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Physician Perceptions of the Performance and Importance of Consultant Pharmacist Services Associated with an Intervention for the Detection and Management of Adverse Drug Events in the Nursing Home

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Abstract

Objective—To assess the importance and performance of consultant pharmacist (CP) services delivered before and after an intervention to detect and manage adverse drug events among nursing home (NH) residents.

Design—Before and after intervention survey of physicians participating in a randomized controlled trial (RCT).

Setting—Four non-profit, academically-affiliated NHs.

Participants—Attending physicians providing NH care who were randomized to intervention or control groups.

Interventions—Within the intervention arm, CPs provided academic detailing to physicians, responded to alerts from a medication monitoring system, adjudicated system alerts for adverse drug events (ADEs), and provided structured recommendations about ADE management.

Main Outcome Measures—We compared physicians' assessments of the *importance* and *performance* of CP services before and after the trial intervention in the intervention and control groups.

Results—In the intervention group, ratings of *importance* increased for all 24 survey questions, and 5 of the changes were statistically significant ($p < .05$). In the control group, ratings of *importance* increased for 16 questions, and none of the changes were statistically significant. In the intervention group, ratings of *performance* increased for all 24 questions, and 20 of the changes were statistically significant. In the control group, ratings of *performance* increased for 16 questions, and none of the changes were statistically significant.

Conclusion—A multifaceted, CP-led intervention comprised of academic detailing, computerized decision support, and structured communication framework, can improve physicians' assessment of importance and performance of CP services.

Keywords

drug-related side effects and adverse drug reactions; adverse drug reaction reporting systems; pharmacovigilance; nursing homes; safety; medication systems

Introduction

The 2014 National Action Plan for Adverse Drug Event (ADE) Prevention developed by the US Department of Health and Human Services identified the nursing home (NH) as a setting where ADE prevention strategies are needed. [1] Patient injury associated with medication use is considered an ADE. [2] ADEs are the most clinically significant and costly medication-related problems in NHs, are associated with an estimated 93,000 deaths a year,

and result in \$4 billion in excess healthcare expenditures. [3–5] As many as two-thirds of the harmful medication-related events in the NH are preventable, [6] and active surveillance for suspected ADEs is one approach to prevention. [7]

Federal regulations require that each NH resident's drug regimen be free from unnecessary drugs (F-Tag 329) and that a consultant pharmacist (CP) conducts a Medication Regimen Review on each NH resident at least monthly (F-Tag 428). As part of the medication regimen review process, CPs are expected to identify medication-related problems, including those related to the presence of an ADE. [8] However, there are limitations in the CPs ability to identify ADEs, including: 1) the low frequency of performing medication regimen reviews (every 30 days); 2) the large number of residents requiring surveillance, if performed more frequently; and 3) the feasibility of ensuring that attending physicians receive recommendations and respond in a timely manner. It is useful to understand the perceived importance of these reviews conducted by CPs to identify opportunities for future improvement of this mandated service.

There have been a number of studies that have evaluated the impact of the drug reviews conducted by CPs on a variety of process measures and outcomes, including the appropriate prescribing of medications [9–11], number of medications prescribed [12–13], cost of medications [12,13], knowledge of drug therapy, therapeutic effects, ADEs, drug interactions [11], mortality, and discharge to a lower level of care [14]. Many of these studies evaluate the cumulative CP services, but lack a more specific evaluation of an individual pharmacist service, such as ADE surveillance.

Our research group recently completed a cluster RCT to determine the impact on ADE detection and management of a new intervention implemented by CPs and an active medication monitoring system that performed ADE surveillance for NH residents (AHRQ NCT01531088). The system provided alerts to a CP who then assessed the patient's situation and provided recommendations to their NH physician of record. The purpose of this project was to assess how physicians enrolled in the intervention and control arms of the trial designed to detect and manage ADEs perceived the *importance and performance* of the CP's services before and after the intervention.

Methods

Setting

The parent cluster-randomized trial was conducted at 4 non-profit, UPMC-affiliated NHs (2 urban and 2 suburban), with an average of 141 beds (range, 50–179). The NH physicians randomly allocated to intervention or control (i.e., usual care) arms of the trial were included as participants in this survey evaluation.

