CLINICAL MANAGEMENT extra

Exploratory Study of Nursing Home Factors Associated with Successful Implementation of Clinical Decision Support Tools for Pressure Ulcer Prevention

CME
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Editor's note: Sadly, Siobhan Sharkey passed away on December 18, 2012.

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All authors, staff, and planners, including spouses/partners (if any), in any position to control the content of this CME activity have disclosed that they have no financial relationships with, or financial interests in, any commercial companies pertaining to this educational activity.

To earn CME credit, you must read the CME article and complete the quiz and evaluation on the enclosed answer form, answering at least 13 of the 18 questions correctly.

This continuing educational activity will expire for physicians on February 28, 2014.

PURPOSE:

To enhance the learner's competence with information about a study examining nursing home factors associated with the On-Time Quality Improvement for Pressure Ulcer Prevention program clinical decision support tools.

TARGET AUDIENCE:

This continuing education activity is intended for physicians and nurses with an interest in skin and wound care.

OBJECTIVES:

After participating in this educational activity, the participant should be better able to:

1. Interpret study components that increase successful implementation of the On-Time program.

2. Apply findings of this study in planning for implementation of a similar program for prevention of pressure ulcers.

ABSTRACT

OBJECTIVES: To determine those factors that are associated with nursing homes' success in implementing the On-Time quality improvement (QI) for pressure ulcer prevention program and integrating health information technology (HIT) tools into practice at the unit level.

DESIGN: Observational study with quantitative analysis of nursing home characteristics, team participation levels, and implementation milestones collected as part of a QI program.

SETTING: Fourteen nursing homes in Washington, District of Columbia, participating in the On-Time Pressure Ulcer Prevention program.

MAIN OUTCOME MEASURES: The nursing home level of implementation was measured by counting the number of implementation milestones achieved after at least 9 months of implementation effort.

MAIN RESULTS: After at least 9 months of implementation effort, 36% of the nursing homes achieved level III, a high level of implementation, of the On-Time QI-HIT program. Factors significantly associated with high implementation were high level of involvement from the administrator or director of nursing, high level of nurse manager participation, presence of in-house dietitian, high level of participation of staff educator and QI personnel, presence of an internal champion, and team's openness to redesign. One factor that was identified as a barrier to high level of implementation was higher numbers of health inspection deficiencies per bed.

CONCLUSION: The learning from On-Time QI offers several lessons associated with facility factors that contribute to high level of implementation of a QI-HIT program in a nursing home.

KEYWORDS: Nursing home quality improvement, pressure ulcer prevention, health information technology tools for clinical decision making

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INTRODUCTION

As the use of health information technology (HIT) grows in long-term care, a better understanding is needed of the nursing home factors associated with successful use of HIT for clinical decision support (CDS) in actual practice. Although literature supports the claim that CDS tools can improve clinical outcomes, there is little information on what nursing home factors increase the likelihood of success.[1–5]

Previous studies in 2 specific areas—effective use of HIT[6] and successful translation of clinical research into practice[7]—provide guidance on what factors to consider: decentralized work practices, information sharing, teamwork, top leadership commitment, facility champion, participation in a collaborative, and links between the improvement effort and senior leadership.

For example, in a recent study examining the benefits of adopting an electronic medical record in nursing homes, the authors explain that "generally, organizations with decentralized work practices may be better at utilizing information in production, especially in those organizations that support information sharing and teamwork."[6] In another study addressing usefulness of clinical informatics in nursing homes, Teigland et al[7] found that "the conditions for successful use of clinical informatics in practice include (1) administrative level and nursing staff buy-in and support, (2) development of an actual process integrating the risk reports into ongoing quality improvement (QI) processes, and (3) a facility 'champion' to keep the effort focused and on track."

In addition, studies focused on understanding the translation of clinical research into practice have identified factors important to a nursing home's success. Lamb et al[8] measured nursing home engagement implementing INTERACT II based on frequency and amount of nursing home team participation in collaborative calls and completion of paper-based QI review tools.[8] VanDeusen Lukas et al[9] identified several factors strengthening an organization's ability to implement evidence-based clinical practices: active top leadership commitment, clinical process redesign led by multidisciplinary improvement teams, and links between improvement efforts and senior management including data review, support, and accountability.

