ORIGINAL ARTICLE

Effect of Nurse-Led Multidisciplinary Rounds on Reducing the Unnecessary Use of Urinary Catheterization in Hospitalized Patients

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(See the commentary by Cornia and Lipsky on pages 820–822)

OBJECTIVE. To determine the effect of nurse-led multidisciplinary rounds on reducing the unnecessary use of urinary catheters (UCs).

DESIGN. Quasi-experimental study with a control group, in 3 phases: preintervention, intervention, and postintervention.

SETTING. Twelve medical-surgical units within a 608-bed teaching hospital, from May 2006 through April 2007.

INTERVENTION. A nurse trained in the indications for UC utilization participated in daily multidisciplinary rounds on 10 medical-surgical units. If no appropriate indication for a patient's UC was found, the patient's nurse was asked to contact the physician to request discontinuation. Data were collected before the intervention (for 5 days), during the intervention (for 10 days), and 4 weeks after the intervention (for 5 days). Two units served as controls.

RESULTS. Of 4,963 patient-days observed, a UC was present in 885 (for a total of 885 "UC-days"). There was a significant reduction in the rate of UC utilization from 203 UC-days per 1,000 patient-days in the preintervention phase to 162 UC-days per 1,000 patient-days in the intervention phase ($P = .002$). The postintervention rate of 187 UC-days per 1,000 patient-days was higher than the rate during the intervention ($P = .05$) but not significantly different from the preintervention rate ($P = .32$). The rate of unnecessary use of UCs also decreased from 102 UC-days per 1,000 patient-days in the preintervention phase to 64 UC-days per 1,000 patient-days during the intervention phase ($P < .001$); and, significantly, the rate rose to 91 UC-days per 1,000 patient-days in the postintervention phase ($P = .01$). The rate of discontinuation of unnecessary UCs in the intervention phase was 73 (45%) of 162.

CONCLUSIONS. A nurse-led multidisciplinary approach to evaluate the need for UCs was associated with a reduction of unnecessary UC use. Efforts to sustain the intervention-induced reduction may be successful when trained advocates continue this effort with each team.

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Catheter-associated urinary tract infections are common in the hospital and lead to added morbidity and cost.[1,2] If these infections are complicated by bacteremia, they may increase the cost of care by more than $2,800.[1] Other factors (not well studied) that contribute to the need for timely removal of urinary catheters (UCs) include patient discomfort with a UC and restricted activity because of catheter presence.[3] Immobility has been associated with additional morbidities, including pressure ulcers.[4]

The best way to prevent a catheter-associated urinary tract infection is to not have a UC inserted. UCs should not be a substitute for nursing care in patients with incontinence nor be the route to obtain urine specimens from patients able to void. Reasons for inappropriate placement of UCs or for failure to discontinue the unnecessary use of UCs include unfamiliarity with the indications for use and lack of a defined nursing management plan (based on published recommendations) to monitor their presence and need.

Previously, we conducted a pilot study in which a resident physician's participation in multidisciplinary rounds with nurses significantly reduced unnecessary UC use.[5] On the basis of that study, we implemented a nurse-driven intervention to reduce unnecessary UC use.

METHODS

Our facility is a 608-bed tertiary care teaching hospital. The study included 12 different medical-surgical units from May 2006 through April 2007. Our study was evaluated and deemed

