	4	4	7	3	14	6
Residents who have/had a catheter inserted and left in their bladder	1	5	10	7	5	6
Short-stay residents who had moderate to severe pain	28	38	20	25	41	24
Short-stay residents with delirium	5	0	4	2	1	3
Short-stay residents with pressure sores	19	13	31	24	25	11

Source: Centers for Medicare and Medicaid Services (February 2004 and February 2005)

Study collection dates: *March–September 2004; **January–July 2004; ***August 2004–February 2005

Table 3
Residents with Ventilation Pneumonitis (89)

Alerts	Triggers	Active Triggers (16,961)	
Dehydration	Left 25% or more of food uneaten.	6738	39.73%
	Insufficient fluids.	280	1.65%
	Dehydrated. Output exceeds input.	180	1.06%
Constipation	Regular bowel movement has not occurred (within last 72 hours).	1123	6.62%
Skin integrity	Bladder incontinent.	1018	6.00%
	Turning or repositioning program has not occurred (within last 6 hours).	433	2.55%
	Bowel incontinent.	204	1.20%
Improvement in condition	Decision making decreased from 2 to 0	591	3.48%
	Bladder continence decreased from 4 to 2	484	2.85%
	Bladder continence decreased from 3 to 2	439	2.59%
	Personal hygiene decreased from 4 to 3	413	2.43%
	Walk in room decreased from 8 to 3	331	1.95%
	Decision making decreased from 3 to 0	313	1.85%
	Toilet use decreased from 4 to 3	294	1.73%
	Locomotion on unit decreased from 4 to 3	277	1.63%
	Dressing decreased from 4 to 3	249	1.47%
	Behavioral symptoms decreased from 1 to 0	207	1.22%
	Transfer decreased from 4 to 3	179	1.06%
	Locomotion off unit decreased from 4 to 3	178	1.05%
	Walk in corridor decreased from 8 to 3	175	1.03%

Table 4
Residents with Alzheimer's Disease (13)

Alerts	Triggers	Active Triggers (5578)	
Dehydration	Left 25% or more of food uneaten.	1571	28.16%
	Dehydrated. Output exceeds input.	174	3.12%
Skin integrity	Bladder incontinent.	1181	21.17%
	Bowel incontinent.	215	3.85%
	Turning or repositioning program has not occurred (within last 6 hours).	206	3.69%
Improvement in condition	Bladder continence decreased from 3 to 2	145	2.60%
	Sad or anxious increased from 1 to 2	83	1.49%
	Locomotion on unit decreased from 4 to 3	79	1.42%
	Decision making decreased from 2 to 1	79	1.42%
	Locomotion off unit decreased from 4 to 3	72	1.29%
	Walk in corridor decreased from 8 to 3	64	1.15%
	Decision making decreased from 2 to 0	55	0.99%
	Bladder continence decreased from 4 to 2	55	0.99%
	Locomotion off unit decreased from 8 to 3	41	0.74%
	Walk in room decreased from 8 to 3	35	0.63%
Decline in condition	Decisions of daily life severely impaired.	65	1.17%
	Locomotion off unit increased from 2 to 3	38	0.68%
	Eating increased from 0 to 3	31	0.56%
Constipation	Regular bowel movement has not occurred (within last 72 hours).	57	1.02%

Table 5
Residents with Cerebral Vascular Accident (18)

