

Impact of a Falls Menu-Driven Incident-Reporting System on Documentation and Quality Improvement in Nursing Homes

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Purpose: Data from incident-reporting systems have been used successfully in disciplines other than health care to improve safety. This study tested the effect of a falls menu-driven incident-reporting system (MDIRS) on quality-improvement efforts in nursing homes. **Design and Methods:** Following instrument development and testing, the intervention occurred over a 4-month period in three intervention nursing homes using the MDIRS matched with three homes using their existing narrative incident report to document falls. Data on fall incidents were collected from facility incident reports, and comparisons in incident-report documentation were made between the intervention and control groups. The minutes from quality-improvement meetings were examined to see how incident-report data were used for fall-prevention strategies. **Results:** Almost one third of nursing home residents among the six facilities fell during the 4-month study period. Intervention nursing homes had significantly better documentation of fall characteristics on the incident reports than did the control nursing homes. Although only one nursing home fully imple-

mented the MDIRS intervention, all three facilities identified strengths of the system. **Implications:** The MDIRS can have a significant impact in improving how nursing staff assess residents following a fall incident. Traditional narrative methods of documenting adverse incidents are time consuming and may not yield sufficient and accurate data. This model has the potential to enhance quality-improvement efforts and augment the current system of adverse incident reporting in nursing homes.

Key Words: *Accidental falls, Medical errors, Medical informatics, Reporting system, Quality assurance*

Over 8 million adverse incidents occur annually among 1.5 million nursing home residents (Gabrel & Jones, 2000; Gurwitz, Sanchez-Cross, Eckler, & Matulis, 1994). Falls are the most frequently reported adverse incident, as one half of all nursing home residents fall each year (American Geriatrics Society, The British Geriatrics Society, & The American Academy of Orthopaedic Surgeons, 2001; Gryfe, Amies, & Ashley, 1977; Tinetti, 1987). System-wide changes including improvements in the reporting and detection of adverse incidents are needed to improve elder care (Tsilimingras, Rosen, & Berlowitz, 2003). In this article, we describe the testing of a falls menu-driven incident-reporting system (MDIRS) and compare it with the traditional methods of reporting falls in nursing homes.

Adverse Incidents

Adverse incidents, also referred to as *adverse events*, are defined as “unplanned events which caused, or had the potential to cause, harm to patients” (Hart, Baldwin, Gutteridge, & Ford, 1994, p. 556). In an effort to improve aviation safety, Flanagan (1954) developed the critical incident technique to investigate

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airline mishaps. Building on Flanagan's work, the National Aeronautics and Space Administration Aviation Safety Reporting System was established in the 1970s to record voluntary, anonymous reports from airline workers. These data have resulted in a reduction of human error by means of redesigns of aircraft, air traffic control systems, and training (Billings, 1997). The ASRS model serves as a template for improving adverse incident reporting in health care settings.

Health Care Incidents

The use of incident reports in health care can be traced to a landmark study that examined mishaps in anesthesia (Cooper, Newbower, Long, & McPeak, 1978). Although the impetus for this study was the rising cost of malpractice insurance, the study was instrumental in improving practice (Gaba, 2000). Anesthesiology is acknowledged as the leading medical specialty to successfully address patient safety (Helmreich, 2000; Leape, 1994). In the early 1990s, research on medical errors in hospitals began to appear in the scientific literature (Brennan et al., 1991; Leape et al., 1991). As a result, the Institute of Medicine published a series of reports that called for a variety of initiatives, including standardized incident-reporting systems (Aspden, Corrigan, Wolcott, & Erickson, 2004; Kohn, Corrigan, & Donaldson, 2000). The goal of reporting systems is to gather information ultimately leading to changes in unsafe practices, thus preventing future errors.

Reporting Incidents in Nursing Homes

As a result of the complexity of the physical and mental impairments of nursing home residents, they are at risk for a high proportion of adverse incidents (Kapp, 2003; Rothschild, Bates, & Leape, 2000; Rubenstein, 1997; Rubenstein, Josephson, & Robbins, 1994). The most common adverse incidents occurring in nursing homes are falls, non-fall-related injuries (e.g., bruises, burns, and skin tears), and medication errors (Gurwitz et al., 1994, 2000, 2005; Malone, Rozario, Gavinski, & Goodwin, 1991). These adverse incidents lead to resident health issues as well as considerable staff administration time and associated costs.

