

Knowledge of Evidence-Based Urinary Catheter Care Practice Recommendations Among Healthcare Workers in Nursing Homes

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OBJECTIVES: To assess the knowledge of recommended urinary catheter care practices among nursing home (NH) healthcare workers (HCWs) in southeast Michigan.

DESIGN: Self-administered survey.

SETTING: Seven NHs in southeast Michigan.

PARTICIPANTS: HCWs.

MEASUREMENTS: The survey included questions about respondent characteristics and knowledge about indications, care, and personal hygiene pertaining to urinary catheters. The association between knowledge measures and occupation (nurses vs aides) was assessed using generalized estimating equations.

RESULTS: Three hundred fifty-six of 440 HCWs (81%) responded. More than 90% of HCWs were aware of measures such as cleaning around the catheter daily, glove use, and hand hygiene with catheter manipulation. They were less aware of research-proven recommendations of not disconnecting the catheter from its bag (59% nurses, 30% aides, $P < .001$), not routinely irrigating the catheter (48% nurses, 8% aides, $P < .001$), and hand hygiene after casual contact (60% nurses, 69% aides, $P = .07$). HCWs were also unaware of recommendations regarding alcohol-based hand rub (27% nurses and 32% aides with correct responses, $P = .38$). HCWs reported informal (e.g., nurse supervisors) and formal (in-services) sources of knowledge about catheter care.

CONCLUSION: Significant discrepancies remain between research-proven recommendations pertaining to urinary catheter care and HCWs' knowledge. Nurses and aides differ in their knowledge of recommendations against harmful practices, such as disconnecting the catheter from the bag and

routinely irrigating catheters. Further research should focus on strategies to enhance dissemination of proven infection control practices in NHs. *J Am Geriatr Soc* 58:1532–1537, 2010.

Key words: urinary catheter; nursing homes; translating research into practice

Urinary catheters are frequently used for short- and long-term care in skilled nursing home (NH) facilities.^{1,2} A recent study of all skilled NHs in four states showed that 12% to 13% of all new admissions had indwelling catheters.² Within Department of Veterans Affairs NHs, 14% of residents have an indwelling urinary catheter.¹ Indwelling urinary catheters are often used to manage refractory urinary retention, large skin wounds, and pressure ulcers to avoid contamination or for comfort care in patients receiving hospice care. These indwelling catheters carry many risks for NH residents, including asymptomatic bacteriuria, symptomatic urinary tract infections (UTIs), and antimicrobial resistance.^{3–5}

The majority of residents with indwelling urinary catheters have persistent bacteriuria. Microbial surveys have shown that more than 95% of all NH residents with urinary catheters have bacteriuria.^{4,5} Moreover, it is estimated that 50% of NH residents with urinary catheters will have symptomatic catheter-associated UTIs each year.⁶ UTIs can lead to bacteremia, sepsis, and death.³

Nursing home residents with indwelling catheters are also more likely to have UTIs with multidrug-resistant organisms than residents without these devices.^{7,8} Research shows that these residents are commonly colonized with multidrug-resistant organisms, often at multiple body sites, including nares, oropharynx, groin, and perianal areas.^{9–11} Colonizing organisms from these residents may also be transferred to other residents, usually by the hands of healthcare workers (HCWs).^{8,12}

Previous research studies reveal that specific catheter care practices can reduce entry of organisms into the usually

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sterile urinary bladder. These research advances have been translated into recommendations from leading organizations such as the Centers for Disease Control and Prevention (CDC) to prevent catheter-associated disease and complications.^{13–15} The extent to which these recommended practices are being used in NHs is not known. Therefore, we sought to assess the awareness of current evidence-based urinary catheter care practices in HCWs working in NHs. The specific objectives were to evaluate HCWs' knowledge and awareness of recommended practices pertaining to urinary catheter care, compare differences in knowledge of catheter care practices between nurses and nurse aides, and evaluate the sources of HCWs' knowledge about urinary catheters and their care.