Consultant Pharmacist Services

As part of the CP-led intervention in the trial, CPs first provided academic detailing to intervention physicians describing the frequency, clinical significance, preventability, and impact (clinical and financial) of ADEs in the NH setting. Throughout the 9-month trial, in addition to the federally mandated 30-day medication regimen reviews (i.e., usual care), CPs

responded to alerts from the active medication monitoring system (Figure 1), adjudicated the alert for a potential ADE, and provided structured recommendations to intervention physicians about ADE management using the SBAR (Situation, Background, Assessment and Recommendation) structured communication framework during regular work hours (M-F 9AM – 5PM)[15,16]. The active medication monitoring system we used was the TheraDoc™ Clinical Surveillance Software System, which is used throughout in the UPMC Health System, including the 4 participating NHs, to automate the detection of potential adverse drug events. The TheraDoc™ system integrates data from several disparate information source systems, including admission/discharge/transfer, pharmacy, and laboratory. These data are integrated in real time, so that they appear in TheraDoc™ within seconds of being entered into the source system. An expert panel of physicians and pharmacists developed the knowledge base of medications and rule parameters for adverse drug event detection using a consensus based process as previously described.[17] For patients managed by physicians allocated to the control arm of the trial, a separate group of CPs who did not have access to or use the active medication monitoring system performed the 30-day medication regimen reviews mandated by Federal Regulations. The pharmacist working with patients in the intervention and control groups worked for the same consulting pharmacy service.

Survey

This before and after intervention survey of participants enrolled in the trial was approved by the University of Pittsburgh, Institutional Review Board. A previously published and validated survey containing 21 items pertaining to CP services was used as the basis for our evaluation.[18] We included 18 of the 21 items from the Clark et al. survey, removing three that were not relevant to the trial's objectives. We added six additional items relating to medication safety (total = 24 items). We further characterized the items into 2 groups assessing CP services: 1) benefitting the facility (questions 9–11, 13–17, 19, and 21–23) and 2) addressing residents' care and safety (questions 1–8, 12, 18, 20, and 24). All questions used a 5-point Likert scale, ranging from "Not at all Important" (1) to "Extremely Important" (5) for questions relating to importance, and "Poor" (1) to "Excellent" (5) for questions relating to performance. The 24-item questionnaire is provided in Appendix 1. The same 24-item survey was used for importance and performance, but the response referenced each of these individual characteristics and was administered simultaneously.

Physician Respondents

A research assistant or the principal investigator (SMH) invited physicians to complete the 24-item paper-based survey on up to two occasions. The pre-intervention survey was completed during the enrollment/consent process and prior to randomization for both the intervention and the control physicians. On the pre-intervention survey, we also collected physician demographic data including gender, type of medical degree (MD, DO), residency training, fellowship training, and number of hours spent in the NH per week. The post-intervention survey was distributed to all participating physicians after all NHs completed the study intervention. Figure 2 illustrates when the survey was administered relative to the intervention in the RCT.

Analysis

We used appropriate descriptive statistics to summarize physician characteristics, and survey responses. We used Wilcoxon signed rank test to compare pre- and post-intervention responses to each survey item within each intervention arm; and Wilcoxon rank sum tests to compare pre- to post-intervention changes in responses to each item between the intervention arms. All analyses were conducted using SAS version 9.2 (SAS[®] Institute, Inc., Cary, NC).

Results

Respondents

Of the 36 physicians enrolled in the RCT, 20 (100%) in the intervention and 16 (100%) in the control groups completed the pre-intervention survey, of which 17 (85%) in the intervention and 15 (94%) in the control groups also completed post-intervention surveys and comprise the survey respondents for these analyses. Demographic data are provided in Table 1 for the 32 physician respondents and the descriptive statistics were similar for the 36 physicians included in the RCT. Of note, the physician demographics for the intervention and control groups were similar (Table 1).

Importance of Consultant Pharmacist Services

The mean scores for all 24 survey items about perceived importance increased from 0.1 to 0.8 between the pre-intervention and post-intervention surveys for the intervention group. For 5 questions, a statistically significant mean change in importance was noted in the intervention physicians for (Table 2) including: 1) provides and periodically updates facility policies and procedures (M= 0.8, SD= 0.9); 2) comes to the facility during state surveyor visits (M= 0.8; SD= 1.3); 3) identifies educational and informational needs about medications and provides information resources when needed (M= 0.6; SD= 0.8); 4) provides disease management services (M=0.5; SD= 1.1); and 5) participates in appropriate facility committee meetings (M= 0.5; SD= 1.0). The mean scores for 16 of 24 survey items about importance increased from 0.1–0.5 in the control group, but none of these changes were statistically significant.

