

ORIGINAL RESEARCH

Effect of SBAR situational awareness technique as educational intervention on critical care nurse students' skills of patient safety

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ABSTRACT

Background: Situation awareness could actively scan for risk across multiple domains. It has been defined as “the perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future”. Situation awareness includes three levels; perception, comprehension, and projection. Perception is the first step in developing situation awareness as it includes students' perception of status, attributes, and dynamics of relevant elements in the ICU environment. Comprehension of the present situation is based on outputs of the perception. It includes understanding of the significance of the relevant elements. Finally, projection of future status includes the ability of students to predict the future actions of certain elements in the ICU environment. Appropriate situation awareness could increase the probability of a good task performance. In addition, feedback covers state of the ICU environment affected by both decisions and performance of the selected actions. While SBAR is acronym that represents the actual application of situational awareness through situation, background, assessment and recommendation. A representation of SBAR situational awareness has been depicted as an inner factor in the method for giving patient consideration and basic leadership that helps health care professionals to handle and process information about what is occurring. SBAR is a mechanism useful for framing any conversation, especially critical ones, requiring a practitioner's immediate attention and action to foster a culture of patient safety. Critical care nurses play an important role in their workplace related to patient safety. They should be able to recognize and analyze patient safety incidents using protocols, work in a team, learn from errors, and be able to identify actions and recommendations on how to prevent patient safety incidents through the use of SBAR situational awareness technique. Nursing students' should recognize and understand what is going on around them. Consequently, they can plan ahead with greater knowledge to patient safety which arise the need to integrate SBAR situation awareness in their curricula.

Method: A quasi experimental research design was used in this study in which two tools were used for data collection: “Self-Situational Awareness Assessment Questionnaire” and “Critical Care Nurse Students' Safety Skills Checklist”.

Results: There was a statistical significant difference between both groups of students in relation to situation awareness perception, process and skills ($p < .001$). Moreover, there was a statistical significant difference between the study and control groups in relation to the students' practices score regarding patients' safety standards in the post-assessment phase ($p < .001$).

Conclusion: In the current study, the SBAR situation awareness technique was used in training critical care nurse students to improve their situation awareness level to patient safety skills. Situation awareness perception, process and skills level were significantly increased for critical care nurse students who are subjected to the training program. Also, the students' skills regarding patients' safety standards practices were significantly improved.

Key Words: Critical care nursing students, Educational intervention, Safety skills, SBAR, Situational awareness, Situational awareness technique

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1. INTRODUCTION

Historically health care systems in intensive care units (ICUs) have been designed to respond to life threatening problems, rather than predict and prevent adverse events. Prevention of unrecognized deterioration is always associated with better outcomes. With a definitive objective of patient safety at forefront in healthcare, it is essential to distinguish methodologies which can at last diminish the recurrence of sentinel occasions as situational awareness. Situation awareness could actively scan for risk across multiple domains. It has been defined as “the perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future”. While SBAR is acronym that represents the actual application of situational awareness through situation, background, assessment and recommendation. A representation of SBAR situational awareness has been depicted as an inner factor in the method for giving patient consideration and basic leadership that helps health care professionals especially in critical care settings to handle and process information about what is occurring. Although clinical operations are dynamic with small margins for error, situational awareness has not been widely studied by those at the frontline in healthcare.^[1-4]

In attempting to explain different human behaviors in operating complex systems, situation awareness presents a focus that goes beyond traditional information processing techniques. Accordingly, situation awareness includes three levels; perception, comprehension, and projection. Perception is the first step in developing situation awareness as it includes students’ perception of status, attributes, and dynamics of relevant elements in the ICU environment. Comprehension of the present situation is based on outputs of the perception. It includes understanding of the significance of the relevant elements. Finally, projection of future status includes the ability of students to predict the future actions of certain elements in the ICU environment. This is achieved through knowing the status and dynamics of the elements, in addition to comprehension of the situation. Decisions and performance of action for students are strongly affected by their situation awareness level because situation awareness forms the major input to decision making in critical care practice. Appropriate situation awareness could increase the probability of a good task performance. In addition, feedback covers state of the ICU environment affected by both decisions and performance of the selected actions.^[5-8]