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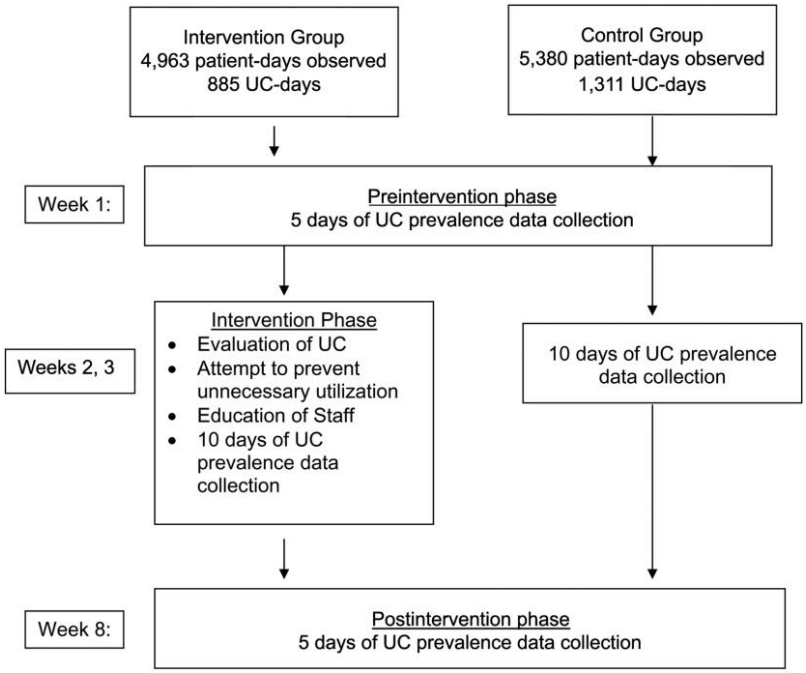

FIGURE 1. Flow diagram showing the 3 phases of the intervention to determine the effect of nurse-led multidisciplinary rounds that evaluate the need for urinary catheters (UCs) on the discontinuation of unnecessary UCs. A UC-day was calculated as one patient-day on which the patient had a UC.

to be exempt from further institutional review board scrutiny because of its relation to quality improvement. No patient identifiers were entered into the final database.

Each unit had a preexisting multidisciplinary team that made rounds and met daily to discuss the patient's progress. The team was composed of a case manager, a social worker, a nurse manager, and the patient care nurses. No physicians or physician assistants were involved in the team. We asked each multidisciplinary team to include the UC project nurse in their daily rounds during the intervention. We informed them that her role was to assist this team to evaluate and to teach the appropriateness of UC utilization.

We defined the indications for UC utilization on the basis of the Centers for Disease Control and Prevention recommendations. They were urinary tract obstruction, neurogenic bladder dysfunction and urinary retention, the need to undergo urologic procedures, or urologic surgery or surgery on contiguous structures.[6] In addition, we considered the use of UCs for incontinent patients with stage 3 or 4 sacral pressure ulcers and for hospice or end-of-life patients to be appropriate use.

Before we started the study, key hospital leaders were informed of the study and were asked for their support. These leaders included the chief medical and nursing officers and the chiefs of medicine, surgery, and family medicine. In addition, resident physicians and physician assistants were informed about the nurse-led intervention. Finally, attending physicians in the internal medicine department were notified of the study in one of their business meetings.

The study was divided into 3 phases: preintervention, intervention, and postintervention (Figure 1). We targeted 2 units at a time for intervention (with 2 other units serving as controls). During each phase, 2 units were concurrently studied. During the preintervention phase, baseline data were collected for 5 working days (Monday through Friday) on each of the 2 units. The data collected included the prevalence of UC use and the reasons for use. On day 5, the nursing staff was given in-service training on appropriate UC utilization. (Educational material addressing the indications for UC utilization was distributed to the nurses.) The second phase was the intervention phase, which consisted of 10 working days of data collection. During this phase, the project nurse participated in the daily multidisciplinary rounds. During rounds, each patient was evaluated for presence of a UC. If the patient had an indwelling UC, the reasons for use were reviewed with the team. If an appropriate indication was not found, the patient's nurse was asked to contact the physician to discontinue the catheter. The last phase, which began 4 weeks after the intervention phase ended, was the postintervention phase. Data were collected for 5 working days on the prevalence of UC use and the reasons for use.