Performance of Consultant Pharmacist Services

Likewise, all of the survey questions (n=24) for performance increased in scores for the intervention group with mean changes ranging from 0.4–1.1. For 20 questions a statistically significant mean (M) change in performance was noted in the intervention physicians (Table 3). Eight factors with the most significant changes between pre and post included: 1) identifies residents at risk for disease and recommends appropriate intervention [M=1.1, Standard Deviation (SD) = 1.1]; 2) provides and periodically updates facility policies and procedures (M=1.1, SD= 0.8); 3) monitors and reports medication errors (M=1.1; SD= 0.8); 4) monitors and reports an increased risk for developing adverse drug events (M=1.0; SD= 1.1); 5) conducts medication regimen reviews in a timely manner (M=0.9; SD= 0.7); 6) detects and manages adverse drug events (M=0.9; SD= 0.9); 7) monitors effectiveness of drug therapy (M= 0.9; SD= 1.2); and 8) comes to the facility during state surveyor visits

($M=0.9$; $SD=1.2$). Thirteen of the 24 survey questions increased in scores for the control physicians ranging from 0.1–0.6, but none were statistically significant.

Comparison of Pre and Post Survey Results between Intervention and Control Groups

All of the mean changes for physicians' assessment of performance for the intervention group were greater ($n=23$ questions) compared to the control group with the exception of one question, number 3 (monitors overall safety of drug therapy) where the control group had a larger mean positive change.

Discussion

This survey study focuses on the physicians' assessment of the CP's services prior to and after the implementation of a RCT that created a new pharmacy practice model for the detection and management of potential ADEs in the NH. Physicians noted an improvement in CP services for the residents' care and facility when the CP was actively involved with ADE detection and management. This study offers a unique perspective relative to many pre and post survey designs, in that we also conducted pre and post surveys for the controls. The control group physicians reported benefits in pharmacy services as measured by importance and performance; however, their assessment did not improve significantly after the new pharmacy model began.

It is interesting to note that the importance of the 5 components of service that had statistically significant improvements per the intervention physicians were related to CP services that benefited the facility. One can speculate that the new pharmacy practice and communication model allowed the physicians to place increasing importance on these CP services that targeted the facility, since the CP services that targeted the resident were being managed so well with the new model. Another perspective could be that the physicians identified additional benefit in the pharmacy services after enhanced communication occurred with the implementation of our model. If this were true, then the physicians might have felt it important that pharmacists become more engaged in other components of service, such as facility-specific factors. For example, following the new pharmacy practice and communication model, additional importance was placed on having the pharmacist perform medication related educational needs and having a pharmacist participate in committee meetings. Again, this could have been a function of physicians' appreciating the benefit of the pharmacist following enhanced interactions.

Similarly, the intervention physicians responded that the performance of 20 of the questions of service provided by the CP and measured in the survey, improved significantly at the conclusion of the study. Unlike the changes that were significant in the importance section of the survey, physicians in the intervention group rated both CP services that targeted the facility ($n=11$) and the resident ($n=9$) as significant in the performance section of the survey. The new pharmacy practice model includes the pharmacist receiving an alert from the active medication monitoring system, adjudicating the alert for a potential ADE and providing structured recommendations to intervention physicians. We think it likely that this led to a significant improvement in the physicians' assessment of the CP's performance of managing resident specific factors. One of the alerts developed in the surveillance system

identified residents that met the criteria for risk of drug-associated acute kidney injury, thus permitting an opportunity to prevent progression from risk to injury to failure. This could explain the improvement in the score for “identifying residents at risk for disease” and “monitors and reports an increased risk for developing adverse drug events”. [19] Previous research suggests for example that the risk for drug-associated kidney injury is particularly common in the NH and this might be a good starting point for alert development at other NH facilities that want to advance pharmacy services. [20] Another resident-focused CP service that the physicians noted improvement was “monitors and reports medication errors” and the pharmacist did receive alerts for several medication errors such as the co-prescribing of potassium supplements and ACE inhibitors. The active medication monitoring system provided continuous surveillance, even after the pharmacist made a recommendation. As a result, any subsequent abnormal laboratory values would trigger another alert allowing for further management. This likely contributed to the perception of improvement for “monitors effectiveness of drug therapy”. Our pharmacy practice model was designed to “conduct medication regimen reviews in a timely manner” and “detect and manages adverse drug events” to overcome the limitations of current pharmacy services. Based on the opinions of the physicians, we were successful in achieving this outcome.