There are numerous issues that could affect the situation that can be categorized as context, individual, or cognitive variables. Context variables include noisy environment, interruptions, poor working place, increased workload, and poor

teamwork. Individual variables include individuals’ competencies, along with other issues such as anxiety, illness, fatigue, and negative life situations. Lastly, cognitive variables include attention tunneling, information overload and the tendency to undertaking familiar tasks automatically which results in an inability to recognize any change in certain situation.^[9,10] Poor situation awareness may be responsible for almost 50% of the serious adverse events that occur in ICU settings. Critical care nurses can be able to influence context, individual, or cognitive variables that degrade situation awareness through effective communication technique which is SBAR technique. Therefore, inclusion of such educational technique in undergraduate critical care nursing students’ curricula is crucial. SBAR is an easy-to-remember, concrete mechanism useful for framing any conversation, especially critical ones, requiring a practitioner’s immediate attention and action. It allows focused and easy way to set expectations for what and how will be communicated between members of the team, which is fundamental for creating teamwork and fostering a culture of patient safety.^[11-16]

Safety skills include non-technical skills such as leadership, teamwork, communication, co-operation, decision making and situation awareness, and also go beyond these to include other behaviors and attributes such as conscientiousness, vigilance and humility. Importantly, non-technical skills support technical skills such as systematic assessment, fluid management during simulation, urethral catheterization, central venous catheter insertion, or resuscitation interventions. Critical care nurses play an important role in their workplace related to patient safety. They should be able to recognize and analyze patient safety incidents using protocols, work in a team, learn from errors, and be able to identify actions and recommendations on how to prevent patient safety incidents through the use of SBAR situational awareness technique. Critical care nursing students’ should recognize and understand what is going on around them. Consequently, they can plan ahead with greater knowledge to patient safety which arise the need to integrate SBAR situation awareness in their curricula.^[17-20] Up to our knowledge, there are no national studies have been investigated the effect of SBAR situational awareness educational intervention on critical care nursing students’ safety skills. Moreover, no study was conducted till the time of the study at the Faculty of Nursing, Alexandria University regarding this issue for the critical care nurse students. That’s why this study was conducted.

1.1 The aim of the study

Is to determine effect of SBAR situational awareness technique as educational intervention on critical care nurse students’ skills of patient safety.

1.2 Research hypothesis

Students who are subjected to SBAR situational awareness educational intervention exhibit higher patient safety skills than those who are not.

2. MATERIALS AND METHOD

2.1 Research design

A quasi experimental research design was used to conduct this study.

2.2 Setting

This study was carried out at Critical Care and Emergency Nursing Department, Faculty of Nursing, Alexandria University.

2.3 Subjects

The subjects of this study comprised 200 nursing students out of 400 undergraduate nursing students who were registered in " Critical Care Nursing I course" during the first semester of the academic year (2018-2019). The subjects were assigned randomly into two equal groups; study and control, 100 students for each.

2.4 Measures

Two tools were used for data collection:

Tool one: Self-Situational Awareness Assessment Questionnaire.

This tool was developed by the researchers after extensive review of the related literatures^[21-26] to assess the critical care nurse students' self-situational awareness level. It consists of two parts:

Part I: It consists of socio-demographic data of the students as; age, sex, residence, academic achievement and previous qualifications.

Part II: It is a 3-point likert scale ranging from always to never. It consisted of 3 categories as following; situation awareness perception (16 items), situation awareness process (13 items) and situation awareness skills (22 items). In which a higher score indicates a higher situation awareness level. The tool's reliability was calculated using Cronbach's Alpha test, it was reliable and the test coefficient value was 0.764.

