Effect of Implementing Multi-component Nursing Intervention on Agitation Level among Critically Ill Patients

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Abstract

Background: *The presence of agitation often obscures the accurate diagnosis and postpones the initiation of treatment of critically ill patients. To mitigate the negative consequences of agitation, multi-component nursing interventions were tailored for these patients. Those are evidence-based interventions that address the unique needs, preferences, and values of patients.* ***Aim:*** *To* determine the effect of multi-component nursing intervention on agitation level among critically ill patients*.* ***Settings:*** *This study was conducted across four adult intensive care units ICUs located within Alexandria Main University Hospital (AMUH) in Egypt.* ***Subjects:*** *A convenient sample consisting of 60 critically ill patients was divided into two equal groups, with each group comprising 30 patients.* ***Tools:*** *Three tools were employed in this study. The first tool was the "agitation risk assessment". The second tool utilized was the "outcomes of multi-Component nursing intervention on agitation". The third tool applied was the "agitation adverse events Assessment".* ***Results:*** *The study results showed that the frequency of agitation was significantly reduced in the multi-component intervention group compared to the routine care group on days 4 and 5 (p = (p=<0.018 and 0.035, respectively). Furthermore, agitation levels over five days did not differ significantly between the multi-component intervention group and the routine care group (p=0.077, 0.516, 0.492, 0.274, and 0.684, respectively).* ***Conclusion:*** *Implementation of a multi-component nursing intervention significantly reduced the* frequency *of agitation.* ***Recommendations:*** *Critical care nurses (CCNs) should integrate multi-component nursing interventions into their daily practice that tailored to the patient's needs and preferences.*

Keywords: Multi-component nursing intervention, agitation level, critically ill patients.
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Introduction

The ICU environment presents unique challenges that may induce agitation among patients. Factors such as separation from family and friends, proximity to other patients, and uncomfortable surroundings serve as significant stressors. These environmental factors can adversely affect the psychological health of patients, potentially resulting in heightened levels of agitation. Agitation, a distressing psychomotor state, is prevalent in the ICU, affecting 31.8-70.8% of patients. Patients may exhibit disorganized thoughts and unintentional, purposeless movements due to agitation (Adams et al., 2021; Aubanel et al., 2020; Azimaraghi et al., 2023).

Agitated patients may put themselves at risk by exhibiting behaviors such as fidgeting or thrashing. The presence of agitation is associated with unplanned discontinuation of long-term supportive care, such as intravenous fluids or mechanical

ventilation (MV), increased rates of nosocomial infections, and extended duration of hospitalization in ICU. This reinforces the necessity for constant monitoring and vigilance by healthcare providers. However, when faced with a critically ill and extremely agitated patient, clinicians have limited data to use to make decisions about the most appropriate course of action. Moreover, some measures taken may worsen rather than reduce the incidence of agitation (Adams et al., 2021; Aubanel et al., 2020; Raveesh et al., 2022; Williamson et al., 2020).

Traditionally, the two main approaches to treating agitation in the ICU have been pharmacological and physical restraint. The pharmacological approach encompasses the administration of various medications, such as sedatives and muscle relaxants, which can significantly influence patient outcomes, particularly during the extubation process. However, it is important to use these medications with caution due to their potential for severe adverse effects. Such effects may manifest as respiratory depression, hemodynamic instability, extended durations of ICU admission, prolonged mechanical ventilation, and an elevated risk of exacerbating agitation and delirium (Adams et al.; Buckley et al., 2021; Ostuzzi et al., 2020).

Consequently, it is essential to evaluate the effectiveness of non-pharmacological approaches that address the unique needs and preferences of patients in reducing agitation. By implementing a patient-centered care model tailored to the specific requirements and preferences of each person, healthcare providers can significantly enhance the standard of care provided to patients who are undergoing episodes of agitation. The utilization of multi-component nursing interventions is broadly recognized as the optimal non-pharmacological approach for the effective management of agitation within the ICU. Such interventions encompass the concurrent provision of multiple familiar items to patients (Adams et al., 2022; Deng et al., 2020; Freeman et al., 2019; Sayed et al., 2020).