Three survey questions directly relate to the communication surrounding ADE management (Q4: Recommends appropriate lab work to monitor drug therapy; Q5: Recommends appropriate changes to drug regimen; Q20: Available for consultation between regular facility visits) from the original Clark et al. survey. [15] Our positive findings suggest that the communication framework in the cluster RCT (i.e., SBAR) and method of delivering the recommendations (i.e., secure email with telephone availability during working hours) were successful. An example of an SBAR email communication delivered to the physician is provided in Figure 3. These recommendations via SBAR email and telephone communications were provided according to escalation protocols to provide consistency. Telephone communication was used for more severe the ADE or a greater the concern for resident harm, while email communication was used for the less severe ADEs.

A previous survey conducted for purposes of a gap analysis of 21 services provided by CPs indicated there were 13 areas for improvement in performance, 10 of which were evaluated in our study (3, 7, 8, 10, 11, 13, 16, 17, 22, 23). [15] The intervention we provided demonstrated improvement in 6 of the 10 areas (7, 8, 10, 11, 13, 17). Also, we added 6 questions to the survey pertaining specifically to ADE management services performed by CPs (1, 6, 12, 18, 21, 24). Intervention physicians found an improvement in performance for all 6 services that were assessed by physicians. Pharmacist services should be focused on the safe use of medications including the prevention of ADEs. As such, we suggest that these 6 questions be included in future surveys that assess the importance and performance of CPs.

Currently, there is a National emphasis on better use and safety of drugs in the NH setting driven by the recognition that NH residents are at greater risk for ADEs than older adults dwelling in the community. [1] Active medication monitoring systems with clinical decision support are recommended to improve prescribing and preventing ADEs. [21–24] Two studies that evaluated the impact of clinical decision support in the NH reported a significantly greater number of appropriate drug orders but no overall improvement in ADE

rates. [5,25] We have successfully implemented clinical decision support in 4 NH to enhance and expand the care of the residents by the CP. It is believed that this is a practical strategy to enhance pharmacy services given adequate resources. While the patient-level health outcomes of this intervention are not presented in this study, the positive impact of the intervention on performance of CP services is important because it may translate into improved patient safety.

This study is limited by a small sample size of physician respondents. The generalizability of the results to other nursing homes may be a challenge depending on the current pharmacy services provided and the resources available to provide this new pharmacy care model.

Conclusion

A new pharmacy practice and communication model that combines academic detailing, computerized decision support, and a structured communication framework, can improve physicians' assessment of importance and performance of consultant pharmacist services in the skilled nursing facility.

Acknowledgments

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Appendix 1. Consultant Pharmacist Services

This section of the survey is to help us understand the importance of services provided by consultant pharmacists in UPMC nursing homes and to assess perception of their performance of services. Although the medication regimen review activity of consultant pharmacists has received the most attention over the years, the consultant pharmacist has other responsibilities.

In COLUMN 1, please rate the IMPORTANCE of each of these other activities. In COLUMN 2, please rate the PERFORMANCE of each of these other activities. *Please make sure to circle your answers in BOTH columns.*

Factor	COLUMN 1: IMPORTANCE					COLUMN 2: PERFORMANCE				
	Not at all Important		Extremely Important			Poor		Excellent		
	▼			▼		▼		▼		
1. Monitors and reports significant drug-drug interactions	1	2	3	4	5	1	2	3	4	5
2. Conducts medication review in a timely manner	1	2	3	4	5	1	2	3	4	5

Factor	COLUMN 1: IMPORTANCE					COLUMN 2: PERFORMANCE				
	Not at all Important		Extremely Important			Poor		Excellent		
	▼			▼		▼		▼		
3. Monitors overall safety of drug therapy	1	2	3	4	5	1	2	3	4	5
4. Recommends appropriate lab work to monitor drug therapy	1	2	3	4	5	1	2	3	4	5
5. Recommends appropriate changes to drug regimen	1	2	3	4	5	1	2	3	4	5
6. Monitors effectiveness of drug therapy	1	2	3	4	5	1	2	3	4	5
7. Monitors cost-effectiveness of drug therapy	1	2	3	4	5	1	2	3	4	5
8. Identifies residents at risk for disease and recommends appropriate intervention	1	2	3	4	5	1	2	3	4	5
9. Provides disease-management services	1	2	3	4	5	1	2	3	4	5
10. Provides and periodically updates facility policies and procedures	1	2	3	4	5	1	2	3	4	5
11. Assists facility with controlled substances accountability	1	2	3	4	5	1	2	3	4	5
12. Detects and manages adverse drug events	1	2	3	4	5	1	2	3	4	5
13. Assists facility with infection control	1	2	3	4	5	1	2	3	4	5
14. Participates in appropriate facility committee meetings	1	2	3	4	5	1	2	3	4	5
15. Provides written reports to facility on medication use patterns	1	2	3	4	5	1	2	3	4	5
16. Helps facility minimize drug spending on Medicare Part A	1	2	3	4	5	1	2	3	4	5
17. Helps facility comply with state and federal regulations	1	2	3	4	5	1	2	3	4	5
18. Monitors and reports medication errors	1	2	3	4	5	1	2	3	4	5