Although no standard incident report exists, many nursing homes use a narrative "Briggs" Corporation incident report. The licensed nurse completes this narrative report, which is a semistructured open-ended description of the incident. The primary purpose of incident reports is to document the adverse incident to fulfill nursing home regulatory and malpractice insurance requirements, rather than for quality improvement (Braun, 2001). Nursing homes are required by federal regulations to conduct and document an investigation when a fall or other incident has occurred (Code of Federal Regulations, 2003; Curry & Hogstel, 2002). There are no specific guidelines, however, directing when a report should be filed or what data elements have to be included in the investigation. Thus,

there is great variation regarding adverse incident documentation in the nursing home setting. Lack of definitional clarity and standardized definitions and the failure to recognize that an incident has occurred are barriers to accurately reporting incidents (Barach, 2003).

Several nursing home studies have found under-reporting of circumstances and characteristics regarding the adverse incident. For example, environmental and other extrinsic risk factors are frequently not identified in incident reports and medical records (Cali & Kiel, 1995; Harrison, Booth, & Algase, 2001; Nyberg, Gustafson, Janson, Sandman, & Eriksson, 1997; Thapa, Brockman, Gideon, Fought, & Ray, 1996; Tinetti, 1987). The failure to identify potentially modifiable risk factors can have profound effects on the occurrence of future incidents.

Reporting Mechanisms

The systematic surveillance of adverse incidents is essential to identify the issues that warrant intervention (Gurwitz et al., 1994). Computer systems are increasingly being used to reduce error and improve the reporting of adverse incidents in health care settings (Wald & Shojania, 2001). This method provides a standardized structure and consistency for what items have to be included in an evaluation and analysis of adverse incidents (Johnson, 2002) by allowing the reporter to just "point and click" on a list of options related to the incident rather than trying to evaluate it in an unstructured manner. Such systems offer several benefits, including reduction in documentation time, improving the data elements collected, and providing efficient methods to analyze data for quality improvement and increase the detection and reporting of adverse incidents (Aspden et al., 2004; Classen, Pestotnik, Evan, & Burke, 1991; Cullen et al., 1995; Kobus, Amundson, Moses, Rascona, & Gubler, 2001). These features may improve the identification and reduction of risk factors for future incidents among nursing home residents (Harrison et al., 2001). An alternative to the narrative form used in most nursing homes is a computerized menu-driven incident-reporting system (MDIRS).

Design

We developed an MDIRS aimed at providing a comprehensive, detailed, systematically guided assessment of adverse incidents. Because falls are the most frequently reported adverse incident in nursing homes (Gurwitz et al., 1994), we focused our efforts on developing an incident report that was specific to falls.

Instrument Development

First, a panel of four content specialists (Waltz, Strickland, & Lenz, 1991) who have conducted and published research on falls in nursing homes met to identify key data elements (e.g., potentially modifiable risk factors) that should be included in a falls incident report. This panel of experts used a literature review

that we prepared to help rate key data elements. The literature included clinical practice guidelines and systematic reviews related to falls in the elderly population (American Geriatrics Society et al., 2001; American Medical Directors Association & The American Health Care Association, 1998; Ledford, 1996; Rubenstein, Powers, & MacLean, 2001; Sattin, 1992) and major research studies concerning falls in nursing homes (Capezuti, Strumpf, Evans, Grisso, & Maislin, 1998; Gurwitz et al., 1994; Kiely, Kiel, Burrows, & Lipsitz, 1998; Ray et al., 1997; Rubenstein, Josephson, & Osterweil, 1996; Rubenstein et al., 1994; Thapa et al., 1996; Tinetti, 1987).