Tool two: Critical Care Nurse Students' Safety Skills Checklist.

This tool was developed by the researchers according to Egyptian patient standards of patient safety^[27] to assess critical care nurse students' safety skills. It consisted of eleven sections with 63 items as following; identify patient correctly (8 items), improve effective communication (7 items)

,improve medication safety (11 items), improve critical laboratory value reporting system (4 items) , improve handling system of the tubes and equipment (4 items) , improve system of alarm handling (3 items), ensure correct patient surgery (3 items), reduce risk of health care associated infection (9 items), reduce risk of patient fall (5 items), reduce risk of bed sores occurrence (5 items), and environmental safety (4 items). Students' interventions are measured using a dicotomus scale of done (completely or incompletely) and not done. Students' grade was out of 63, each item denotes one grade. The tool's reliability was calculated using Cronbach's Alpha test, it was reliable and the test coefficient value was 0.745 in which the higher the score the higher students' safety skills level.

Tools' content validity

Tools' content validity was tested by a jury of five experts in the related fields and the necessary modifications were done. Tools I, II were tested for their reliability and the tools were reliable. A pilot study was carried out on 10% of the sample size to ascertain the clarity and applicability of the tools and identify difficulties that may face the researcher during data collection.

2.5 Study procedures

The students were allocated randomly into study group (100 critical care nurse students) who received training on situation awareness to patient safety using SBAR technique during the conduction of the clinical sections of critical care nursing I course. Control group (100 critical care nurse students) who received the traditional clinical section of critical care nursing I course. The study tools were used twice; the first time as a pretest before the application of SBAR situation awareness educational intervention of patient safety and the second time as a posttest after the application of the educational intervention. The SBAR situation awareness educational intervention of patient safety was developed and implemented by the researchers. It was carried out through three phases: preparation, implementation and evaluation phase.

1) The preparatory phase: In this phase the researchers tried to find a real meaning to the new concept through adequate preparation of the researchers and content.

a) Researcher preparation

-Reading the available evidences about SBAR situational awareness technique, either recent or old until the time of data collection from books, digital libraries and websites including the national and international researches related to the topic.

-Self-training on the SBAR situational awareness technique.

b) Content preparation

The researchers developed SBAR module for patient safety standards guided by the Egyptian standards of patient safety.

2) The Implementation phase: In this phase, the researchers performed pretest for both the study and control groups using the two tools to assess the critical care nurse students' situational awareness level (tool I) and evaluate their safety skills (tool II). The application of the SBAR situational awareness module took about 4 sessions along 4 weeks, 1 session/week; each session lasted for about 180 minutes (the time of the original section). It started in the first semester of the second academic year 2018-2019. The training was based on the integration between the Egyptian patient standards of patient safety with the SBAR technique as following S: situation in which standards were assessed in their actual situation, B: background in which the standards background for the patient was assessed. While, A: assessment, in which the patient was assessed in the present state according to the standards and finally R: recommendations, in which the final recommendations were concluded for each standard based on the previous assessment.

3) The Evaluation phase: In this phase the researchers assessed the critical care nurse students in both the study and control groups to evaluate their situational awareness level and safety skills using the two study tools at the end of the sessions.

2.6 Administrative design and ethical considerations

Official permission to conduct the study was obtained from the Dean of the Faculty of Nursing; Alexandria University, the Head of Critical Care & Emergency Nursing department, in addition to Nursing Education Department after explaining the aim of the study. Written informed consent was obtained from each critical care nurse student after explanation of the study's aim and assurance about the privacy, anonymity and confidentiality of the obtained data. The right to refuse to participate in the study was affirmed to critical care nurse students. Data collection was carried out by the researchers during the first semester of the academic year 2018-2019 starting from September 2018 to January 2019.