Alerts	Triggers	Active Triggers (4380)	
Dehydrated	Left 25% or more of food uneaten.	1261	28.79%
	Dehydrated. Output exceeds input.	257	5.87%
	Diarrhea.	18	0.41%
Skin integrity	Bladder incontinent.	945	21.58%
	Turning or repositioning program has not occurred (within last 6 hours).	165	3.77%
	Bowel incontinent.	148	3.38%
Incontinence	Regular bowel movement has not occurred (within last 72 hours).	158	3.61%
Improvement in condition	Bladder continence decreased from 3 to 2	121	2.76%
	Locomotion off unit decreased from 4 to 3	60	1.37%
	Eating decreased from 1 to 0	57	1.30%
	Locomotion on unit decreased from 4 to 3	54	1.23%
	Walk in corridor decreased from 8 to 3	52	1.19%
	Walk in room decreased from 8 to 3	48	1.10%
	Decision making decreased from 2 to 0	44	1.00%
	Bladder continence decreased from 4 to 2	41	0.94%
	Walk in corridor decreased from 1 to 0	25	0.57%
Decline in condition	Sad or anxious increased from 0 to 2	42	0.96%
	Decisions of daily life severely impaired.	33	0.75%
	Locomotion off unit increased from 1 to 3	26	0.59%
	Bowel continence increased from 2 to 3	23	0.53%

Table 6
Residents with Dementia (20)

Alerts	Triggers	Active Triggers (9263)	
Skin integrity	Bladder incontinent.	2686	29.00%
	Bowel incontinent.	351	3.79%
	Turning or repositioning program has not occurred (within last 6 hours).	344	3.71%
Dehydration	Left 25% or more of food uneaten.	2233	24.11%
	Dehydrated. Output exceeds input.	299	3.23%
	Diarrhea.	48	0.52%
Improvement in condition	Bladder continence decreased from 3 to 2	254	2.74%
	Locomotion off unit decreased from 4 to 3	176	1.90%
	Bladder continence decreased from 4 to 2	117	1.26%
	Decision making decreased from 2 to 1	112	1.21%
	Decision making decreased from 2 to 0	98	1.06%
	Decision making decreased from 3 to 0	96	1.04%
	Walk in corridor decreased from 8 to 3	92	0.99%
	Locomotion on unit decreased from 1 to 0	60	0.65%
	Eating decreased from 1 to 0	52	0.56%
	Walk in corridor decreased from 1 to 0	46	0.50%
	Toilet use decreased from 3 to 2	46	0.50%
Decline in condition	Decisions of daily life severely impaired.	66	0.71%
	Locomotion off unit increased from 1 to 3	58	0.63%
Incontinence	Regular bowel movement has not occurred (within last 72 hours).	49	0.53%

Table 7
Residents with Depressive Disorder (7)

Alerts	Triggers	Active Triggers (2379)	
Dehydration	Left 25% or more of food uneaten.	733	30.81%
	Dehydrated. Output exceeds input.	99	4.16%
Skin integrity	Bladder incontinent.	620	26.06%
	Turning or repositioning program has not occurred (within last 6 hours).	86	3.61%
	Bowel incontinent.	69	2.90%
Improvement in condition	Decision making decreased from 2 to 0	53	2.23%
	Bladder continence decreased from 3 to 2	45	1.89%
	Walk in corridor decreased from 8 to 3	44	1.85%
	Bladder continence decreased from 4 to 2	29	1.22%
	Personal hygiene decreased from 3 to 2	25	1.05%
	Walk in room decreased from 8 to 3	21	0.88%
	Dressing decreased from 3 to 2	19	0.80%
	Locomotion off unit decreased from 4 to 3	16	0.67%
	Decision making decreased from 2 to 1	15	0.63%
	Locomotion on unit decreased from 1 to 0	14	0.59%
	Bowel continence decreased from 3 to 2	14	0.59%
	Locomotion off unit decreased from 4 to 2	13	0.55%
	Decision making decreased from 3 to 0	12	0.50%
Incontinence	Regular bowel movement has not occurred (within last 72 hours).	50	2.10%
Decline in condition	Dressing increased from 2 to 3	16	0.67%

Table 8
Residents with Hypertension (11)