In each of the 3 phases of the study, 2 units were studied concurrently (ie, a total of 5 periods of observation for 10 units) with 2 other units serving as controls. The timeline was as follows: units A and B (intervention) with units C and D (control), units C and D (intervention) with units K and L (control), units E and F (intervention) with units K and L (con-

TABLE 1. Rates of Urinary Catheter (UC) Utilization During the 3 Phases of the Study

Variable	No. of UC-days/ no. of patient-days (rate)[b]			*P* value[a]			
	Preintervention (5 days)	Intervention (10 days)	Postintervention (5 days)	All 3 phases	Preintervention vs intervention	Intervention vs postintervention	Preintervention vs postintervention
Intervention group							
All UCs	246/1,210 (203)	409/2,526 (162)	230/1,227 (187)	.005	.002	.05	.32
Unnecessary UCs	124/1,210 (102)	162/2,526 (64)	112/1,227 (91)	.001	<.001	.01	.58
Control group							
All UCs	329/1,219 (270)	669/2,822 (237)	313/1,339 (234)	.052	.03	.81	.04

[a] Determined by χ^2 test.

[b] This rate was calculated as (no. of UC days divided by no. of patient days) × 1,000.

trol), units G and H (intervention) with units K and L (control), and units I and J (intervention) with units K and L (control). Units C and D served as controls once each (before they underwent any intervention), and units K and L served as controls 4 times each and did not undergo any intervention during the study period. Only data on the prevalence of UC use was collected in the control units.

Definitions. Measurements during the study included the UC utilization rate, the rate of unnecessary UC use, the proportion of all UC use that was unnecessary, and the rate of discontinuation of unnecessary UCs. A UC-day was defined as one patient-day on which the patient has a UC. The prevalence rate of UC utilization was calculated as (the number of UC-days divided by the total number of patient-days during a period of time) times 1,000. The prevalence rate of unnecessary UC utilization was calculated as (the number of unnecessary UC-days divided by the total number of patient-days during a period of time) times 1,000. The percentage of UC use that was unnecessary was calculated as (the number of unnecessary UC-days divided by the total number of UC-days) times 100. The rate of discontinuation of unnecessary UCs was calculated as (the number of unnecessary UCs discontinued divided by the number of UCs evaluated for which no indication for use was found) times 100.

Statistical analysis. Statistical analysis was done using SPSS software, version 12.0 (SPSS). A *P* value less than .05 was considered significant. A Mantel-Haenszel test was used to compare the intervention groups (pooled) with the control groups (pooled) across the 3 study periods. We then used χ^2 analysis to compare the intervention and control UC utilization rates in the preintervention, intervention, and postintervention periods, stratified by group (by means of 3 × 2 tables). The rate of unnecessary UC use and the rate of discontinuation of unnecessary UCs were compared for the intervention group. Data were then deconstructed into 2 × 2 tables to compare just 2 time periods for the control and for the intervention groups. A statistic designed to evaluate data that were related was not chosen for this analysis, because it is highly unlikely that a single patient would have been in the hospital and catheterized throughout the 8 weeks of this study, since our average length of stay is less than 5 days. We judge the deviation from the assumption of independence to be slight, and the χ^2 test is robust enough to deal with a small degree of nonindependence.

RESULTS

Utilization rates in the 3 study phases. The intervention group (10 units) had 4,963 patient-days observed; of those, 885 (18%) were UC-days. The control group (2 units) had 5,380 patient-days observed; 1,311 (24%) were UC-days. The Mantel-Haenszel test revealed an overall difference between groups over time ($P < .005$). Both groups showed a reduction in the rate of utilization of UCs during the study period, although a larger decrease in the utilization rate was seen in the intervention group, compared with the control group. Specifically, for the intervention group, there was a 20% reduction in the utilization rate from 203 UC-days per 1,000 patient-days in the preintervention phase to 162 UC-days per 1,000 patient-days in the intervention phase ($P = .002$). On the other hand, the control group had a decrease in the utilization rate of 12%, from 270 UC-days per 1,000 patient-days to 237 UC-days per 1,000 patient-days ($P = .03$) (Table 1).

In the postintervention phase, the utilization rate for the intervention group increased to 187 UC-days per 1,000 patient-days; the rate for the control group (234 UC-days per 1,000 patient-days) did not show any significant change from the intervention phase (Table 1). For the control group, the differences in rates in the 3 phases were not significant (Table 1).