The objective of this study, using findings from the literature as a basis for the variables to study, was to determine those factors that are associated with nursing homes' success in implementing the On-Time QI for a pressure ulcer (PrU) prevention program and integrating HIT tools into practice at the unit level. Specifically, the authors examined a set of facility characteristics along with factors associated with success: top leadership commitment, multidisciplinary team participation in workgroup calls, links between improvement effort and senior leadership, facility champion, and team openness to redesign. In this study, the authors focused on nursing homes in Washington, District of Columbia (DC), because unlike other On-Time implementation efforts where facility readiness was a prerequisite for participation, in DC, all facilities were invited to participate. Without an upfront screen or criteria for nursing home participation in DC On-Time, the sample is more representative of US nursing homes and, therefore, provides the opportunity to better understand what facility and staff characteristics are associated with implementation success. The goal in DC was to develop a unified QI-HIT strategy that linked the use of HIT and CDS tools to frontline practice in ongoing improvement of clinical processes and outcomes.

On-Time QI provides clinical decision-making tools, strategies for tool use, and guided facilitation for nursing home frontline staff

to improve risk identification, care coordination across disciplines, and timely intervention. On-Time was developed with funding from the Federal Agency for Healthcare Research and Quality (AHRQ) and with more than 75 nursing homes across the United States. Results from the initial pilot project in 2003–2005 and dissemination efforts taking place from 2006 to the present have been described previously.[10–12]

After reading this article, the clinician will be better able to interpret the key components of the On-Time approach and demonstrate examples of process improvements that integrate clinical decision-making reports into daily practice.

KEY OBJECTIVES

The On-Time PrU program has 3 primary objectives:

- to leverage documentation and knowledge of certified nursing assistant (CNA) staff who serve as primary informants to licensed staff;
- to support collaborative clinical decision making of a multidisciplinary team using CDS reports that summarize resident information from daily documentation; and
- to establish practices for proactive risk identification and early intervention to prevent PrUs as part of frontline caregivers' daily work.

Understanding the key factors associated with successful implementation of the On-Time QI-HIT program will help support future dissemination plans and set expectations for facility teams and/or collaboratives.

METHODS

Overview

This study was conducted as part of the On-Time QI project in Washington, DC, funded by AHRQ in collaboration with the Delmarva Foundation (the DC QI organization) and supported by DC Health Care Association.

To implement the On-Time program, a nursing home needed, at a minimum, long-term-care HIT software for CNA daily documentation. Next, the facility confirmed that its vendor software included On-Time program requirements. Once software requirements were confirmed, the facility collaborated with an On-Time QI facilitator, who guided facility teams through program implementation: use of the On-Time Completeness Report to monitor CNA documentation and integration of the 4 On-Time CDS reports into daily workflow via a series of process improvements. Workflow was reengineered, as needed, with frontline staff collaboration to promote optimal use of each CDS tool.

All On-Time PrU CDS reports utilized CNA daily documentation; reports displayed information in a variety of ways to meet the unique needs of various users. Each On-Time CDS report is linked to 1 or more process improvement strategies, offering facility teams the opportunity to select strategies for CDS report use that align with facility goals. On-Time process improvements are implemented on each long-term-care nursing unit throughout the facility.

Facilities in DC followed the standard On-Time implementation approach from 12 to 18 months: (1) each facility team participated in working sessions over the telephone, led by an On-Time facilitator; (2) phone calls were held weekly and then biweekly to support each facility's implementation success; and (3) 2 all-facility in-person learning sessions were held to share experiences and learning across facilities.

Data monitored throughout On-Time QI implementation included facility characteristics, facility team participation in collaborative calls, team skills and capacity, and HIT implementation.