2.7 Statistical analysis

Information was nourished to the PC and investigated utilizing IBM SPSS programming bundle adaptation 20.0. (Armonk, NY: IBM Corp) Quantitative information was depicted utilizing number and percent. Quantitative information was portrayed utilizing mean, standard deviation. Criticalness of the acquired outcomes was made a decision at the 5% level.

The used tests were

1) Chi-square test For categorical variables, to compare between different groups.

2) Monte Carlo correction Correction for chi-square when more than 20% of the cells have expected count less than 5.

3) Student *t*-test For normally distributed quantitative variables, to compare between two studied groups.

4) Paired *t*-test For normally distributed quantitative variables, to compare between two periods.

3. RESULTS

Table 1 shows the distribution of the studied critical care nurse students according to their characteristics. In relation to demographic data, more than half of the studied critical care nurse students (62%, 58%) of the control and study groups respectively are females and the majority of them (70%, 57%) of the control and study groups respectively are less than 22 years old. No statistical significant difference between the studied groups of students was found in relation to students' residence ($p = .686$). Regarding the academic achievement, this table also shows that there was no statistical significant difference between the studied groups of students ($^M C p = .402$). Moreover, there was no statistical significant difference between the studied groups of students ($^M C p = .136$) in relation to their previous qualifications. The difference between students who exposed to situation awareness training in both groups of students was not statistically significant ($p = .077$).

Table 2 illustrates a comparison of the studied critical care nurse students according to self-assessment of their current situation awareness prior the training program (first week of semester). In relation to situation awareness perception and process, there was no statistical significant difference between both groups of students ($p = .217, .105$) respectively. Concerning the situational awareness skills; Critical thinking, Problem solving, Decision making, and Communication skills, there was no statistical significant difference between both groups of students ($p = .549, .931, .122, \text{ and } .075$) respectively.

Table 3 presents a comparison of the studied critical care nurse students according to self-assessment of their current situation awareness after at the 12th week of semester for the control group and finishing the training program for the study group (the 12th week). In relation to situation awareness perception and process, there was a statistical significant difference between both groups of students ($p \leq .001, < .001$) respectively. Regarding the situational awareness skills, there was a statistical significant difference between both groups of student in favor to the study group related to all subtypes of skills ($p \leq .001, < .001, < .001, \text{ and } < .001$) respectively.

Table 1. Distribution of the studied critical care nurse students according to their characteristics

Characteristics	Groups				Significance	
	Control (n = 100)		Study (n = 100)		Test of Sig.	p
	No.	%	No.	%		
Sex						
Female	62	62.0	58	58.0	$\chi^2 = 0.333$.564
Male	38	38.0	42	42.0		
Age (years)						
Min. – Max.	20.0 – 25.0		20.0 – 25.0		$t = 0.941$.348
Mean \pm SD.	21.28 \pm 1.48		21.45 \pm 1.03			
Residence						
Rural	26	26.0	22	22.0	$\chi^2 = 0.754$.686
Urban	57	57.0	57	57.0		
University city	17	17.0	21	21.0		
Academic achievement						
A-	0	0.0	2	2.0	$\chi^2 = 8.013$	^{MC} $p = .402$
B+	13	13.0	10	10.0		
B	32	32.0	28	28.0		
B-	27	27.0	28	28.0		
C+	11	11.0	20	20.0		
C	10	10.0	10	10.0		
C-	5	5.0	2	2.0		
D	1	1.0	0	0.0		
F	1	1.0	0	0.0		
Previous qualifications						
Secondary school	80	80.0	75	75.0	$\chi^2 = 4.221$	^{MC} $p = .136$
Technical institution	14	14.0	23	23.0		
Other faculties	6	6.0	2	2.0		
Previous exposure to situation awareness training						
Yes	42	42.0	30	30.0	$\chi^2 = 3.125$.077
No	58	58.0	70	70.0		

Note. χ^2 : Chi square test; MC: Monte Carlo; t : Student t -test; p : p value for comparing between the two studied groups; * $p \leq .05$.