Unnecessary UC utilization. In the intervention group, the rate of unnecessary use of UCs decreased from 102 UC-days per 1,000 patient-days in the preintervention phase to 64 UC-days per 1,000 patient-days in the intervention phase ($P < .001$), then rebounded to 91 UC-days per 1,000 patient-days postintervention ($P = .01$) (Table 1). There was a significant difference in the rate of unnecessary UC use in the preintervention, intervention, and postintervention phases (50.4%, 39.6%, and 48.7%, respectively; $P = .01$). Seventy-three (45%) of the 162 UCs considered unnecessary were discontinued in the intervention phase; 7 (9.5%) of these UCs were reinserted after removal because of urinary retention. Although we did not do a quantitative assessment, reasons for not removing the UC included diuretic therapy and patient debility for cardiology services; the need for strict input and output monitoring

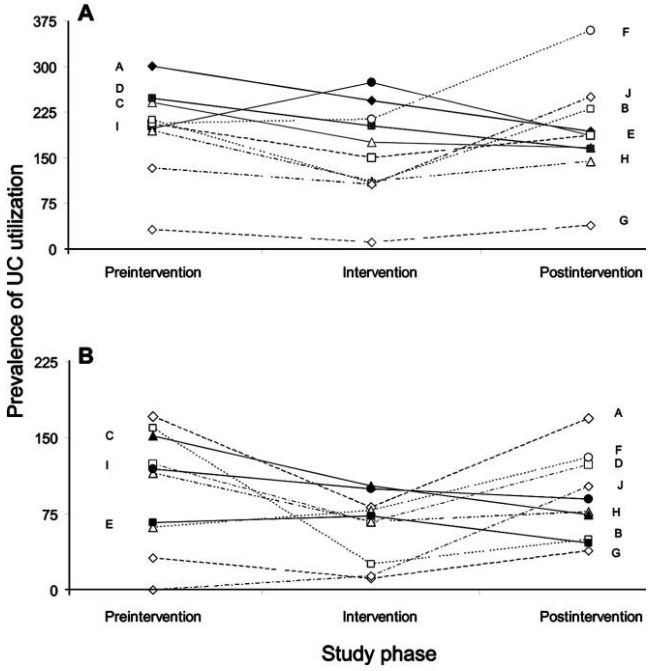

FIGURE 2. Prevalence of urinary catheter (UC) utilization during the 3 phases of the study in the 10 units that participated in the intervention. *A,* all UCs; *B,* unnecessary UCs (note different scales). The prevalence rate of UC utilization was calculated as (no. of days of UC use divided by the total no. of patient-days during a period of time) × 1,000. The prevalence rate of unnecessary UC utilization was calculated as (no. of days of unnecessary UC use divided by the total no. of patient-days during a period of time) × 1,000.

for nephrology services; and reluctance to remove a UC on postoperative day 1, for surgical services.

Evaluation of individual units. The change in prevalence of UC use during the different phases of the study was not always paralleled by a similar change in the rate of unnecessary UC utilization. Of 10 units that underwent the intervention, 2 (units A and D) had a drop in prevalence of UC use in both the intervention and the postintervention phases. However, the rate of unnecessary UC utilization for these 2 units rebounded in the postintervention phase (Figure 2a, 2b). In contrast, unit I showed an increase in prevalence of UC utilization during intervention but a reduction in the rate of unnecessary UC utilization during the same phase (Figure 2a, 2b).

Reasons for UC utilization. We evaluated the reasons given for UC utilization for the 3 phases of the study. Of the 885 UC-days, UCs were indicated in 485 (55%) (Table 2). A large number of patients did not have an identifiable reason for placement of the UC.