Factor	COLUMN 1: IMPORTANCE					COLUMN 2: PERFORMANCE				
	Not at all Important		Extremely Important			Poor		Excellent		
	▼			▼		▼		▼		
19. Comes to the facility during state surveyor visits	1	2	3	4	5	1	2	3	4	5
20. Available for consultation between regular facility visits	1	2	3	4	5	1	2	3	4	5
21. Identifies facilities educational and informational needs about medications and provides informational resources when needed	1	2	3	4	5	1	2	3	4	5
22. Trains staff on commonly used medications in nursing facilities	1	2	3	4	5	1	2	3	4	5
23. Trains staff on proper administration of medication	1	2	3	4	5	1	2	3	4	5
24. Monitors and reports an increased risk for developing adverse drug events	1	2	3	4	5	1	2	3	4	5

Modified from Clark TR. *Consult Pharm.* Sep 2008;23 Suppl C:3–15.

Questions 1,6,12,18,21,24 were added to the Clark TR. Survey.

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ADE: Drug-Associated Acute Kidney Injury

Admit Diagnosis: CARE INVOLVING OTHER SPECIFIED REHABILITATION PROCEDURE, OTHER

Demographics & renal function

Age: 79 years

Sex: F

SCr: 4.18 ()

Height: 61 in (155 cm)

CrCl: 9 mL/min(Cockcroft-Gault; weight used=55 kg)

Weight: 145.2 lb (66 kg)

Possible drug associated ACUTE KIDNEY FAILURE.

This patient's CREATININE has increased greater than or equal to 3 fold relative to the nadir value (1.2 mg/dL) found in the past 365 days and has at least 1 active order(s) for a drug associated with acute kidney injury.

Most Recent Serum Creatinine: CREATININE= 4.18 MG/DL (COMPREHENSIVE METABOLIC PANEL W/EGFR Collected: 09/06/2012)

Nadir Serum Creatinine: Creatinine= 1.2 mg/dL (Basic Metabolic Profile Collected: 07/10/2012 06:35:00)

Drug	Dose	Start	End	Status	Pat Class
FUROSEMIDE TAB 40MG	40 MG PO QD	08/31/2012		ACTIVE	I

Previously published in: Determining the incidence of drug-associated acute kidney injury in nursing home residents. Handler SM, Cheung PW, Culley CM, Perera S, Kane-Gill SL, Kellum JA, Marcum ZA. J Am Med Dir Assoc. 2014 Oct;15(10):719-24.

Figure 1.
Example of alert

Figure 2.
Study Design of Before and After Intervention Survey

Please respond to the email or call [REDACTED] before 4 PM:

S: Resident has acute kidney failure as defined by the RIFLE criteria.

B: Resident is a 79 yo w/ baseline CrCl of 33 mL/min (Stage 3 chronic kidney disease) and diastolic congestive heart failure.

A: Furosemide was increased from 20 mg daily to 40 mg daily on 08/31/12. Since this time, weight has decreased 5 lbs. and oral intake has consistently been at 75%-100%.

R: Recommendations include: 1) stop furosemide; 2) start IVFs D5W @ 75 cc/hr x 1 liter; 3) strict I&O's x 5 days; and 4) repeat SCr in 24 hr.

ADE: Drug-Associated Acute Kidney Injury

Demographics & renal function

Age: 79 years	Sex: F
SCr: 4.18 ()	Height: 61 in (155 cm)
9 mL/min(Cockcroft-CrCl: Gault; weight used=55 kg)	Weight: 145.2 lb (66 kg)

Possible drug associated ACUTE KIDNEY FAILURE.