Critical care nurses are essential in addressing agitation within ICU environments by identifying early signs of agitation and implementing targeted multi-component nursing interventions. Collaborating closely with family members is crucial for developing effective and personalized strategies. Families are valuable partners in care, aiding in the identification of patient preferences and familiar objects, which are central to the implementation of multi-component nursing interventions (Fiest et al., 2020; Nouri et al., 2021; Sedghi et al., 2020).

Significance of the study and its implications

By investigating the effect of implementing multi-component nursing intervention on agitation level, this research contributes valuable insights into evidence-based practices that can enhance patient comfort and safety, reduce the risk of complications, and improve overall care quality in critical care settings. The findings could inform clinical guidelines and training, emphasizing the importance of comprehensive, tailored interventions to manage agitation effectively.

Aims of the Study

The aim of this research is to determine the effect of implementing multi-component nursing intervention on agitation level among critically ill patients.

Research hypotheses

- Critically ill patients receiving multi-component nursing interventions demonstrate reduced agitation scores compared to those who do not receive such interventions.
- Critically ill patients receiving multi-component nursing interventions show a decreased frequency of agitation in

contrast to those who do not receive such interventions.

Materials and Method

Materials

Design: This study was conducted utilizing a quasi experimental research design.

Settings: This study was conducted across four adult ICUs located within AMUH in Egypt namely; eighth floor unit of the educational building that contains 8 beds, seventh floor unit of the educational building that contains 8, unit II that contain 12 beds, and unit III that contains 15 beds. These ICUs admit patients experiencing a range of acute medical conditions. Patients are either admitted directly from the emergency department or are transferred from various other departments within the hospital.

Subjects: This study included a convenience sample of 60 critically ill patients admitted to the above-mentioned settings. Inclusion criteria for this study specify that patients must be aged between 18 and 60 years. Additionally, patients must possess a Glasgow Coma Scale (GCS) score of 12, along with a Richmond Agitation and Sedation Scale (RASS) score between +2 and +4 to be considered eligible for participation. Patients with a history of psychiatric conditions, substance addiction, or receiving sedatives or muscle relaxants, also, those with hearing or vision impairment, traumatic brain injury, or stroke were excluded from the study.

The determination of the study sample size was conducted through power analysis utilizing the PASS program version 20, which indicated a minimum required sample size of 30 participants per group, with a significance level set at 0.05 and a power of 90%.

Tools: Three tools were employed to collect the essential data for the study:

Tool one: "Agitation risk assessment". The researcher developed this tool following a comprehensive examination of the relevant literature (Freeman, 2021; Freeman et al., 2019; Gottlieb et al., 2018; Mahmood et al., 2018; Raveesh et al., 2022; Shahriyari et al., 2021; Wang et al., 2021; Williamson et al., 2020) to determine the risk factors indicating the liability of agitation among critically ill patients. The tool is composed of two parts:

Part I: Patients' demographic and clinical profile: This part encompasses demographic information, including the patient's age and sex, alongside clinical details such as the admission diagnosis, comorbidities, level of consciousness, severity of illness, and length of ICU stay.

Part II: Risk factors assessment record: The researcher developed this tool to evaluate risk factors, which encompassed those associated with agitation. **Metabolic/endocrine variables** such as electrolyte abnormalities (sodium, calcium, magnesium, potassium, and phosphate), glycemic level abnormalities, renal failure, liver failure, thyrotoxicosis, and myxedema coma. **Gas exchange parameters** such as PaCO2 and Horowitz index. **Infectious conditions** such as chest infection, septicemia, urinary tract infection (UTI), and meningitis. **Pharmacotherapy** such as anticholinergic, opioids, vasopressors, steroids, and antibiotic medications. **Other conditions** such as shock, pain, body temperature abnormalities, delirium, presence of pressure ulcers, presence of mechanical ventilation, and a number of invasive devices. Each element is scored on a dichotomous scale of yes and no. Yes (score 1) indicates that patients have a risk factor and no (score 0) indicates that patients have not a risk factor.