Once the experts identified the modifiable risk factors, they ranked the importance of each item as important or not important. We chose individual items on the basis of what the clinical practice guidelines recommend as being important for the licensed nurse to assess following the fall. We included items if at least three of the experts agreed they were important. We chose a total of 10 modifiable risk factors (e.g., restraint use) in the end. We chose to leave some items out of the incident report, such as use of high-risk medications, because it is the primary care provider's responsibility to evaluate these. Furthermore, we did not want a form that would be too burdensome for the licensed nurse to complete, as this may lead to incomplete or inaccurate information (Harrison et al., 2001; Tinetti, 1987).

Instrument Testing

The next phase was pilot testing the MDIRS over a 3-month period in two 100-bed proprietary nursing homes that were part of a large chain. Similarly, a second round of pilot testing occurred in one 250-bed nonprofit nursing home in suburban Atlanta over a 1-month period. During both phases, licensed nurses on all shifts attended a 20-min inservice on how and when to complete the MDIRS. Trained research assistants then coded and entered the data from paper copies into an electronic database. Comments from a total of 67 licensed nurses and three administrators helped to refine and redefine individual components of the tool. We made changes to the wording of the questions and order of items in the list of choices and provided additions and deletions. Following each phase of tool development, the expert panel reviewed the MDIRS to assess content validity and clarity of the items by again ranking the importance of the items.

Once agreement for a final version was reached after two deliberations and pilot testing was completed, we collaborated with a computer programmer to develop a computerized version of the MDIRS. Our goal was to develop a program with which licensed nurses with minimal computer skills could easily enter MDIRS data by using the point-and-click method. In this program, in order to minimize missing data, we placed constraints in the system by forcing required circumstances about the fall (e.g., presence of injury) to be reported. The programmer also developed easily generated graphs and tables that nursing home administrators could use as quality-improvement reports.

The MDIRS

Refer to Figures 1, 2, and 3 for examples of the MDIRS form. The MDIRS provides a series of close-ended questions with multiple-choice alternatives that prompt the nurse to consider risk factors and assessment information related to the incident. Rather than writing an open-ended narrative description of the fall event, the nurse completes the form by checking the appropriate boxes in several key areas such as location, time, activity, possible causes, footwear, detailed physical assessment information (e.g., level of consciousness, range of motion, vital signs) and the fall outcome (e.g., type of injury). A training manual was available on all nursing units and included definitions and coding rules for each of the critical elements. Because most nursing homes do not have unit-based computers, the licensed nurse first completes a paper version of the MDIRS after a resident falls. The MDIRS information is then entered into the computer database by a trained staff member.

Methods

We present data from six for-profit Georgia nursing homes with number of beds ranging from 120 to 186; this represents a total of 910 residents, most of whom (> 80%) are long-term stayers. Five of the six nursing homes are part of a chain. After we matched the nursing homes into three pairs on the basis of salient characteristics (e.g., number of beds, staffing mix, payor status, and mean fall rates), we randomized the nursing homes in each pair into intervention and control groups. The three intervention homes replaced their existing narrative incident report with the MDIRS to document falls, whereas the three control facilities continued to use their existing narrative incident-reporting form. Our procedure of collecting de-identified data was exempted from written informed consent by the Emory University Institutional Review Board.

We collected data from facility incident reports (MDIRS or narrative) over a 4-month period. We summarized data about the frequency of falls, related injuries, causes, and circumstances by using basic descriptive statistics (e.g., means, standard deviations, and percentages). Because the intervention period lasted only 4 months and we collected fall data only during the study period, we provided descriptive, rather than inferential, statistics on the characteristics of fall incidents. In addition, we tested the difference between proportions of documentation of salient characteristics on the incident reports between the intervention and control groups (z test for proportions).

We also attended or reviewed minutes from at least one quality-improvement meeting in the intervention and control nursing homes. After the completion of the study, an investigator obtained verbal feedback with key nursing home staff (staff nurse, director of nursing, and administrator) and recorded the information in field notes. Key questions such as the strength and weaknesses of the nursing home's fall program were elicited. In the intervention homes, the investigator specifically asked if the nursing home used the computer output

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Fall Reporting Form Database

← CONTINUE Page 2 >>

Resident's Last Name: Jones First Name: John

All information below should be completed by the licensed nurse on the resident's unit.

