Activity Aprons for Inpatients Requiring Individual Nursing Assignment Care: A Prospective Randomized Controlled Pilot Study

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Abstract

Background: Activity aprons are commercially available products used to occupy patients with dementia at home or in long-term care facilities. We hypothesized that inpatient use of activity aprons could potentially reduce or eliminate behaviors that result in self-harm, increased nursing supervision, and restraint use in an inpatient hospital setting. **Methods:** A single-center prospective randomized controlled pilot study was performed from July 2015 to November 2016 comparing activity apron plus standard care versus standard care alone. Consecutively enrolled patients were randomized by stratified randomization using age (cutoff: 80 years) and preexisting diagnosis of dementia or cognitive impairment. Primary outcomes were safety and feasibility of apron use. Secondary outcomes included duration of hospitalization postrandomization and individual nursing assignment (IA), time in restraints, nonphysical restraints use, falls, apron-related complications, dismissal destination, and 30-day hospital readmission. **Results:** Thirty patients were enrolled, with 13 randomized to apron and 17 randomized to the control group. There was no statistically significant reduction in mean length of hospital stay (15.8 vs 21.5 day; $P = .40$), duration of IA compared to non-apron control group (6.4 vs 9.1, respectively; $P = .39$), or antipsychotic medication use (61.5% vs 70.6% in control group; $P = .60$). No complications secondary to apron use were seen. **Conclusions:** Activity aprons are a safe addition to the standard of care when managing encephalopathic patients in the inpatient setting. These aprons may have a role as part of a comprehensive complement of interventions to address delirium and encephalopathy in hospitalized patients.

Keywords

activity apron, individual nursing assignment, length of hospitalization

Background

Health-care providers face numerous challenges when taking care of hospitalized patients with dementia, delirium, or encephalopathy. Behaviors such as pulling or removing of intravenous lines, urinary catheters, and even feeding tubes are common, and such behaviors can result in patient harm. Lowering the risk of these complications may require a nurse or other health-care provider to be present at all times, the use of physical or chemical restraints, or both. These interventions come at a cost. Nursing and staff resources are finite, and the use of restraints has been associated with increased morbidity and mortality.^{1,2} Furthermore, until the behaviors cease or alternative solutions are identified, these patients are unable to be discharged, resulting in prolonged hospitalizations.

Activity aprons (also known as distraction aprons) are commercially available products used to occupy and distract

patients with dementia at home or in long-term care facilities. We hypothesized that, in an inpatient setting, the aprons may potentially reduce or eliminate behaviors that result in increased nursing supervision or restraints, thus resulting in reduced length of stays and less use of restraints. However,

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there is no existing scientific literature on the use of activity aprons. Therefore, we performed a prospective randomized controlled pilot study to evaluate the feasibility, and safety, of the use of activity aprons for hospitalized patients.

Methods

This was a single-center, prospective, randomized controlled pilot study comparing the use of an activity apron plus standard care versus standard care alone for adult inpatients on a neurology or general medicine service requiring individual nursing assignment due to risk of unintentional harm secondary to encephalopathy, delirium, or dementia. Potential patients were identified by the physician team, nursing staff, or physical and occupational therapists and screened for consecutive enrollment by the authors if criteria for participation were met. Additional inclusion criteria that were considered are mentioned as follows: home address within the state of Minnesota or within 180 miles of Rochester, Minnesota, and staff anticipating the patient would require individual nursing assignment for at least 12 hours. Individuals were excluded from participation if they were on individual nursing assignment due to intentional self-harm or elopement risk. Many of our patients require care at a skilled nursing facility after hospital discharge, so patients without health insurance were excluded so as to try and control for the effect this could have on length of stay. Women known to be pregnant were also excluded. Patients admitted to intensive care units were enrolled only after transfer to a general care service. Data were not collected on patients screened for the study who were not enrolled.

For eligible patients, consent was obtained verbally from the patient's next of kin or power of attorney. Once consent was obtained, patients were randomized to either the apron group or control group. Stratified randomization was used to ensure the balance of the 2 groups with respect to age (greater than or less than 80 years) and a preexisting diagnosis of dementia or cognitive impairment or not. For all enrolled patients, we collected demographic data, admitting diagnosis, pre- and posthospitalization functional status, duration of individual nursing assignment, baseline agitation, or sedation as measured by the Richmond Agitation-Sedation Scale (RASS),³ duration of use of physical restraints, use of antipsychotic medications (chemical restraint), falls, complications during hospitalization, length of hospitalization, hospital readmission within 30 days, and 30- and 90-day mortality.

The activity aprons were made by hospital volunteers, at a cost of approximately \$20 per apron and followed a general template (Figure 1). To reduce the risk of falls, the apron was designed to not fall below the patient's knees. To prevent choking and asphyxiation risk, the aprons were designed to be loose fitting and secured with Velcro. The aprons were not recycled, and they were either given to the patient at discharge

Figure 1. An example of an activity apron used in this study.

or discarded after use secondary to concern for risk of transmitting hospital-acquired infections.