Measures

Level of implementation

The outcome, level of implementation, was measured by counting the number of implementation milestones achieved after at least 9 months of implementation effort. On-Time facilitators tracked implementation milestone dates for each facility. Prior to implementing process improvements, the initial step for each facility was using the Completeness Report to monitor CNA documentation completeness trends and identify areas that may require follow-up, such as missing or inaccurate documentation. Following this, a milestone was met each time a facility implemented an On-Time process improvement facility-wide. Facilities implementing 3 or more process improvements, integrating CDS reports into practice, were categorized as high level of implementation. As level of implementation increased, so did the number of PrU risk factors being addressed, the number of clinical disciplines involved in using CDS in practice, and therefore the likelihood of improved management of risk factors associated with developing PrUs. Levels of implementation are as follows:

- Level I: an initial process improvement implemented facility-wide. Teams began implementing process improvements linked with the Nutrition Report. The Nutrition Report, generated from CNA daily documentation of meal intake, was used to identify and monitor residents with decreased meal intake and/or weight loss, both of which are key indicators for high risk of PrU development. Quality improvement personnel, staff educators, Minimum Data Set coordinators, dietitians, nurse managers, and CNAs are primary participants in process improvements at level I.
- Level II: a total of 2 process improvements implemented facility-wide. Once the Completeness and Nutrition Reports

were integrated into weekly workflow, teams expanded their focus and monitored additional parameters important to identify residents at high risk for PrU development, such as weight variances, bladder and bowel continence, and Foley catheter use. Teams chose an additional process improvement and On-Time report that would support targeted risk areas: (1) Weight Summary Report for weight loss; (2) Trigger Summary Report for bladder and bowel incontinence, or Foley catheter use; or (3) Priority Report to spot weekly changes in risk areas. Nurse managers, wound nurses, and rehabilitation staff played a more active role at this level.

• Level III: a total of 3 or more process improvements implemented facility-wide. The On-Time program offers multiple process improvement strategies for each report. Teams at a high level of implementation collaborate and consider options that best align with facility goals. Teams at this level are highly engaged in the use of report data to support clinical decision making and become more creative in the ways report data are used. Facility teams often engage social workers, medical directors, and physiatrists at this level.

Facility Characteristics

Each administrator or director of nursing provided information on facility characteristics and staffing. Facility characteristics included bed size, ownership, administrator and director of nursing tenure, CNA tenure, dietitian staffing (in-house or on contract), baseline in-house PrU development rate, and information on implementation of HIT. In addition, information from the Centers for Medicare & Medicaid Services Nursing Home Compare website was collected about the number of deficiencies, 5-star ratings, and the PrU quality measure in the year prior to implementation of On-Time.

Facility Team Participation in Workgroup Calls

On-Time facility team participation was tracked by the facilitator during workgroup calls from April 2010 through June 2011. Facility team leads were either administrator/director of nursing or QI director/staff educator. Workgroup participation was measured in 3 categories: high = 76% to 100%, medium = 51% to 75%, and low = 50% or less, based on conference call attendance records. Participation was measured separately for the facility leadership team of administrator or director of nursing or assistant director of nursing, and clinical participants, such as nurse manager, dietitian, social worker, CNA, and rehabilitation workers.

Facility Team Skills and Capacity

On-Time facilitators made observations about presence of an internal champion and team skills and capacities throughout the implementation process. The specific factors observed were the following:

• internal champion: someone responsible for guiding internal implementation and supporting the On-Time process improvements as part of everyday practice; and

• openness to redesign: team willingness to trial and implement On-Time process improvements (high = no resistance; medium = some resistance from 1 discipline; low = much resistance from more than 1 discipline).

HIT Implementation

Facility HIT implementation factors were tracked for each facility and included (1) whether the HIT vendor was new to the On-Time program and required new module development or had existing On-Time module requirements; (2) level of HIT support at the facility measured as facility or corporate HIT support available or not; and (3) number of HIT implementation issues reported by team members during workgroup conference calls.

Analysis

Because of the small sample size, in order to assess the associations between predictor variables and level of implementation outcomes, the authors calculated nonparametric Spearman correlation coefficients and their *P* values. The authors analyzed outcomes at 2 different levels: 3-level outcome (level I, level II, and level III [high, medium, and low levels]) and 2-level outcome (high and not high level of implementation). We also calculated Spearman correlation coefficients between the predictor variables to determine how highly they were correlated. Spearman correlation was used to avoid assuming normality of variables.