METHODS

Study Sites

This survey-based study was conducted between August and December 2006 in seven community-based, freestanding NHs in southeastern Michigan. These facilities are part of an infection control research consortium and have participated in prior observational microbial studies of NH residents with indwelling devices. The University of Michigan Medical School institutional review board approved the study. All seven facilities have residents requiring long-term care, as well as short-term rehabilitation. They also have designated infection control professionals responsible for their infection control program. Four of the facilities are nonprofit, two are for profit, and one is run by the state government. Total number of beds ranged from 56 to 160 beds (Table 1). All HCWs, including nurses (registered professional nurse (RN) and licensed practical nurse (LPN)) and nurse aides, from the seven facilities received the study questionnaire except for agency HCWs on per diem assignment who were excluded from participation. RNs and LPNs were considered to be nurses because their scope of practice for urinary catheter care is identical. Although only nurses insert, change, and irrigate catheters, nurses and nurse aides can change the leg bags, a practice that can cause a disruption in the normally closed-drainage system. In Michigan, nurse aides are required to complete a minimum 75-hour state-approved nurse aide training program to become a certified nurse aide.

Study Design

A self-administered anonymous questionnaire was used to evaluate HCWs' knowledge regarding CDC-recommended urinary catheter care practices. Infection control practitioners at each facility were involved in the planning phase of the study. A member of the research team handed the questionnaire out to all HCWs, for all shifts, as they reported to work. Additional questionnaires were left with the facilities' infection control practitioners, who were also involved in choosing the best times to distribute the questionnaires. For example, at one facility, in addition to handing out the questionnaire as HCWs reported to work, the infection control practitioner distributed the survey during a scheduled in-service session. A cover letter explaining the purpose of the study accompanied each questionnaire. Consent was implied by voluntary return of the questionnaire. Completed questionnaires were placed in a box in the infection control practitioner's office at each facility. Canvas totes with infection control messages were given to the infection control practitioners to be distributed at their discretion to acknowledge participation in various infection prevention projects. Each facility in the consortium also received a certificate of participation from the University of Michigan for participation.

Study Questionnaire

The questionnaire was based on national recommendations pertaining to urinary catheter indications and care and hand hygiene guidelines.¹³ Knowledge items tested CDC recommendations pertaining to indwelling urinary catheter care. No distractors were included. The questionnaire was first pilot tested among eight nurses on the infection control committee at the University of Michigan. Individual domains and items were clarified based on their recommendations.

Demographic questions for HCWs included sex; profession (RN, LPN, or nurse aide); duration of service at the NH in months; and number of residents with urinary catheters under their care.

Their knowledge about indications for indwelling urinary catheter use and urinary catheter care was assessed using questions related to indications for long-term urinary catheters as per the CDC guidelines; measures that should be taken for the care of residents with urinary catheters, including local skin care around the catheter site, routine

Table 1. Survey Sample Characteristics

Characteristic	Facility 1	Facility 2	Facility 3	Facility 4	Facility 5	Facility 6	Facility 7
Beds, n	160	142	102	82	71	120	56
Facility ownership	Nonprofit	For Profit	Nonprofit	Nonprofit	For Profit	Government	Nonprofit
HCWs eligible, n	78	67	91	54	50	74	26
HCWs enrolled, n	73	51	85	43	15	74	15
Female:male	66:7	48:3	84:1	40:3	13:2	70:4	15:0
Years at facility, mean \pm standard deviation	8.6 \pm 8.8	9.7 \pm 8.9	9.2 \pm 9.8	7.8 \pm 7.9	12.6 \pm 8.6	8.9 \pm 9.5	8.1 \pm 11.4
Nurse:nurse aide	34:39	24:27	24:61	11:33	9:6	19:55	7:8
Nurse time/resident per day	1h 53m	1h 19m	1h 10m	1h 5m	1h 11m	1h 2m	1h 22m
Nurse aide time/resident per day	2h 19m	2h 19m	2h 40m	2h 54m	2h 3m	2h 9m	2h 11m

HCW = healthcare worker.