2. Date of Fall (month/ day/year) 10/20/03 3. Time of Fall (hour: minutes am/pm) 2:00 PM

4. Initials of Person Completing Form (FML) TEP

6. Was the incident a:

- Found on floor (unwitnessed)
- Fall to the floor (witnessed)
- Near fall (resident lowered to floor by staff)

7. The cause of the incident was:

- Unknown
- Lost balance
- Slip (specify)
- Lost strength/weakness
- Trip
- Lost consciousness/seizure
- Equipment malfunction (specify)
- Other cause (specify)

9. The activity during the incident was:

5. The incident location was:

- Resident's Bedroom
- Bathroom
- Another Resident's Room/Bathroom
- Hall
- Dining/Day room
- Outside Building
- Shower/Tub Room
- Other (Specify)
- Unknown

8. The footwear at the time of incident was:

Other (specify)

10. Was there staff present during the activity in question 9?

Figure 1. Sample screen from the MDIRS.

(e.g., graphs) to identify patterns of concern and to guide the discussion of falls in quality-improvement meetings.

Results

The study occurred over a 4-month period. Overall, 28.4% of all residents (259/910) fell at least once during the intervention period. A total of 259 fallers accounted for 426 fall incidents among the six nursing homes (incidence rate of 0.116 per person-months). The majority of residents only fell once. A total of 35.5% of those who fell did so recurrently, with most of them ($n = 53$) falling twice during the study period. Fall incidents were equally represented in both groups (χ^2 goodness of fit = 2.4, $df = 1$, $p = .121$), with 54% ($n = 229$) of incidents from residents in the control group compared with 46% ($n = 197$) in the intervention group.

Fall Incidents

Refer to Table 1 for a description of the type of fall incident and fall-related injuries sustained during the

4-month study period. In a majority of falls, residents were found on the floor without a witness to the incident. Almost one third of falls were witnessed by a nursing home staff member or another resident. A small number of falls (5.6%) were identified as near falls. Almost 70% of fall incidents did not result in an injury, 15% constituted a minor injury, and 7.2% of the incidents had a serious outcome.

The frequency of falling was similar for evening (37.2%) and daytime (36.7%) shifts. For almost 25%, the circumstances of the fall were not documented. A majority of falls occurred during a resident's change in position, such as during a transfer, attempting to get out of a wheelchair, or transfer out of bed unassisted. Other fall incidents occurred when the resident was ambulating or standing and lost his or her balance, slipped, lost strength or became weak, or tripped.

See Table 2 for a comparison of proportions of data included on incident reports. The proportion of near falls reported was significantly higher in the intervention group than it was in the control group ($z = 2.53$, $p = .011$). Furthermore, the proportion of the type of footwear was documented more in the intervention

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Fall Reporting Form Database

Resident's Last Name: Jones First Name: John

All information below should be completed by the licensed nurse on the resident's unit.

2. A. Was a restraint in use at the time of the incident?

Yes [Complete Part B]
 No
 Unknown

C. Were siderails up?

Yes (complete part D)
 No
 Unknown

AS A RESULT OF THIS INCIDENT,

3. Did the resident's mental status change? No Yes Unknown
4. Did the resident's level of consciousness change? No Yes Unknown
5. Was the resident's blood glucose level checked? No Yes

Figure 2. Sample screen from the MDIRS.

group than it was in the control group ($z = 18.62$, $p = .0001$).

A significantly greater proportion of fall type (e.g., witnessed, unwitnessed, or near fall; $z = -2.80$, $p = .005$), circumstances ($z = 5.24$, $p = .001$), side-rail status ($z = -3.26$, $p = .0006$), and restraint status ($z = -4.07$, $p = .0001$) were not documented in the control nursing homes compared with the intervention nursing homes. Conversely, there were no significant differences in the proportion of unknown fall outcome ($z = 0.58$, $p = .72$) and pain documentation ($z = 0.03$, $p = .51$) between the intervention and control groups.

Quality-Improvement Implementation

Overall, there were no difficulties identified by the unit nurses completing the paper version of the MDIRS. Based on feedback from the nursing staff, future drafts of the MDIRS should include a systematic evaluation of all incidents, not just falls. However, there were some difficulties with the computerized data-entry component of the intervention. Two of the three intervention nursing homes used the MDIRS software to develop charts and graphs in the quality-

improvement meetings, though only one nursing home did so for the entire study period.