RESULTS

Facility characteristics

There were 14 nursing home facilities (representing 2102 beds) out of 19 total nursing homes in DC that participated in On-Time. All nursing homes in DC were invited to participate in On-Time; however, 5 declined. The 14 participating nursing homes represented a wide variation of size, ownership, tenure of leadership, tenure of CNAs, and dietitian arrangements. Of the 14 facilities, 5 participating facilities (36%) had fewer than 100 beds, and 9 facilities (64%) had 100 beds or more. There was diverse ownership: 36% for-profit and 64% nonprofit or government owned; 27% were part of a multifacility organization (Table 1). Five DC facilities did not participate for a variety of reasons: 2 organizations had primarily assisted-living or independent-living beds and considered themselves different from the skilled nursing facility organizations. The other 3 organizations were

Table 1.

ASSOCIATION OF FACILITY CHARACTERISTICS WITH LEVEL OF IMPLEMENTATION

Facility Characteristics	Total Facilities (N = 14)	Level III (High) Implementers (n = 5)	Level II Implementers (n = 6)	Level I Implementers (n = 3)	Correlation Coefficient (*P*) for 3-Level Outcome[a]	Correlation Coefficient (*P*) for 2-Level Outcome[b]
Size (no. of beds)					−0.16 (0.588)	−0.24 (0.400)
<100	5 (35.7%)	1	3	1		
100	9 (64.3%)	4	3	2		
Ownership					0.16 (0.588)	0.24 (0.400)
For profit	5 (35.7%)	1	3	1		
Nonprofit/government	9 (64.3%)	4	3	2		
Part of multifacility organization					−0.13 (0.667)	−0.14 (0.630)
Yes	4 (28.6%)	1	2	1		
No	10 (71.4%)	4	4	2		
Administrator tenure					0.19 (0.511)	0.34 (0.228)
<2 y	8 (57.1%)	4	2	2		
≥2 y	6 (42.9%)	1	4	1		
Director of nursing tenure					0.19 (0.515)	0.15 (0.611)
<2 y	7 (50%)	2	3	2		
≥2 y	7 (50%)	3	3	1		
CNAs					0.25 (0.441)	0.31 (0.331)
% Full-time CNAs with tenure >3 y (mean)	65.1	76	61.5	56.7		
Dietitian					0.55 (0.043)[c]	0.47 (0.089)
In-house	10 (71.4%)	5	4	1		
Contract	4 (28.6%)	0	2	2		
Health inspections						
No. of deficiencies/bed (mean)	0.194	0.110	0.194	0.332	−0.74 (0.003)[d]	−0.65 (0.012)[c]
CMS 5-star rating					0.44 (0.115)	0.40 (0.160)
5	3 (21.4%)	1	2	0		
4	4 (28.6%)	3	0	1		
3	2 (14.3%)	1	1	0		
2	3 (21.4%)	0	2	1		
1	2 (14.3%)	0	1	1		
Baseline PrU rate						
CMS quality measure: Q1 2010 (high-risk residents with PrU) (mean)	12.38[e]	10.5	13	13.7	−0.16 (0.592)	−0.27 (0.376)
In-house PrU rate: January 2010 (mean)	2.44	2.8	2.1	2.5	0.21 (0.492)	0.25 (0.402)

[a]Outcomes: level I, level II, level III implementation.
[b]Outcomes: level III, not level III implementation.
[c]Spearman correlation significant at $P \leq .05$.
[d]Spearman correlation significant at $P \leq .01$.
[e]This represents n = 13 facilities; 1 facility had NA in CMS nursing home compared because of small sample size.

Table 2.