Alerts	Triggers	Active Triggers (4644)	
Dehydration	Left 25% or more of food uneaten.	1298	27.95%
	Dehydrated. Output exceeds input.	183	3.94%
Skin integrity	Bladder incontinent.	834	17.96%
	Turning or repositioning program has not occurred (within last 6 hours).	132	2.84%
	Bowel incontinent.	68	1.46%
Improvement in condition	Bladder continence decreased from 3 to 2	132	2.84%
	Decision making decreased from 2 to 0	103	2.22%
	Locomotion off unit decreased from 4 to 3	89	1.92%
	Walk in corridor decreased from 8 to 3	69	1.49%
	Eating decreased from 1 to 0	59	1.27%
	Bladder continence decreased from 4 to 2	56	1.21%
	Walk in room decreased from 8 to 3	56	1.21%
	Locomotion on unit decreased from 4 to 3	53	1.14%
	Transfer decreased from 4 to 3	52	1.12%
	Toilet use decreased from 1 to 0	35	0.75%
	Decision making decreased from 2 to 1	31	0.67%
	Behavioral symptoms decreased from 1 to 0	31	0.67%
	Personal hygiene decreased from 4 to 3	28	0.60%
	Dressing decreased from 4 to 3	28	0.60%
Incontinence	Regular bowel movement has not occurred (within last 72 hours).	66	1.42%

Table 9
Residents with Osteoarthritis (7)

Alerts	Triggers	Active Triggers (3399)	
Skin integrity	Bladder incontinent.	914	26.89%
	Turning or repositioning program has not occurred (within last 6 hours).	110	3.24%
	Bowel incontinent.	56	1.65%
Dehydration	Left 25% or more of food uneaten.	745	21.92%
	Dehydrated. Output exceeds input.	126	3.71%
Improvement in condition	Bladder continence decreased from 3 to 2	104	3.06%
	Locomotion off unit decreased from 4 to 3	81	2.38%
	Walk in corridor decreased from 8 to 3	67	1.97%
	Walk in room decreased from 8 to 3	63	1.85%
	Bladder continence decreased from 4 to 2	55	1.62%
	Decision making decreased from 3 to 0	42	1.24%
	Locomotion on unit decreased from 4 to 3	29	0.85%
	Personal hygiene decreased from 4 to 3	28	0.82%
	Bed mobility decreased from 4 to 3	28	0.82%
	Toilet use decreased from 4 to 3	28	0.82%
	Eating decreased from 4 to 3	28	0.82%
	Decision making decreased from 2 to 1	25	0.74%
Decline in condition	Sad or anxious increased from 1 to 2	47	1.38%
	Bowel continence increased from 1 to 3	35	1.03%
	Overall condition changed from 2 to 2	30	0.88%

Table 10
Residents with Pneumonia (7)

Alerts	Triggers	Active Triggers (2471)	
Dehydration	Left 25% or more of food uneaten.	743	30.07%
	Dehydrated. Output exceeds input.	96	3.89%
Skin integrity	Bladder incontinent.	385	15.58%
	Bowel incontinent.	73	2.95%
	Turning or repositioning program has not occurred (within last 6 hours).	63	2.55%
Improvement in condition	Walk in room decreased from 8 to 3	77	3.12%
	Regular bowel movement has not occurred (within last 72 hours).	57	2.31%
	Bladder continence decreased from 3 to 2	55	2.23%
	Walk in corridor decreased from 8 to 3	53	2.14%
	Locomotion on unit decreased from 4 to 3	50	2.02%
	Locomotion off unit decreased from 4 to 3	47	1.90%
	Behavioral symptoms decreased from 2 to 0	31	1.25%
	Bladder continence decreased from 4 to 2	28	1.13%
	Personal hygiene decreased from 4 to 3	28	1.13%
	Bed mobility decreased from 4 to 3	28	1.13%
	Decision making decreased from 2 to 0	27	1.09%
	Walk in corridor decreased from 4 to 3	27	1.09%
	Dressing decreased from 4 to 3	18	0.73%
Decline in condition	Eating increased from 2 to 3	29	1.17%
	Overall condition changed from 0 to 2	25	1.01%