In one nursing home, data entry and analysis was conducted during the entire 4-month study period. The output graphs were used in quality-improvement meetings. In this home, quality-improvement graphs were used to identify the location of falls and the shift in which falls most commonly occurred. As a result of these data, this nursing home reported a problem with restraint-related falls and planned to implement a restraint-reduction program following completion of the study.

The second intervention nursing home only entered approximately 2 months' worth of data as a result of computer problems and the director of nursing's multiple absences. In spite of multiple attempts to remedy the problem, a technical problem prevented quality-improvement reports from being printed. Therefore, the director of nursing reported the software results verbally in the meeting. A specific problem identified in the second intervention nursing home was that many residents fell while in bare feet or while wearing only socks but no other footwear. The improved information from the MDIRS paper version was cited as a strength of the intervention.

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Fall Reporting Form Database

Resident's Last Name: Jones First Name: John

All information below should be completed by the licensed nurse on the resident's unit.

10/20/03 2:00 PM

5. A. What was the incident outcome?

Injury (complete part B)
 Non-injury
 Unknown

← FINISHED

B. If injury, indicate site(s) injured in first column, and the type of injury for each site entered:

Injury_Site	Left_Right	Bruise_SkinTear_Abrasion	Fracture	Laceration_Sutures_Subdural Hematoma	Pain	Other	If_Other_Specify_Injury_Type
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Record: 1 of 1

Figure 3. Sample screen from the MDIRS.

The third intervention nursing home entered a limited amount of data (less than 1 month's worth) into the MDIRS program. This facility had multiple staffing problems and frequent turnover of the staff trained in using the computer system. Furthermore, the director of nursing in this facility expressed an aversion to using a computer in her daily work activities. Therefore, no quality-improvement reports were generated at this facility. However, the physical and occupational therapists reported receiving improved nursing assessment information from the MDIRS.

Three control nursing homes recorded and calculated fall incidents by hand in a log book. In the quality-improvement minutes, information was limited to the number of fall incidents and the associated injuries. Contextual factors (e.g., environmental factors, restraint use) associated with the falls also were not included in the quality-improvement summaries.

Discussion

Incident report data have led to practice changes in process, organization, supervision, training, and teamwork (Leape, Berwick, & Bates, 2002). The current method of reporting adverse incidents in nurs-

ing homes does not provide sufficient data on the circumstances regarding falls. The MDIRS we have presented here provides a method that is straightforward, acceptable by licensed nurses, and has the ability to easily analyze adverse incident data for quality-improvement purposes.

Computerized clinical information systems are increasingly being used in hospitals to reduce errors and improve incident reporting (Dixon, 2002; Elkins et al., 2004). Although some problems have plagued the computerized Nursing Home Minimum Data Set (MDS), its standardized feature provides an excellent example of how such information is used to improve care (Mor, 2004). This system provides licensed nurses with a systematic, structured, and consistent guide for evaluation. In this study, we found that the enhanced reporting system was better able than the traditional system to guide the nurses' assessment of falls. We are unsure why the nursing homes scored similarly in pain and outcome documentation, other than lack of power.

Having a separate paper documentation and computerized data-entry process was problematic in this study. Although we found that the MDIRS improved incident-report documentation, several organizational factors such as frequent staff turnover, multiple absences caused by illness, and overload of duties prevented

Table 1. Type of Fall Incident and Injury Outcome

Fall Characteristic	Overall (N = 426)	Intervention Group (n = 197)	Control Group (n = 229)
Type of fall incident			
“Found on floor” (unwitnessed)	270 (63.4)	124 (62.9)	146 (63.8)
Witnessed fall	119 (27.9)	51 (25.9)	68 (29.7)
Near fall	24 (5.6)	21 (10.7)	3 (1.3)
Not documented or unknown	13 (3.1)	1 (.5)	12 (5.2)
Injury outcome			
No injury	296 (69.5)	145 (73.6)	151 (65.9)
Minor injury ^a	62 (14.5)	21 (10.6)	41 (17.9)
Serious injury ^b	31 (7.2)	13 (6.6)	18 (7.9)
Pain	15 (3.5)	7 (3.6)	8 (3.5)
Other or unknown	22 (5.2)	11 (5.6)	11 (4.8)

Notes: Data were collected in 6 facilities over 4 months. All values are reported as frequency (%) unless otherwise noted.