ASSOCIATION OF FACILITY TEAM PARTICIPATION WITH LEVEL OF IMPLEMENTATION

Facility Team Participation in Workgroup Calls	Total Facilities (N = 14)	Level III (High) Implementers (n = 5)	Level II Implementers (n = 6)	Level I Implementers (n = 3)	Correlation Coefficient (*P*) for 3-Level Outcome[a]	Correlation Coefficient (*P*) for 2-Level Outcome[b]
Team lead					−0.16 (0.588)	−0.24 (0.400)
Administrator/DON	5 (35.7%)	1	3	1		
QI director or staff educator	9 (64.3%)	4	3	2		
Meeting participation: administrator					0.27 (0.350)	0.25 (0.390)
High	4 (28.6%)	2	2	0		
Med	2 (14.3%)	1	0	1		
Low	8 (57.1%)	2	4	2		
Meeting participation: director of nursing					0.55 (0.040)[c]	0.43 (0.121)
High	6 (42.9%)	4	2	0		
Med	4 (28.6%)	0	3	1		
Low	4 (28.6%)	1	1	2		
Meeting participation: administrator or director of nursing					0.78 (0.001)[d]	0.75 (0.002)[d]
High	7 (50%)	5	2	0		
Med or low (neither High)	7 (50%)	0	4	3		
Meeting participation: nurse manager					0.58 (0.031)[c]	0.42 (0.139)
High	6 (42.9%)	4	2	0		
Med	5 (35.7%)	0	4	1		
Low	3 (21.4%)	1	0	2		
Meeting participation: dietitian					0.52 (0.056)	0.55 (0.043)[c]
High	9 (64.3%)	5	3	1		
Med	4 (28.6%)	0	2	2		
Low	1 (7.1%)	0	1	0		
Meeting participation: staff educator or QI					0.55 (0.043)[c]	0.26 (0.365)
High	9 (64.3%)	4	5	0		
Med	4 (28.6%)	1	1	2		
Low	1 (7.1%)	0	0	1		

Continues

Table 2.
ASSOCIATION OF FACILITY TEAM PARTICIPATION WITH LEVEL OF IMPLEMENTATION, CONTINUED

Facility Team Participation in Workgroup Calls	Total Facilities (N = 14)	Level III (High) Implementers (n = 5)	Level II Implementers (n = 6)	Level I Implementers (n = 3)	Correlation Coefficient (*P*) for 3-Level Outcome[a]	Correlation Coefficient (*P*) for 2-Level Outcome[b]
Meeting participation: CNA					0.49 (0.073)	0.43 (0.124)
High	4 (28.6%)	3	1	0		
Med	5 (35.7%)	1	3	1		
Low	5 (35.7%)	1	2	2		

[a]Outcomes: level I, level II, level III implementation.
[b]Outcomes: level III, not level III implementation.
[c]Spearman correlation significant at $P \leq .05$.
[d]Spearman correlation significant at $P \leq .01$.

delayed in participating: 2 had leadership turnover, and 1 had HIT issues. The characteristics of these organizations were similar to the participating organizations in bed size and ownership status.

Level of implementation

Each facility started implementation of On-Time on the first unit between April 2010 and September 2010. After 9 to 15 months, the level of implementation into practice ranged from level III or high (n = 5 nursing homes or 36%), to level II (n = 6 nursing homes or 43%), to level I (n = 3 nursing homes or 21%) based on the number of milestones achieved. There were 2 facility characteristics that were significantly associated with level of implementation: in-house dietitian (positive: presence of in-house dietitian was associated with [high] level III implementation) and number of health inspection deficiencies (negative: more deficiencies associated with [low] level 1 implementation) ($P = .043$ and $P = .003$, respectively) (Table 1).

Facility team participation in workgroup calls

The team lead was the QI or staff education director at 9 facilities (64%) and the administrator or director of nursing at 5 facilities (36%). High participation varied by individual team members: administrator or director of nursing (50%), nurse

Table 3.
ASSOCIATION OF FACILITY TEAM SKILLS AND CAPACITY WITH LEVEL OF IMPLEMENTATION

Team Skills and Capacity	Total Facilities (N = 14)	Level III (High) Implementers (n = 5)	Level II Implementers (n = 6)	Level I Implementers (n = 3)	Correlation Coefficient (*P*) for 3-Level Outcome[a]	Correlation Coefficient (*P*) for 2-Level Outcome[b]
Internal champion					0.75 (0.002)[c]	0.65 (0.013)[d]
Yes	8 (57.1%)	5	3	0		
No	6 (42.9%)	0	3	3		
Team openness to redesign					0.84 (0.0002)[e]	0.79 (0.001)[c]
High	6 (42.9%)	5	1	0		
Med	5 (35.7%)	0	4	1		
Low	3 (21.4%)	0	1	2		

[a]Outcomes: level I, level II, level III implementation.
[b]Outcomes: level III, not level III implementation.
[c]Spearman correlation significant at $P \leq .01$.
[d]Spearman correlation significant at $P \leq .05$.
[e]Spearman correlation significant at $P \leq .001$.