DISCUSSION

Our findings confirm that simple interventions for the management of UCs may be effective in reducing unnecessary utilization. In our study, a nurse trained in the indications for UC utilization educated other nursing staff and empowered them to ask the physicians for an order to discontinue unnecessary UCs. Our nurse-led intervention was associated with discontinuation of 45% of those catheters that did not meet the indication criteria. Previous studies have used daily physician reminders[7]; computerized feedback to physicians and a nurse-directed protocol[8]; and computer-based order entry.[9] Our intervention was based on daily evaluation of the need for the UC and prompt discontinuation of the UC when it was no longer necessary, an approach that needs to be integrated into the daily evaluations of the hospitalized patient.

Our intervention increased nurse and physician awareness of the presence of UCs that may not be needed. Multiple studies have shown that UCs are often placed with no appropriate indications. In one study, 38% of UCs placed during the first 24 hours after admission on the medical units did not have a justifiable indication.[10] In another study, only 46% of elderly patients with a UC in a community teaching hospital had an appropriate indication.[11] Saint et al.[12] noted that physicians were unaware of the presence of a UC for 28% of their patients who had one; this lack of awareness increased to 41% for patients without an indication for UC use. In our study, more than two-thirds of UCs with no indication for placement did not have a clear reason for placement. Other factors, such as healthcare worker convenience and patient convenience, may play a significant role in the inappropriate utilization of UCs.[3,12] We did not specifically look at patient conditions such as altered mental status, morbid obesity, incontinence, and immobility, all frequent reasons for placing a UC, although none are considered indications. In addition, nursing shortages and the increased work volume may affect a perception by nurses that UC placement may reduce their workload.

Our control group showed a decrease in UC utilization of about 10% from the preintervention phase to the intervention phase; however, the decrease was less pronounced than that of the intervention group. One explanation may be related to the

TABLE 2. Reasons for Use of Urinary Catheters (UCs) Recorded by Team on Rounds

Class of UC, reason	No. (%) of UCs (n = 885)
UC with appropriate indication	
All	485 (54.8)
Neurogenic bladder dysfunction	206 (23.3)
Urinary tract obstruction	91 (10.3)
Hospice or comfort care	87 (9.8)
Urologic procedures	63 (7.1)
Stage 3 or 4 sacral pressure ulcers	38 (4.3)
UC without appropriate indication	
All	400 (45.2)
No clear reason	272 (30.7)
Nonobstructive renal insufficiency	59 (6.7)
Transferred from the intensive care units	52 (5.9)
Patient request	8 (0.9)
Postoperative day 2 or later	9 (1.0)

heightened awareness of physicians and physician assistants regarding the intervention and to their willingness to evaluate their patients' need for the UC. Another explanation may be related to the potential exposure of the control group to the intervention of nurses who work on both the intervention and control units. In addition, the prevalence of UC utilization may not be the best marker of improvement in catheterization practices. Our data suggest that the prevalence of unnecessary UC utilization provides a better predictor of the success of an intervention.

Our study has some limitations. We only applied the intervention to 1 hospital. An important factor for the success of the study is the belief of nurses and physicians in the importance of evaluating UC need and of discontinuing unnecessary UCs, a belief which may vary between hospitals. In addition, we did not assess reasons for UC utilization in the control group. Although there was a small drop in the rate of UC utilization in the control group, this may not necessarily indicate a drop in the rate of nonindicated UC utilization. An area that still needs to be examined is how to sustain the effect of the intervention. This may be achieved by having advocates ("champions") on each unit who will promote this effort.[13] A second important area is the construction of a mechanism to assess the need for UCs for patients being transferred from intensive care units (areas with a high prevalence of use) to the general medical-surgical units (areas with a lower prevalence of use), so that any unnecessary UCs are discontinued. The third area to target is the emergency department, with a focus on avoiding placement of UCs unless necessary. The fourth area relates to patient education on the risks of UC use; this will help address the issue of both patient convenience and healthcare worker convenience, while empowering the patient to be his or her own advocate to reduce the risk of harm. Finally, an evaluation of the financial impact of this intervention on both length of stay and utilization of services may provide more impetus for hospitals to support this effort.

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Potential conflicts of interest. All authors report no conflicts of interest relevant to this study.

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