Table 2. Healthcare Worker (HCW; Nurses and Nurse Aides) Knowledge of Centers for Disease Control and Prevention Recommendations for Urinary Catheter Use and Care Practices, Hand Hygiene, and Catheter Care

Question	Correct Answer, n (%)			Odds Ratio (95% Confidence Interval)	P-Value
	All HCWs	Nurses	Nurse Aides		
Long-term use of urinary catheters (such as Foley or suprapubic) is appropriate for the following conditions					
Urinary retention that can not managed by intermittent catheterization (indicated)	276 (78)	99 (88)	164 (75)	1.6 (0.6–4.3)	.35
Large pressure ulcers (indicated)	252 (71)	93 (83)	159 (60)	1.6 (0.5–0.7)	.38
Terminal illness that makes bed clothing changes uncomfortable for the resident (indicated)	246 (69)	83 (74)	152 (70)	1.2 (0.8–1.8)	.46
The following questions concern personal hygiene when caring for residents with indwelling urinary catheters.					
I cleanse my hands with soap and water or alcohol-based hand rub before UC manipulation (recommended).	317 (97)	99 (93)	218 (98)	0.2 (0.1–0.6)	.008
I cleanse my hands with soap and water or alcohol-based hand rub after UC manipulation (recommended).	315 (96)	99 (93)	216 (97)	0.4 (0.1–1.9)	.26
It is not necessary to cleanse hands after casual contact (such as taking pulse or adjusting their position) with residents with UC (recommended).	218 (61)	64 (59)	154 (69)	0.6 (0.3–1.0)	.06
If my hands are not soiled, hand hygiene with alcohol-based hand rub is adequate after manipulation of catheter site (recommended).	106 (32)	29 (27)	70 (32)	0.7 (0.3–1.5)	.38
The following measures should be taken for care of residents with an indwelling urinary catheter.					
Area around UC cleaned at least once a day (recommended).	302 (85)	98 (94)	204 (91)	1.2 (0.3–5.1)	.84
Catheter should be changed once a month.	54 (16)	27 (22)	27 (12)	2.7 (1.4–5.3)	.003
Catheter and its bag can be temporarily disconnected (not recommended).	122 (34)	59 (57)	63 (29)	3.6 (2.4–5.3)	< .001
Catheter should be irrigated once per week (not recommended).	68 (19)	50 (48)	18 (8)	10.0 (5.2–16.8)	< .001

UC = indwelling urinary catheter.

changing and irrigation of urinary catheters, and the need to maintain a closed-drainage system; indications for changing a urinary catheter, such as on admission, after a hospitalization, infection, leaking, blockage, or routine monthly change; and personal hygiene measures while taking care of residents with urinary catheters, such as hand hygiene before and after care of these residents, glove usage during care, and recommended indications for hand hygiene. Two open-ended questions were used to query as to how HCWs in NHs learn about infection prevention practices pertaining to urinary catheter care and hand hygiene. Information on the availability of alcohol-based hand rub (in patient rooms vs only on treatment carts) in the facility was obtained from the infection control practitioner.

Statistical Analyses

Responses were measured on a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree). For example, the item “The catheter should be irrigated once a week” was coded as 1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree, 6 = do not know. For established and research-proven indications, do not know and neither agree nor disagree (3 or 6) were considered incorrect. Table 2 shows percentage of HCWs (nurses and nurse aides) with correct and incorrect responses to questions about indications for urinary catheter

use, hand hygiene, and knowledge about indwelling catheter care practices. To account for the differences in training and scope of practice and to identify specific areas of improvement, nurses and nurse aides were analyzed separately. Nurses in leadership positions, such as the Director of Nursing and Nursing Supervisor, were also allowed to take the survey, although their numbers were too few ($n = 15$) to be analyzed separately. The association between knowledge of urinary catheter use and catheter care with occupation (nurses vs nurse aides) was assessed using linear and logistic regression with generalized estimating equations (GEEs) to account for the clustering effect among staff working in the same facility, presence of urinary catheter care policy, or adjusted for time at the facility and whether they were taking care of patients with urinary catheters at the time of the study.