Figure 3.
Example of SB AR Communication

Table 1

Comparison of Baseline Physician Characteristics for Respondents in the Intervention and Control Groups

Characteristics	All Respondents N=(32) n (%)	Intervention Physicians N=17 n (%)	Control Physicians N=15 n (%)	P Value
Gender - Male	23 (71.9)	12 (70)	11 (73.3)	0.30
Medical Degree				
MD	30 (93.8)	17 (100)	13 (86.7)	0.21
DO	2 (6.3)	0 (0)	2 (13.3)	
Residency				
Family Medicine	14 (43.8)	9 (52.9)	5 (33.3)	0.26
Internal Medicine	18 (56.3)	8 (47.1)	10 (66.7)	
Fellowship				
Geriatric Medicine	8 (25)	5 (29.4)	3 (20)	0.91
Pharmacy/Pharmacology	8 (25)	4 (23.5)	4 (26.7)	
Not Completed	16 (50)	8 (47.1)	8 (56.3)	
Certificate of Added Qualification in Geriatrics	9 (28.1)	6 (35.3)	3 (20)	0.20
Nursing Home Hours Weekly Mean (SD)	7.5 (5.6)	7.4 (5.6)	7.5 (6.1)	0.76

MD= medical degree; DO = doctors of osteopathic medicine; SD= standard deviation

TABLE 2
SURVEY RESULTS FOR INTERVENTION AND CONTROL PHYSICIANS' PERCEPTION OF THE IMPORTANCE OF PHARMACIST SERVICES

Survey Items	Intervention Group (n=17)			Control Group (n=15)		
	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY:	MEAN CHANGE IN PRE and POST SURVEY	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY:	MEAN CHANGE IN PRE and POST SURVEY
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
1. Monitors and reports significant drug-drug interactions ^a	4.6 (0.6)	4.8 (0.3)	0.3 (0.7)	4.4 (0.9)	4.6 (0.6)	0.2 (0.6)
2. Conducts medication review in a timely manner ^a	4.5 (0.8)	4.8 (0.4)	0.3 (0.8)	4.4 (0.9)	4.5 (0.6)	0.1 (1.0)
3. Monitors overall safety of drug therapy ^a	4.7 (0.6)	4.9 (0.2)	0.3 (0.7)	4.4 (0.9)	4.6 (0.7)	0.2 (0.7)
4. Recommends appropriate lab work to monitor drug therapy ^a	4.1 (0.9)	4.4 (0.9)	0.4 (1.1)	4.2 (0.8)	4.0 (1.0)	-0.1 (0.9)
5. Recommends appropriate changes to drug regimen. ^a	4.1 (0.7)	4.4 (0.7)	0.4 (1.2)	4.1 (1.1)	3.9 (0.9)	-0.1 (1.1)
6. Monitors effectiveness of drug therapy ^a	3.8 (0.9)	4.4 (1.0)	0.3 (1.1)	3.4 (1.1)	3.7 (1.1)	0.3 (1.1)
7. Monitors cost-effectiveness of drug therapy ^a	3.8 (0.9)	3.8 (0.9)	0.1 (1.2)	3.7 (0.9)	4.1 (0.8)	0.5 (0.9)
8. Identifies residents at risk for disease and recommends appropriate intervention ^a	3.9 (1.0) [	4.1 (0.9)	0.3 (1.3)	3.1 (1.4)	3.5 (1.1)	0.4 (1.4)
9. Provides disease-management services ^b	3.6 (1.1)	3.9 (0.9)	0.5 (1.1) **	3.1 (1.0)	3.2 (1.2)	0.1 (1.0)
10. Provides and periodically updates facility policies and procedures. ^b	3.9 (0.7)	4.4 (0.9)	0.8 (0.9) **	3.6 (0.7)	3.6 (1.4)	-0.1 (1.2)
11. Assists facility with controlled substances accountability ^b	4.4 (0.7)	4.6 (0.5)	0.4 (0.9)	4.5 (0.8)	4.4 (1.1)	-0.1 (0.9)
12. Detects and manages adverse drug events ^a	4.7 (0.7)	4.9 (0.9)	0.4 (0.7)	4.3 (0.9)	4.5 (0.9)	0.2 (0.9)
13. Assists facility with infection control ^b	4.1 (1.0)	4.0 (0.9)	0.1 (1.5)	3.4 (1.1)	3.4 (1.4)	0.1 (1.2)
14. Participates in appropriate facility committee meetings ^b	3.9 (0.9)	4.2 (0.7)	0.5 (1.0) *	3.9 (1.0)	4.2 (1.0)	0.4 (1.2)
15. Provides written reports to facility on medication use patterns ^b	3.9 (0.9)	4.2 (0.8)	0.5 (1.2)	4.1 (0.9)	4.3 (0.6)	0.3 (0.7)
16. Helps facility minimize drug spending on Medicare Part A ^b	3.8 (0.7)	3.9 (0.9)	0.2 (1.2)	3.9 (1.0)	4.0 (0.8)	0.1 (0.9)
17. Helps facility comply with state and federal regulations ^b	4.4 (0.8)	4.6 (0.6)	0.3 (1.2)	4.5 (0.7)	4.0 (0.5)	0.1 (0.8)
18. Monitors and reports medication errors ^a	4.6 (0.8)	4.9 (0.3)	0.4 (0.9)	4.6 (0.5)	4.6 (0.5)	0.0 (0.5)
19. Comes to the facility during state surveyor visits ^b	3.7 (0.9)	4.5 (0.6)	0.8 (1.3) **	4.2 (0.9)	4.0 (1.4)	-0.1 (1.3)