Tool two: "Outcomes of multi-component nursing intervention on agitation". This tool was developed to assess the effects of a multi-component nursing intervention on the agitation in critically ill patients. It

comprises two parts: the first part was adopted from Sessler et al.,(2002), while the second part was developed by the researcher following a comprehensive review of the relevant literature (Surg et al., 2021;Sedghi & Ghaljeh, 2020;Adams et al., 2022;Nouri et al., 2021).

Part I: Richmond Agitation Sedation Scale (RASS): This part was adopted to assess sedation and agitation levels in adult patients who are admitted to ICUs. It utilizes a 10-point scale includes four levels of agitation, ranging from +1 to +4, a neutral score of 0 indicating a calm and alert state, and five levels of sedation from -1 to -5. Agitation is indicated by a score of +2 or higher on the RASS scale. This detailed scoring system enables a nuanced assessment of patient states, facilitating precise monitoring and management of both agitation and sedation in critical care settings. Research has shown that this scale has a high level of inter-rater reliability, with a Cronbach's alpha of 0.93, and is applicable to both medical and surgical patients, regardless of their ventilation or sedation status.

Part II: Agitation characteristics assessment record: The researcher developed this tool to assess the characteristics of agitation, including duration, frequency, and diurnal occurrence.

Tool three: "Agitation adverse events assessment". The researcher developed this tool following a comprehensive examination of the relevant literature (Adams et al., 2022; Freeman, 2021; Shahriyari et al., 2021) to assess adverse events of agitation. Adverse events associated with agitation were categorized as invasive device-related adverse events, safety-related adverse events, physical restraint application, and sedation administration. Invasive device-adverse events such as unplanned self-tracheal extubation, self-removal of the central or peripheral venous catheter, self-removal of foley urinary catheter, self-removal of chest tube, self-removal of the enteral feeding tube, and biting on endotracheal. Safety-adverse events such as resisting care, workforce injuries, getting out of bed, and patient-ventilator asynchrony.

Method

Approval was obtained from the Research Ethics Committee at the Faculty of Nursing, Alexandria University. Following a comprehensive explanation of the study's objectives, the administrative authorities of the respective settings granted permission to proceed with the study. The study tools were evaluated for content validity by a panel of nine experts in the field, resulting in necessary modifications. A pilot study was conducted involving six critically ill patients, constituting 10% of the total sample size, to evaluate the clarity and applicability of the research tools. The participants from the pilot study were excluded from the main study sample. Findings from the pilot study indicated that no additional modifications were required. The reliability of the three tools was assessed using Cronbach's alpha, with scores of 0.83 for the first tool, 0.91 for the second, and 0.87 for the third, all of which are considered acceptable. Data collection was carried out by the researcher over a period of nine consecutive months, from January 2023 to September 2023.

Data collection commenced with the routine care group, followed by the collection of data from the multi-component intervention group. This sequential approach was implemented to mitigate the risk of contamination between the routine care and multi-component intervention groups, which could potentially influence the outcomes of the study.

The study was carried out in three distinct phases:

Phase I: Involved the assessment of patients from both groups. This assessment included the collection of demographic and clinical information, identification of factors that may predispose patients to agitation,

measurement of agitation level, and examination of the specific characteristics associated with agitation for each patient.

Phase II: Implementation of the multi-component nursing interventions. Patients in the routine care group were subjected to the routine care used in the study settings, which included pharmacological and non-pharmacological interventions. Patients in the multi-component intervention group were subjected to multi-component nursing intervention daily for five days. The intervention consisted of various components, including orientation intervention conducted twice daily. Additionally, reading intervention, family automated voice intervention, familiar sound intervention, familiar olfactory intervention, and familiar visual intervention were conducted once daily as follows:

1. Orientation intervention: The researcher conducted orientation intervention twice a day for 5 minutes, between 02:00 PM and 08:00 PM. This intervention involved providing orientation about time, place, person, the patient's condition, the condition of the intensive care environment, and the efforts made by family and caregivers to enhance the patient's health.

2. Reading intervention: The researcher in partnership with the patient's family collected data regarding the patient's preferred types, authors, and specific books or newspapers that held positive emotional associations. Once the patient's reading preferences were determined, the reading materials were presented to the patient in a comforting and conducive environment for 10 minutes once a day at 02:30 PM.