Table 2. Mean situation awareness pre-assessment responses among the studied groups

	Groups	N	Mean	Std. Deviation	t	p
Situation awareness self-assessment						
Situation awareness perception	Study	100	26.43	2.97	1.240	.217
	Control	100	27.36	6.89		
Situation awareness process	Study	100	21.47	3.25	1.628	.105
	Control	100	22.26	3.61		
Situational awareness skills						
Critical thinking skills	Study	100	11.85	2.08	0.601	.549
	Control	100	12.06	2.81		
Problem solving skills	Study	100	10.21	2.11	0.087	.931
	Control	100	10.18	2.75		
Decision making skills	Study	100	6.78	1.68	1.555	.122
	Control	100	6.40	1.78		
Communication skills	Study	100	6.82	1.67	1.790	.075
	Control	100	6.40	1.65		
Overall	Study	100	35.66	3.62	0.792	.430
	Control	100	35.660	3.62		

Note. t : Student t -test; p : p value for comparing between the two studied groups in pre period; * $p \leq .05$.

Table 3. Mean situation awareness post-assessment responses among the studied groups

	Groups	N	Mean	Std. Deviation	t	p
Situation awareness self-assessment						
Situation awareness perception	Study	100	42.61	3.26	17.641*	< .001*
	Control	100	30.49	6.05		
Situation awareness process	Study	100	34.92	3.33	21.598*	< .001*
	Control	100	23.15	4.31		
Situational awareness skills						
Critical thinking skills	Study	100	18.51	2.09	17.612*	< .001*
	Control	100	12.14	2.95		
Problem solving skills	Study	100	16.02	2.01	17.026*	< .001*
	Control	100	10.18	2.78		
Decision making skills	Study	100	10.95	1.25	20.416*	< .001*
	Control	100	6.43	1.83		
Communication skills	Study	100	10.76	1.53	19.859*	< .001*
	Control	100	6.22	1.70		
Overall Skills	Study	100	56.24	4.45	24.663*	< .001*
	Control	100	34.97	7.39		

Note. t: Student t-test; p: p value for comparing between the two studied groups in pre period; *p ≤ .05.

Table 4 illustrates a comparison of pre and post self-assessment according to their situation awareness for the study group (before and after finishing the training program). In which there was a statistical significant difference related to situation awareness perception and process, and skills (p ≤ .001, < .001, < .001, and < .001) respectively.

Table 5 indicates mean percentage of the studied groups of

critical care nurse students' practices score regarding patients' safety standards. It was found that there was no statistical significant difference (p = .613) between the study and control groups in relation to the students' practices score regarding patients' safety standards in the pre-assessment phase (1st week). At the 12th week in the post-assessment phase, there was a statistical significant difference (p < .001) between the study and control groups.

Table 4. Comparison between the pre and post situation awareness assessment in the study group

	N	Study group				t	p
		Pre-assessment		Post-assessment			
		Mean	Std. Deviation	Mean	Std. Deviation		
Situation awareness self-assessment							
Situation awareness perception	100	26.43	2.97	42.61	3.26	< .001*	
Situation awareness process	100	21.47	3.25	34.92	3.33	< .001*	
Situational awareness skills							
Critical thinking skills	100	11.85	2.08	18.51	2.09	< .001*	
Problem solving skills	100	10.21	2.11	16.02	2.01	< .001*	
Decision making skills	100	6.78	1.68	10.95	1.25	< .001*	
Communication skills	100	6.82	1.67	10.76	1.53	< .001*	
Overall Skills	100	35.66	3.62	56.24	4.45	< .001*	

Note. t: Student t-test; p: p value for comparing between the two studied groups in pre period; *p ≤ .05.