^aIncludes bruise, skin tear, or abrasion.

^bIncludes laceration requiring sutures, head injury, or fracture.

complete data entry because we relied primarily on administrative staff to enter the MDIRS data into the computer. Furthermore, the six nursing home directors of nursing spent a considerable amount of time tabulating falls quality-improvement data by hand, rather than employing computerized spreadsheets.

One suggestion to improve computerized reporting and aggregation of incident-report data is to have computerized data entry for the MDIRS conducted by the nursing staff at the unit level. These data can then be easily summarized for the quality-improvement reports more efficiently. The cost effectiveness of paperless documentation systems and unit-based computers has to be considered and further studied. Furthermore, administrative buy-in is a major factor influencing whether information is successfully implemented (Capezuti, 2004).

There are many potential benefits to efficiently producing incident-report data in an analyzable format. For example, footwear style (or lack thereof) has been shown to increase the risk of falls (Koepsell et al., 2004). Because this study identified that assessment of footwear was better in the intervention homes, its identification and intervention through quality-improvement initiatives can have an impact on fall-prevention outcomes.

There were a few limitations to this study. First, an examination of whether the improvements in incident-report documentation led to an actual reduction in falls and injuries was not conducted; it was not feasible as a result of the low statistical power and short intervention period. Next, although great effort was made to appropriately pair and randomize the groups, there could have been intrinsic differences within the pairs accounting for differences in our comparisons. As a result of a corporate-level conflict following randomization, the third pair was not randomized, which could have introduced bias into the study. Finally, because we were not onsite at the time of the fall, we did not collect data on the interrater reliability and validity with the nurses completing the MDIRS.

Table 2. Comparison of Incident Report Documentation

Documentation	Intervention (n = 197 falls)	Control (n = 229 falls)	p
Near fall documented	21 (10.7)	3 (1.3)	.011
Footwear documented	179 (91.0)	3 (1.3)	.0001
Pain documented	7 (3.6)	8 (3.5)	.51
Type of fall not documented	1 (< 1)	12 (5.2)	.005
Circumstances not documented or unknown	23 (11.7)	76 (33.2)	.001
Outcome not documented	11 (5.6)	10 (4.3)	.72
Siderail status not documented	4 (2)	22 (9.6)	.0006
Restraint status not documented	5 (2.5)	31 (13.5)	.0001

Notes: Data were collected in 6 facilities over 4 months. All values are reported as frequency (%) unless otherwise noted. p values correspond to a z test of differences.

Nursing home administrators have primarily used incident reports to monitor institutional liability. This can lead to punitive consequences for staff and may be a deterrent to accurate staff reporting (Gurwitz et al., 1994; Kapp, 2003). Another problem is that nursing homes rarely collect “near miss” data (Kohn et al., 2000). Near misses are events that almost occur and often have the same underlying cause as incidents resulting in an outcome (Barach & Small, 2000). Because near misses are less emotionally charged, monitoring them may help staff become less reluctant to report (Aspden et al., 2004; Firth-Cozens, 2002). In this study, we found that near misses were reported better in the nursing homes using the MDIRS than they were in the nursing homes using the traditional reporting method.

When anesthesiologists faced increased litigation, they utilized an incident-reporting system to systematically examine the problem, ultimately resulting in significant reductions in errors (Gaba, 2000). Now with the growth of nursing home litigation, we need to identify ways that can realistically be implemented in the current fiscal environment (Braun & Capezuti, 2000; Stevenson & Studdert, 2003). Unfortunately, numerous legal barriers in nursing homes have limited the reporting and evaluation of adverse incidents (Kapp, 2003). Nursing home staff should be encouraged to disclose incidents in a nonpunitive environment. We must carefully identify and break down the barriers to reporting and evaluating adverse incidents in nursing homes. Enhancing data-collection methods can potentially lead to these needed improvements in nursing home safety.

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