3. Family automated voice intervention: The researcher asked the patient's family to introduce someone who had the most contact with a patient to obtain audio recordings of a voice or conversation that would be familiar and comforting to the patient. Once the automated voice system was created, the sounds were delivered to patients through headphone for 5 minutes once a day at 03:00 PM**.**

4. Familiar sound intervention: The researcher in partnership with the patient's family collected data regarding the patient's personal history, cultural background, and individual preferences regarding familiar and comforting sounds. Once a patient's preferences were determined, the sounds were delivered to patients through headphone for 5 minutes once a day at 03:30 PM**.**

5. Familiar olfactory intervention: The researcher in partnership with the patient's family collected data regarding the scents that were familiar and comforting to the patient. Once the patient's olfactory preferences are determined, the scent was delivered and placed at three cm from the nostrils for 5 minutes once a day at 04:00 PM.

6. Familiar visual intervention: The researcher in partnership with the patient's family collected data regarding visual elements that were familiar and comforting to the patient. Once the patient's visual preferences are determined, the visual element was shown to the patient at 10 cm from the patient eyes for 5 minutes once a day at 04:30 PM.

7. Sleep promotion intervention: The researcher in partnership with the patient's family collected data regarding the patient's typical sleep-wake cycle and preferred sleep times. Once the patient's sleep time was determined, the next step is to create a personalized sleep intervention plan based on familiar time cues. This involved applying earplugs and cloth eye mask to each patient during sleep at nighttime according to their habitual home bedtime daily, but not after 22:00 PM.

Ethical considerations:

Consent was obtained from patients or their family members following a comprehensive discussion about the study's

objectives. Participants were explicitly informed of their right to decline participation in the research. Throughout the study, patient privacy was maintained, and the confidentiality of the gathered data was protected at all times. Participants were assured that they could withdraw from the study whenever they wished.

Statistical Analysis

The analysis of the data collected in this study was conducted utilizing the Statistical Package for the Social Sciences (SPSS), version 28. Continuous variables were reported as means accompanied by standard deviations following normality assessments, whereas categorical variables were expressed in terms of numbers and percentages. To compare the mean values across the study groups, student t-tests were employed. Additionally, chi-square tests and Fisher's exact tests were utilized to evaluate the numbers and percentage distributions among the study groups.

Results

Table 1 illustrates the demographic data comparison between the multi-component intervention group and the routine care group. A total of sixty patients participated in this study. The analysis revealed no significant differences in age and gender between the two groups.

Table 2 shows the distribution of study groups based on clinical data. The predominant diagnosis observed was cardiovascular disease, accounting for 40.0% and 50.0% in the multi-component intervention group and routine care group, respectively (p=0.381). The mean duration of stay in the ICU was recorded as 7.13±6.02 days for multi-component intervention group and 7.97±7.75 days for routine care group, revealing no statistically significant difference (p=0.644). The Acute Physiology and Chronic Health Evaluation (APACHE II) scores indicated that the mean scores for the routine care group and the multi-component intervention group were 14.40±4.95 and 13.07±4.44, respectively, revealing no statistically significant difference (p=0.267). In term of the Sequential Organ Failure Assessment (SOFA), the mean scores for the multi-component intervention group and the routine care group were recorded as 5.40±1.77 and 5.67±2.22, respectively, indicating no statistically significant difference (p=0.609). Additionally, the mean score on the GCS for the multi-component intervention group was 12.87±0.86, compared to 12.83±0.87 for the routine care group, which also showed no significant difference between the two groups (p=0.882).

Table 3 shows the comparisons between study groups according to RASS scores over five days. The level of agitation, as indicated by the RASS score over the five days did not show significant differences between the multi-component intervention and routine care groups, as reflected in the provided table (p= 0.077, 0.516, 0.492, 0.274, and 0.684, respectively). On day 1, both groups recorded the highest average RASS scores. The mean RASS score for the routine care group was 1.87 ± 0.63, whereas for the multi-component intervention group it was 1.62 ± 0.44. In contrast, on day 5, mean RASS scores decreased in the routine care group (0.38 ± 2.12) and the multi-component intervention group (0.55 ± 0.66).