Survey Items	Intervention Group (n=17)			Control Group (n=15)		
	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY:	MEAN CHANGE IN PRE and POST SURVEY	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY:	MEAN CHANGE IN PRE and POST SURVEY
Survey Items	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
20. Available for consultation between regular facility visits ^a	4.1 (0.8)	4.2 (0.8)	0.2 (1.1)	4.0 (1.0)	4.2 (0.9)	0.3 (1.0)
21. Identifies facilities educational and informational needs about medications and provides informational resources when needed ^b	3.9 (0.9)	4.4 (0.7)	0.6 (0.8) ^{**}	4.0 (0.7)	4.3 (0.8)	0.3 (0.6)
22. Trains staff on commonly used medications in nursing facilities ^b	4.5 (0.8)	4.7 (0.5)	0.4 (0.9)	4.3 (0.9)	4.3 (0.7)	0.0 (1.1)
23. Trains staff on proper administration of medication ^b	4.4 (0.8)	4.6 (0.5)	0.4 (1.0)	4.4 (1.0)	4.4 (0.8)	0.1 (1.1)
24. Monitors and reports an increased risk for developing adverse drug events ^a	4.5 (0.8)	4.6 (0.6)	0.2 (0.9)	4.5 (0.7)	4.4 (0.7)	-0.1 (0.9)

Survey Modified from Clark TR. *Consult Pharm*. Sep 2008;23 Suppl C:3–15;