Descriptive statistics were reported as mean and standard deviation for continuous variables and frequencies and percentages for categorical variables. Comparisons between 2 groups (control vs apron) were performed using Wilcoxon rank sum test for continuous variables and using Fisher exact test for categorical variables. All tests were 2 sided and *P* values less than .05 were considered statistically significant. Analysis was performed using SAS software version 9.3 (SAS Inc, Cary, North Carolina).

The institutional review board of Mayo Foundation reviewed and approved this study. Written informed consent was obtained for all participants from their power of attorney/next of kin.

Results

Thirty-six patients were screened for eligibility. Six patients were excluded, with 3 failing to meet inclusion criteria, 2 patients declining participation, and 1 patient was dismissed from the hospital prior to randomization. Thirty patients were

Table 1. Patient Demographics.

Patient Demographics	Control (n = 17)	Apron (n = 13)	P Value
Mean age (median)	67 (68)	70 (75)	.29
Male	10 (58%)	8 (62%)	.88
Preexisting dementia or mild cognitive impairment	7 (41%)	5 (38%)	.88
Glasgow Coma Scale score at enrollment (SD)	13.7 (1.4)	12.4 (2.26)	.09
Mean mRS at enrollment (SD)	1.8 (1.85)	1.9 (1.55)	.87
Mean RASS preenrollment (SD)	0.7 (0.92)	0.6 (1.61)	.88
Physical restraints use preenrollment	8 (47.1%)	9 (69.2%)	.22

Abbreviations: mRS, modified ranking scale; RASS, Richmond Agitation-Sedation Scale; SD, standard deviation.

Table 2. Comparison of Activity Apron Wearers Versus Controls on Primary and Secondary Study Outcomes.

Primary and Secondary Outcomes	Control (n = 17)	Apron (n = 13)	P Value
Hospital length of stay, days, (SD) (Q1, Q3)	21.5 (16.11) (11, 28)	15.8 (9.33) (7, 19)	.40
Study enrollment duration ^a (SD) (Q1, Q3)	11.9 (11.08) (5, 17)	8.7 (7.12) (3, 15)	.40
Duration IA (days)	15.2 (14.93)	13.2 (8.63)	.90
Duration of IA postenrollment, days (SD)	9.2 (10.7)	6.5 (6.17)	.39
mRS at discharge, mean (SD)	4.3 (0.85)	4.1 (0.64)	.45
RASS postrandomization, mean (SD)	0.5 (0.62)	0.1 (1.38)	.33
Patients having complications postrandomization, n (%)	9 (52.6%)	6 (46.2%)	.71
30-day mortality	4 (23.5%)	3 (23.1%)	.97
90-day mortality	6 (35.2%)	5 (38.4%)	.86
30-day readmission	5 (29.4%)	4 (23.1%)	.70
Dismissal destination			.74
Home	1 (5.9%)	1 (7.7%)	
Skilled nursing facility	10 (58.8%)	10 (76.9%)	
Inpatient rehabilitation	1 (5.9%)	—	
Hospice	3 (17.6%)	2 (15.4%)	
Expired in house	1 (5.9%)	—	
Psychiatric hospital	1 (5.9%)	—	

Abbreviations: mRS, modified ranking scale; RASS, Richmond Agitation-Sedation Scale.

^aDuration from study enrollment to hospital discharge.

enrolled and randomized in the study (Supplemental Figure 1). Of these patients, 25 were from a primary neurology service (stroke, n = 18; general neurology, n = 7). The remaining 5 patients were enrolled from general medical services (n = 5). Following the randomization procedure, 13 patients were allocated to the intervention arm to receive the activity apron, and the remaining 17 patients were allocated to the control arm.

There were no statistically significant differences in baseline demographics, preexisting dementia, admitting Glasgow coma scale, admitting functional status (modified Rankin scale) or baseline agitation or sedation as measured by the RASS, or use of physical restraints. The mean patient age in the control arm was 67; the mean age in the apron arm was 70. Fifty-eight percent of control patients were male, and 62% of apron patients were male (Table 1).

Admitting diagnoses were reviewed and included: ischemic stroke (n = 12), intracerebral hemorrhage (n = 3), subdural hematoma (n = 1), subarachnoid hemorrhage (n = 1), dementia with behavioral dyscontrol (n = 2), acute

inflammatory demyelinating polyradiculoneuropathy (n = 1), posterior reversible encephalopathy syndrome (n = 1), traumatic brain injury (n = 1), central nervous system tumors and infections (n = 5), epileptic encephalopathy (n = 2) and sepsis (n = 1), failure to thrive (n = 1), and medication overdose (n = 1). One patient had multiple diagnoses (traumatic brain injury, subarachnoid hemorrhage, and intracerebral hemorrhage).