Table 4 shows the comparison between study groups regarding the frequency of agitation over five days. The table indicates there was a significant difference between the two groups for the frequency of agitation on the days 4 and 5 (p=<0.018 and 0.035, respectively). Patients in the multi-component intervention group had the lowest rates of agitation frequency on days 4 and 5 (43.3% and 40.0%) compared to patients in the routine care group (73.3% and 66.7%).

Discussion

The main findings of this study revealed the efficacy of multi-component nursing interventions in reducing the frequency of agitation among patients in the ICU. Compared with patients receiving routine care, patients receiving a multi-component intervention experienced less agitation. This may be explained by the complexity of the intervention approach. While routine care primarily focuses on basic activities and physical restraint of patients, a multi-component intervention aims to stimulate multiple sensory modalities along with activation of higher cognitive functions. In line with the present study's findings, Sayed et al., (2020) conducted research to establish whether multi-component nursing interventions are an effective strategy for managing agitation among ICU patients. They concluded that multi-component nursing interventions reduced the frequency of agitation among ICU patients, hence improving the general status of the patient.

Similarly, Shahriyari et al., (2021) conducted a study to determine the effectiveness of a combined non-pharmacological intervention provided by family members through scheduled family visits on the frequency of agitation in the ICU. They reported that combining non-pharmacological interventions can reduce the frequency of agitation and accelerate the recovery process of patients in the ICU. In addition, some studies have evaluated the effectiveness of one component of the multi-component intervention investigated in this study on agitation in ICU patients. For example, to evaluate the effectiveness of reorientation on the frequency of agitation, Lee et al., (2023) reported that the frequency of agitation was reduced in patients who received repeated verbal reorientation reminders. They also reported that reorientation is one simple and practical approach to prevent agitation. In another study designed to evaluate the effectiveness of a familiar visual intervention on the frequency of agitation in patients with acute confusion, Givens et al., (2023) reported that the use of familiar photographs led to improvements in restlessness, agitation, and delirium frequency during the nights following the initial observation period.

Regarding the level of agitation, the present study indicated that the mean agitation level for the routine care and the multi-component intervention groups decreased. However, this difference was not statistically significant. This may be due to the intervention mechanism in each group. A possible reason for the reduction in agitation level in the routine care group is the direct sedative effect of pharmacological intervention in the ICU setting where agitation is mainly treated pharmacologically. This sedative effect may reduce the level of agitation compared to the multi-component intervention group by reducing the external signs of agitation despite the difference in the two mechanisms. In contrast, the multi- component intervention promoted a more holistic and individualized approach than the pharmacological intervention. For example, these interventions significantly contributed to creating a familiar environment, which in turn led to a decrease in agitation level.

In alignment with the present research, Guo et al. (2016) carried out a research to explore the effectiveness of a multi-component nursing intervention on postoperative agitation in patients with oral cancer after surgery. In conclusion, they reported that the intervention group had a better level of postoperative agitation, quality of recovery scores, and lower incidence and duration of postoperative delirium when contrasted with the control group. Similarly, Sedghi et al. (2020) examined the impact of non-pharmacological interventions on the levels of agitation among patients with traumatic brain injury (TBI) within the ICU. They found that a combined non-pharmacological family intervention reduced agitation in

patients with TBI who had impaired consciousness. Therefore, this is suggested as a useful intervention for nursing programs.

Conclusion

The results of the present study concluded that implementation of a multi-component nursing interventions significantly reduces the incidence of agitation, agitation-related adverse events, and improves patient outcomes in the ICU. The study's strength is its comprehensive approach using a multicomponent nursing intervention to manage agitation in critically ill patients, potentially improving patient care and safety. However, limitations include a small sample size, which may impact the generalizability of the findings.