* p value <0.10 and

** p value <0.05

^a = consultant pharmacist services that address resident care and safety

^b = Consultant pharmacist services that benefit the facility

SURVEY RESULTS FOR INTERVENTION AND CONTROL PHYSICIANS' PERCEPTION OF THE PERFORMANCE OF PHARMACIST SERVICES

TABLE 3

Survey Items	Intervention Group (n=17)			Control Group (n=15)		
	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY	MEAN CHANGE IN PRE and POST SURVEY	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY	MEAN CHANGE IN PRE and POST SURVEY
Factor	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
1. Monitors and reports significant drug-drug interactions ^a	3.6 (1.1)	4.3 (0.9)	0.6 (0.9) **	3.3 (0.9)	3.7 (1.2)	0.4 (1.2)
2. Conducts medication review in a timely manner ^a	3.3 (1.1)	4.4 (1.1)	0.9 (0.7) **	2.9 (0.9)	3.5 (1.3)	0.5 (1.4)
3. Monitors overall safety of drug therapy ^a	3.6 (0.9)	4.1 (1.2)	0.4 (0.9)	3.2 (0.8)	3.8 (1.1)	0.5 (1.4)
4. Recommends appropriate lab work to monitor drug therapy ^a	3.5 (0.9)	4.1 (1.2)	0.7 (0.9) **	3.2 (0.8)	3.6 (1.1)	0.4 (1.1)
5. Recommends appropriate changes to drug regimen. ^a	3.5 (0.9)	4.1 (1.1)	0.6 (1.1) **	3.4 (1.0)	3.2 (1.1)	-0.3 (1.3)
6. Monitors effectiveness of drug therapy ^a	2.9 (1.1)	4.0 (1.2)	0.9 (1.2) **	2.5 (0.9)	2.8 (1.0)	0.2 (1.3)
7. Monitors cost-effectiveness of drug therapy ^a	3.0 (1.2)	3.6 (1.2)	0.6 (1.0) **	2.6 (1.0)	2.8 (1.3)	0.1 (1.2)
8. Identifies residents at risk for disease and recommends appropriate intervention ^a	2.7 (1.0) [	3.8 (1.3)	1.1 (1.1) **	2.3 (0.9)	2.6 (1.3)	0.2 (0.9)
9. Provides disease-management services ^b	2.7 (1.0)	3.6 (1.3)	0.8 (1.2) **	2.3 (0.9)	2.6 (1.2)	0.2 (0.7)
10. Provides and periodically updates facility policies and procedures ^b	2.8 (1.0)	3.9 (1.0) \	1.1 (0.8) **	2.9 (1.0) \	2.9 (1.2) [3.0]	-0.2 (1.2)
11. Assists facility with controlled substances accountability ^b	3.4 (1.4)	4.1 (1.2) \	0.5 (1.0) *	3.2 (1.6) \	3.3 (1.5) \	-0.1 (1.9)
12. Detects and manages adverse drug events ^a	3.3(1.1)	4.2 (1.2) \	0.9 (0.9) **	2.9 (0.8) \	3.3 (1.4) \	0.3 (1.2)
13. Assists facility with infection control ^b	3.2 (0.6)	3.9 (1.1) \	0.8 (1.2) **	2.3 (0.8) \	2.5 (1.2) \	0.2 (1.3)
14. Participates in appropriate facility committee meetings ^b	3.2 (0.8)	3.9 (0.9)	0.8 (0.8) **	3.4 (1.3) \	3.5 (1.1) \	-0.1 (1.4)
15. Provides written reports to facility on medication use patterns ^b	3.0 (1.0)	3.7 (1.2)	0.7 (1.3) *	3.1 (0.9) \	3.2 (0.9) \	-0.1 (1.1)
16. Helps facility minimize drug spending on Medicare Part A ^b	3.2 (1.0)	3.7 (1.2)	0.5 (1.4)	2.9 (0.9) \	2.9 (1.1) \	-0.1 (0.8)
17. Helps facility comply with state and federal regulations ^b	3.6 (0.6)	4.2 (1.3)	0.6 (1.3) *	3.5 (1.1) \	3.6 (1.1) \	-0.1 (0.9)

Survey Items	Intervention Group (n=17)			Control Group (n=15)		
	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY	MEAN CHANGE IN PRE and POST SURVEY	SCORE FOR PRE SURVEY	SCORE FOR POST SURVEY	MEAN CHANGE IN PRE and POST SURVEY
Factor	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
18. Monitors and reports medication errors ^a	4.6 (0.8)	4.4 (1.1)	1.1 (0.8) **	3.0 (1.2) \	3.6 (1.1) \	0.5 (1.3)
19. Comes to the facility during state surveyor visits ^b	2.9 (0.8)	3.9 (0.9)	0.9 (1.2) **	3.3 (1.0) \	3.0 (1.5) \	-0.3 (1.5)
20. Available for consultation between regular facility visits ^a	3.3 (1.2)	3.8 (1.1)	0.5 (0.8) *	3.0 (0.8) \	3.2 (1.1) \	0.1 (1.2)
21. Identifies facilities educational and informational needs about medications and provides informational resources when needed ^b	3.0 (0.9) \	3.9 (1.2) \	0.8 (0.8) **	2.8 (0.8) \	2.9 (1.2)	0.0 (0.9)
22. Trains staff on commonly used medications in nursing facilities ^b	3.3 (1.0) \	3.8 (1.0) \	0.4 (1.2)	2.7 (1.0) \	2.9 (1.2)	0.1 (0.6)
23. Trains staff on proper administration of medication ^b	3.3 (1.0) \	3.8 (1.1) \	0.6 (1.2)	2.8 (0.9) \	2.9 (1.2)	-0.1 (0.8)
24. Monitors and reports an increased risk for developing adverse drug events ^a	3.2 (1.2) \	4.1 (1.0) \	1.0 (1.1) **	3.1 (0.9) \	3.1 (1.2) \	-0.1 (1.0)

Survey Modified from Clark TR. *Consult Pharm.* Sep 2008;23 Suppl C:3-15;

* p value <0.10 and

** p value <0.05

^a = consultant pharmacist services that address resident care and safety

^b = Consultant pharmacist services that benefit the facility