RESULTS

Of the 440 eligible HCWs, 356 responded, for a response rate of 81%. All facilities had a urinary catheter care policy and alcohol-based hand rub on the treatment cart. On average, each HCW cared for approximately seven residents with an indwelling or suprapubic catheter. Only two facilities had alcohol-based hand rub in all patient rooms. Most of the respondents were female (Table 1). A significant proportion of HCWs were aware of established

recommendations for long-term catheter use (Table 2), such as urinary retention not managed by intermittent straight catheterization (74%), presence of large wounds (71%), and comfort care (69%).

Knowledge About Indwelling Catheter Care Practices

Most respondents were familiar with recommended hand hygiene practices as they relate to the use of indwelling urinary catheters (Table 2). For example, 88% of HCWs agreed that it was necessary to cleanse hands before and after urinary catheter manipulation. Ninety-seven percent indicated that it was necessary to wear gloves during catheter manipulation.

In contrast, only 60% of respondents considered it necessary to cleanse hands after casual contact (e.g., taking vital signs or assisting with transfers) with high-risk residents. More than 60% of respondents also were unaware that the guidelines suggest that alcohol-based hand rub can be used in any situation requiring hand hygiene if hands are not soiled. There were no differences between nurses and aides regarding knowledge of hand hygiene recommendations. Both groups were equally aware of hand hygiene recommendations during any catheter manipulation and equally unaware of hand hygiene recommendations after casual contact and appropriate alcohol-based hand rub usage (Table 2).

A majority of respondents were aware of recommendations, such as cleaning the catheter site regularly (85%) and securing catheter bags below the abdomen (79%, Table 2). In contrast, when asked whether drainage bags can be disconnected to take a urine sample, only 34% responded correctly. Similarly, when asked whether catheters should be irrigated once a week, only 19% responded correctly. Nurses were more likely than nurse aides to be knowledgeable about the indications for long-term urinary catheter care and about other catheter care practices, such as maintaining a closed-drainage system (57% nurses, 29% nurse aides with correct responses, $P < .001$) and avoiding routine bladder irrigations (58% nurses, 8% nurse aides with correct responses, $P < .001$) (Table 2).

Sources of Information Pertaining to Urinary Catheter Care

Responses to the open-ended questions on how HCWs learn about urinary catheter care (325 unique responses) and hand hygiene (329 unique responses) were grouped into two major categories: formal methods and informal methods. Formal methods included in-services, lectures, and nursing school and nurse aide courses. Informal methods included prior experience, nurse supervisors, coworkers, and facility policies.

With respect to urinary catheter care, 52% reported that they learned from didactic formal methods, 24% informally, and 24% from both informal and formal methods. Regarding hand hygiene, 51% reported that they learned from didactic formal methods, 15% from informal methods, and 34% from informal and formal methods.

DISCUSSION

Efforts to reduce healthcare costs have led to fewer hospitalizations and shorter hospital lengths of stay, as well as

more outpatient and home care visits and longer NH stays for older adults.¹⁶ As a consequence, NHs and rehabilitation units are seeing patients with higher acuity of care who require more intensive medical supervision, have more invasive devices (e.g., indwelling urinary catheters, feeding tubes, central venous catheters), and are more prone to infections, as well as antimicrobial resistance. Given this transition toward the use of more long-term or chronic care settings by sicker patients, the incidence and effect of nosocomial infections will only increase, heightening the crucial role of infection control programs and the use of recommended practices in the prevention of nosocomial infections in these settings.^{17,18}

Unfortunately, our study found significant gaps were found between research-proven recommendations related to urinary catheters and HCW knowledge. For example, 25% of survey respondents were unaware of indications for long-term catheter use, 55% were unaware of recommended practices to maintain a closed-drainage system, and 70% were unaware of current recommendations against the practice of routine bladder irrigation. In a study of HCWs in NHs in the United Kingdom, 35% of HCWs reported regular changes of catheter bags and 55% reported routine bladder irrigations, contrary to UK National Institute for Clinical Excellence recommendations.¹⁸ Compromising a closed-drainage system and routine irrigations can harm the patient by causing more UTIs. Findings from the current study provide areas for improvement as HCWs in NH settings prepare to take care of an increasingly sicker population.