Nine (52.6%) patients in the control group and 6 (46.2%) patients in the apron group had a medical complication after randomization (Table 2). Complications seen included pneumonia (n = 5), cardiac arrest (n = 1), urinary tract infection (n = 4), cellulitis (n = 2), anaphylaxis (n = 1), deep vein thrombosis (n = 1), cholecystitis (n = 1), pulmonary embolism (n = 1), and sepsis (n = 1). There were no falls or asphyxiations in either group. There were no complications interpreted as secondary to apron use.

There was no statistically significant difference in duration of individual nursing assignment (IA); however, the mean number of days was lower in the apron group (6.4 days in

Table 3. Antipsychotic and Restraint Use..

Chemical Restraint	Control (n = 12)	Apron (n = 8)	P Value
Days of medical restraint use postrandomization, mean (SD)	9.5 (12.99)	6.6 (7.65)	.73
Cumulative days of chemical restraint use (mean [SD])	14.7 (17.76)	10.0 (9.96)	.67
Number of antipsychotic medications used	Control (n = 17)	Apron (n = 13)	P value
0	6 (35.3%)	5 (38.5%)	.73
1	5 (29.4%)	6 (46.2%)	
2	2 (11.8%)	1 (7.7%)	
3	3 (17.6%)	1 (7.7%)	
4	1 (5.9%)	0 (0%)	
Physical restraint	Control (n = 8)	Apron (n = 9)	P value
Use postenrollment, hours, (SD)	33.5 (51.27)	64.5 (77.90)	.18

Abbreviation: SD, standard deviation.

apron group vs 9.1 days in control group; $P = .39$). The mean length of stay was reduced in patients randomized to apron versus control (15.8 days apron vs 21.5 days control; $P = .40$; Table 2). There was increased duration of use of physical restraints in the apron group versus control (64.5 hours vs 33.5 hours; $P = .18$). The postrandomization RASS was lower in the apron group compared to controls' postrandomization (0.1 vs 0.5; $P = .33$). Thirty- and 90-day mortality was comparable in the apron group versus the control group (30 days: 23.5% vs 23.1%, $P = .97$; 90 days: 35.2% vs 38.4%, $P = .86$).

There was no statistically significant difference in antipsychotic medication use (Table 3); however, the percentage of patients requiring antipsychotic medications was lower in the apron group (61.5% vs 70.6% in control group; $P = .60$). The majority of patients in both groups were discharged to skilled nursing facilities.

Discussion

This pilot study demonstrates the safety and feasibility of using activity aprons as an adjunct to the standard of care when treating hospitalized patients at risk of unintentional self-harm due to encephalopathy, delirium, or dementia. Although not statistically significant, there was a trend toward reduced mean length of stay, lower RASS, and shorter duration of individual nursing supervision in the apron group. There was also no increase in complications or medication use with the use of the activity apron in our cohort, and there was also no statistically significant difference in mortality at 30 and 90 days. This study was not powered to demonstrate efficacy with the sample sizes available. It was estimated that

the number of patients required to demonstrate statistical significance for efficacy was 115 patients in each arm (230 patients total), equating to 10 years of patient enrollment at the current pace. A future prospective trial evaluating the use of activity apron on length of hospital stay with a larger patient cohort is needed.

The potential benefits of shorter hospitalization and reduction in required nursing supervision are vast compared to the cost and risk of use of activity aprons. The cost of 1 additional night of an inpatient stay at many institutions is approximately \$1000.00 (not including medications, testing, or consultative service fees) which would reflect the cost of 50 activity aprons used in our study. With reduced length of stay, there is potentially a reduced risk of hospital-associated infections and improved allocation of nursing and support staff resources. Given the affordability and easy reproducibility of the activity aprons, the potential benefits of a trial of activity apron outweigh the actual fiscal cost of apron production as well as the risks of prolonged hospitalization. The apron was safe to use in our patient population.

We anticipate that this study may be generalizable to a larger population of hospitalized patients. While the majority of patients enrolled in this study were from inpatient neurologic services, these findings can be applied to patients on general medical services or other subspecialty medical services. Additionally, patients on surgical services may benefit from the use of activity apron, given the risk of postoperative delirium.⁴ A common inpatient neurology consult is for altered mental status, and often times, these patients may have a diagnosis of either delirium or a multifactorial encephalopathy. These patients will typically have a clearing of their sensorium over several days with adjustment of environmental factors, improved sleep hygiene, occasionally adjunctive pharmacologic agents, and if needed, correction of underlying metabolic derangement.^{4,5} Use of activity aprons may lead to reduction in complications and reduced length of stay in these patients as well.

Conclusion

Activity aprons are a safe addition to the standard of care when managing encephalopathic, delirious, or patients in the inpatient setting. These aprons may have a role as part of a comprehensive complement of interventions to address delirium and encephalopathy in hospitalized patients. Further studies are needed to demonstrate the efficacy of this intervention.

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Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online

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