Table 4.
ASSOCIATION OF FACILITY HIT IMPLEMENTATION WITH LEVEL OF IMPLEMENTATION

HIT	Total Facilities (N = 14)	Level III (High) Implementers (n = 5)	Level II Implementers (n = 6)	Level I Implementers (n = 3)	Correlation Coefficient (*P*) for 3-Level Outcome[a]	Correlation Coefficient (*P*) for 2-Level Outcome[b]
Vendor new to On-Time					−0.06 (0.840)	−0.07 (0.821)
New to On-Time	9 (64.3%)	3	4	2		
Previously in On-Time	5 (35.7%)	2	2	1		
HIT implementation issues					−0.19 (0.511)	−0.34 (0.228)
Yes	6 (42.9%)	1	4	1		
No	8 (57.1%)	4	2	2		
HIT support					−0.06 (0.840)	−0.07 (0.821)
Full time/ corporate	9 (64.3%)	3	4	2		
Part time/other	5 (35.7%)	2	2	1		

[a]Outcomes: Level I, Level II, Level III implementation.
[b]Outcomes: Level III, not Level III implementation.
Spearman correlation not statistically significant at * $P \leq .05$, ** $P \leq .01$, *** $P \leq .001$.

manager (43%), dietitian (64%), QI or staff education director (64%), and CNAs (29%). Participation (high, medium, and low) for each team member across all facilities is provided in Table 2.

Greater amount of team participation in workgroup calls was associated with a higher level of On-Time implementation: participation of top leadership (administrator or director of nursing) ($P = .001$), nurse manager ($P = .031$), and staff education director or QI ($P = .043$). Participation of dietitian was borderline significant ($P = .056$) in the 3-level outcome analysis and significant in the 2-level outcome analysis ($P = .043$) (Table 2). For top leadership participation, the authors analyzed administrator and director of nursing separately and together and found that greater participation from the director of nursing was significant but greater participation of the administrator or director of nursing was more significant ($P = .040$ vs $P = .001$) (Table 2).

Team skills and capacity

The facilitators observed a wide variety of team skills and capacities (Table 3). There were 8 facilities (57%) with an internal champion. There was a high level of openness to redesign in 6 facilities (43%). Both these team skills and capacity factors were significantly associated with level of implementation. The presence of an internal champion ($P = .002$) and team's openness to redesign ($P = .0002$) were both associated with higher level of implementation.

HIT implementation

There were 9 facilities (64%) that selected an HIT vendor that was new to the On-Time program; 6 facilities (43%) encountered implementation issues or delays related to HIT during the project. Full-time or corporate information technology support was available in 9 facilities (Table 4). None of the HIT implementation factors were significantly associated with level of implementation.

Three independent predictor variables were highly correlated with each other (Spearman correlation coefficient 0.60: greater participation of administrator or director of nursing and nurse manager ($r = 0.70$, $P = .005$), greater participation of administrator or director of nursing and CNA ($r = 0.62$, $P = .018$), and greater participation of CNA and nurse manager ($r = 0.85$, $P = .0001$). These correlations make it difficult to separate out which factors were most important.

DISCUSSION

In this study, 36% of the nursing facilities achieved level III, a high level of implementation of the QI-HIT program after 9 to

15 months. Because some facilities started later than others, the authors expect the level of implementation to improve over time. However, the results after at least 9 months of implementation indicate there are several factors that make a difference in a facility's effort.