Recommendations

Based on the results of the study, the subsequent recommendations are proposed:

- Integrate multi-component nursing interventions into nursing daily practice that tailored to the patient's needs and preferences.
- Incorporate the concept of multi-component nursing interventions for agitated patients, focusing on its positive outcomes in the curricula of undergraduate nursing students and graduate nurse programs in both theory and practice.
- Develop policies and protocols to simplify the documentation system associated with agitation assessment and implementation of multi-component nursing interventions.

Table (1): Frequency distribution of the studied groups according to the demographic data.

Demographic data		Studied groups				Test of Sig.	p
		Multi-component intervention (n=30)		Routine care (n=30)			
		N	%	N	%		
Age	18-≤25	2	6.7%	4	13.3%	χ^2= 0.521	0.247
	>25-≤40	10	33.3%	4	13.3%		
	>40-≤60	18	60.0%	22	73.3%		

Clinical data		Studied groups				Test of Sig.	p
		Multi-component intervention (n=30)		Routine care (n=30)			
		N	%	N	%		
Admission diagnosis	Cardiovascular disorder	12	40.0%	15	50.0%	χ^2= 0.912	P^{FE}= 0.381
	Endocrine/metabolic disorder	1	3.3%	0	0.0%		
	Renal disorder	6	20.0%	4	13.3%		
	Hepatic disorder	7	23.3%	2	6.7%		
	Respiratory disorder	9	30.0%	12	40.0%		
	Gastrointestinal disorder	5	16.7%	4	13.3%		
	Other disorder	7	23.3%	11	36.7%		

SD: **Standard deviation**, **t: Student t-test**, χ^2: **Chi square test**, p: p value for comparing between the two studied groups

Table (2): Frequency distribution of the studied groups according to the clinical data.

Length of ICU Stay, Mean ±SD	7.13 ± 6.02	7.97 ± 7.75	t=0.46	0.644
APACHE II Score, Mean ±SD	13.07 ± 4.44	14.40 ± 4.95	t=1.09	0.276
SOFA Score, Mean ±SD	5.40 ± 1.77	5.67 ± 2.22	t=0.51	0.609
GCS score, Mean ±SD	12.87 ± 0.86	12.83 ± 0.87	t=0.14	0.882

ICU: Intensive Care Unit, **APACHE II:** Acute Physiology and Chronic Health Evaluation, **GCS:** Glasgow Coma Scale, **SOFA**: Sequential Organ Failure Assessment, SD: **Standard deviation**, t**: Student t-test**, FE: **Fisher exact test**, p: p value for comparing between the two studied group

Table (3): Comparison between the studied groups according to RASS score over the five days.

Day	RASS score		Test of sig.	p
	Multi-component intervention (n=30)	Routine care (n=30)		
	SD ±Mean	SD ±Mean		
1st day	0.44±1.62	0.63±1.87	t=1.802	0.077
2nd day	0.63±1.11	1.50±0.91	t=0.653	0.516
3rd day	0.73±0.87	1.69±0.63	t=0.691	0.492
4th day	0.77±0.84	2.0±0.41	t=1.105	0.274
5th day	0.66±0.55	2.12±0.38	t=0.409	0.684

RASS: Richmond agitation sedation scale, t: Student t-test, SD: Standard deviation, p:p value for comparing between the two studied group

Table (4): Comparison between the studied groups according to agitation frequency over the five days.

Day		Agitation frequency				Test of Sig.	p
		Multi-component intervention (n=30)		Routine care (n=30)			
		N	%	N	%		
1st day	Yes	30	100.0%	30	100.0%	NA	-
	No	0	0.0%	0	0.0%		
2nd day	Yes	25	83.3%	25	83.3%	X^2=0.000	0.635
	No	5	16.7%	5	16.7%		
3rd day	Yes	19	63.3%	23	76.7%	X^2=1.270	0.199
	No	11	36.7%	7	23.3%		
4th day	Yes	13	43.3%	22	73.3%	X^2=5.554	0.018*
	No	17	56.7%	8	26.7%		
5th day	Yes	12	40.0%	20	66.7%	X^2=4.286	0.035*
	No	18	60.0%	10	33.3%		

χ^2: **Chi square test**, p: p value for comparing between the two studied groups,*: Statistically significant at $p \leq 0.05$

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