Enhancing hand hygiene practices to prevent infections and antimicrobial resistance has been a major focus of various infection prevention organizations.¹⁹ Thus, it was encouraging to see that respondents were, in general, aware of hand hygiene recommendations during urinary catheter care. Casual contact with residents is common in these facilities; some examples include obtaining vital signs such as blood pressure and pulse rate, assisting with transfers or dining, and taking patients to recreational activities. Even in these situations, hand hygiene with soap and water or alcohol-based hand rub is recommended.¹⁹ A majority of the respondents were not aware of the appropriate use of alcohol-based hand rub for hand hygiene in these situations. Although acute care hospitals have readily embraced alcohol-based hand rub as an easy tool to enhance hand hygiene compliance, NHs have been generally reluctant to place alcohol-based hand rub in individual patient rooms.²⁰ Specifically, placement of alcohol-based hand rub in hallways led to objections during local fire marshal inspections that they may pose a fire hazard. Educational interventions with leadership support aimed at appropriate indications, usage, and techniques pertaining to alcohol-based hand rub can enhance hand hygiene practices in these facilities.

Recommendations, guidelines, and position papers have the potential to enhance patient care by promoting interventions of proven benefit and discouraging ineffective interventions. Introducing guidelines into routine clinical practice requires thoughtful, effective, and efficient dissemination and implementation strategies. It has been suggested that there are three types of systems involved in using research data: researchers, end users, and linkage systems.²¹ The linkage systems are researchers, end users,

or other interested third parties who serve as connections between the researchers and end users. The gap between researchers and end users or the lack of effective linkage system is crucial to suboptimal adoption of proven research practice.²²

The data from the current study show that HCWs in NHs learn infection control practices through formal didactic methods and informally, such as from their nursing managers and supervisors. This suggests that a multi-pronged approach that includes structured educational in-services, informal discussions with supervisors, and identifying effective linkages such as medical directors, infection control professionals, long-term care organizations, and nursing mentors may be required to promote the use of recommended infection prevention practices. Educational content and approach may differ for nurses and nurse aides. Further research is crucial to identify individualized and optimal strategies to bring research to the bedside in these facilities.

Although the data from this study derive from a large sample of HCWs from multiple NHs, there are a few limitations. First, the study relies on self-report. There could be a tendency toward overreporting knowledge regarding recommended practices. Knowledge of recommendations is often not translated into observed practices. Additionally, RNs and LPNs were considered to be nurses because their scope of practice for insertion and care for urinary catheters did not differ. It is possible that the responses would differ between nurses providing care on the floor and those in administration, but the sample size did not allow for subgroup analyses based on clinical and nonclinical duties. Second, the data were collected from HCWs in southeast Michigan facilities and may not be nationally representative. Third, clinical data such as infection rates were not collected. A follow-up study is planned to define the incidence rate of infections in this high-risk group. The survey was based on recommendations from research performed in acute care hospitals and applied to the NH population. Although urinary catheter care should not change between hospitals and NHs, further research is required to learn about mechanisms of infections related to urinary catheter use and care in the NH setting.

Limitations notwithstanding, this study systematically identifies gaps in knowledge pertaining to urinary catheter care and hand hygiene adherence in the NH setting. The excellent response rate gives a generalizable synopsis of knowledge of NH HCWs with different levels of training and methods by which NH HCWs learn about infection control practices. Further research should focus on a national survey of hand hygiene practices in NHs to address discrepancies in various hand hygiene techniques between hospitals and NHs. Direct observations of HCWs providing care to high-risk NH residents can also give important insights into translation of knowledge into actual clinical practice. This study is the first step to designing focused novel educational and dissemination strategies to enhance HCWs' research practices for infection prevention in NHs.

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Conflict of Interest: Dr. Saint serves as a faculty consultant for the Institute of Healthcare Improvement (IHI) on the IHI catheter-associated UTI expedition and during the past 5 years has received honoraria from the Veterans Health Administration, and numerous individual hospitals, academic medical centers, and professional societies.

Author Contributions: Study concept and design: LM, SS, SK. Acquisition of subjects and/or data: LM, SS, SK. Analysis and interpretation of data: LM, SS, SC, AG, SK. Preparation of manuscript: LM, SS, SC, AG, SK.

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