Specific factors of team participation in workgroup calls related significantly to success. First, the significance of the high level of involvement from administrator or director of nursing emphasizes the importance of leadership actively engaged. Second, high level of nurse manager participation differentiates high-level from lower-level implementers. This finding underscores the need for nurse managers' active participation in a QI effort. The active involvement of the nurse manager is a key determinant for a facility achieving beyond level I of On-Time implementation. Traditionally, QI is an activity delegated to QI or staff education personnel; On-Time QI, which impacts clinical workflow, teamwork, and communication among disciplines, requires the entire team to engage actively in QI at the direction of or with the support of a nurse leadership role. Directors of nursing and nurse managers are better able to encourage CNA participation and participation of other disciplines when daily routines are impacted.

Although dietitian participation in workgroup calls was borderline significant, the significance of the dietitian position as in-house or facility staff versus as a contract position suggests that it may be easier for an in-house dietitian to be more involved in nursing home QI efforts, whereas a contract dietitian may be more constrained by the specifics of his or her contract. Often, nurse managers are reluctant to interfere with the workflow and schedule of dietitians in contract positions. Because the dietitian is a key participant in On-Time, it makes sense that an in-house dietitian is associated with a higher level of implementation.

Lastly, high level of participation of the staff educator and QI personnel was associated with a higher level of implementation of On-Time. This finding, although not surprising, suggests that both the involvement of the staff educator in providing initial and ongoing support for computer training and documentation, and QI personnel's help in process improvement and redesign efforts, are important. These team members helped staff appreciate the importance of data quality and supported the QI team process on a daily basis.

The significance of the facility team skills and capacity factors, although subjective measures based on facilitator observation, highlights the characteristics of facility teams that were associated with a high level of implementation: presence of an internal champion and the team's openness to redesign. These findings are consistent with QI implementation success factors reported in the literature.

One factor that was identified as a barrier to a high level of implementation was if a facility had a higher number of health inspection deficiencies per bed. This may be associated with the large amount of time that is spent on addressing and resolving health inspection issues resulting in less time available for QI implementation. It may also indicate that facilities with many diverse quality problems are not ready for a focused QI effort.

It is interesting to note that facility characteristics such as number of beds, type of ownership, top leadership tenure, and baseline PrU quality measure or in-house PrU rates were not significantly associated with level of implementation.

The findings from this study point to several important aspects to consider in assessing facility readiness and setting expectations of facility participation in On-Time QI that will lead to an engaged team capable of achieving a high level of implementation.

Limitations

There were several limitations to this study. The main constraint was the size of the study sample. Given the small sample in this study and high level of correlation of team participation variables, the authors cannot determine specifically the most important combination of team member participation. However, the results support and expand the expectations of facility team member participation in workgroup calls. Also, the sample size allowed only moderate to high levels of correlation to achieve significance (>.55 correlation). In addition, because this was a QI study, the authors were limited to information that was collected to monitor the QI project and support the nursing facilities' integration of CDS into daily

PRACTICE PEARLS

The key factors that contribute to successful integration of a QI-HIT program into nursing home work flow include:

- A strong active involvement of administrator or director of nursing, nurse managers, and QI or staff education personnel is associated with a higher level of implementation.
- An in-house dietitian is associated with a higher level of implementation.
- Success relates to team skills and capacity to support process improvement: presence of an internal champion and team openness to redesign at the unit level is associated with a higher level of implementation.
- Facilities with many diverse quality problems may not be ready for a focused QI effort because the facility is struggling with many diverse quality problems.
- Facility characteristics, such as number of beds, type of ownership, top leadership tenure, and baseline PrU quality measure or in-house PrU rates were not significantly associated with level of implementation.

practice. For example, openness to redesign measured by observation of the facilitators in this study could, in future studies, be measured with a validated instrument via questionnaire like the AHRQ's ''Nursing Home Survey on Patient Safety Culture.''[13]

CONCLUSION

Several lessons were learned from On-Time QI. The first lesson is associated with what facility factors contribute to successful integration of a QI-HIT program in a nursing home. Findings from this study emphasize the need for strong active involvement of administrator or director of nursing, nurse managers, QI or staff education personnel, and dietitian. Also, success relates to team skills and capacity to support process improvement: presence of an internal champion and team openness to redesign at the unit level. In addition, it provides a warning against attempting to begin an intensive QI initiative when a facility is struggling with many diverse quality problems. ●

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