Table 5. Mean scores of the studied groups' practices score regarding patients' safety standards practices

Safety skills	Groups	N	Mean	Std. Deviation	T	p ¹
Pre-assessment (1 st week)	Study	100	28.26	4.59	0.507	.613
	Control	100	28.64	5.93		
Post-assessment (12 th week)	Study	100	34.96	5.95	6.336*	< .001*
	Control	100	29.89	5.35		
p ²			< .001*			

Note. t: Student t-test; p¹: p value for comparing between the two studied groups; p²: p value for comparing between the two periods; *p ≤ .05

4. DISCUSSION

The Patient Safety First Campaign emphasized that how using knowledge of human factors or non-technical skills makes the daily work environment and activities safer. The non-technical skills can be defined as the cognitive, social and personal resource skills that complement technical skills such as leadership, communication, coordination, teamwork and situational awareness. Integrating training of the non-technical skills in the undergraduate program is crucial for critical care nurse students to prevent the preventable adverse events and insure patient safety.^[21] In this regard, the current study concerned with studying the effect of training the critical care nurse students using the SBAR situational awareness technique on their patients' safety skills level.

The current study finding reveals that all the studied students have a low level of situational awareness in which there was no statistical significant difference between the studied groups' situational awareness level; perception, process, and skills before start of the training. This may be related to that most of the students of both groups have not been exposed to SBAR situation awareness technique training previously. Moreover, SBAR situation awareness technique is not considered by the curriculum in the study setting. In line with this finding, McKenna et al. (2014)^[28] explored in a mixed method study the nursing students' situation awareness in responding to patient deterioration simulated scenarios and they found that the study participants had a low situational awareness level. Also in agreement with the current study finding, Phillips (2014)^[29] using a mixed methods design examined the situation awareness of the undergraduate nursing students. Phillips indicated that the nursing students' situational awareness level was deficient.

Pre-training, critical care nurse students from both groups lacked the awareness perception to surrounding environment, safety issues in the clinical settings and had poor integration of new information into the existing body of knowledge, in addition, use information in critical thinking and problem solving. Significant improvement in situation awareness perception scores were demonstrated between the pre and post assessment (post-training) in the study group. This finding is in line with O'Meara et al. (2014),^[4] who conducted a quasi-experimental before-and-after study to determine whether the use of certain educational techniques has the potential to enhance the feedback quality and improve situation awareness among students. They found that there were significant improvements in the participants' situation awareness scores between the first and third scenarios applied.

In critical care nursing, situation awareness is identified as the nurses' perception of relevant clinical cues related to

the patient and his or her environment, the comprehension of the meaning of salience about these cues, in addition to the anticipated projection of required interventions based on those cues.^[30] The studied students in the current study had a low level in the perception, comprehension, and projection of situation awareness before receiving the training. In which they didn't have cues that trigger perception; visual, auditory, tactile, or olfactory which create the ability to detect and understand the different distinctions regarding the patients' safety standards, identifying the patient correctly, communication process, handling system of the equipment, complications, and environmental safety. Comprehension is how the nurse students integrate the meaning to multiple pieces of information and set priority of tasks, which in turn influence their performance.^[31] In this study, the information gained by students while they collect data about their assigned patients hadn't been reflected in their safety practices as self-reported by the majority of them. This is differed significantly in the second assessment after the training. Projection is the ability of students to forecast future events.^[3] This level of situation awareness process was also poor for the studied students pre-training and improved significantly post-training.

Situation awareness is necessary in complex and dynamic environment reliant on humans who have to make decisions where safety is substantial.^[6] The current study indicated that the studied students in both groups had poor situation awareness skills represented in critical thinking skills, problem solving skills, decision making skills, and communication skills. Unsurprisingly, the studied students' situation awareness skills have been improved after the training program which is reflected in their patients' safety skills. In which there was a statistical significant difference between the studied groups in the safety skills in favor to the study group. Also, there was a statistical significant difference between the first (before training) and second (after training) assessment of the study group. This may be due to SBAR situation awareness training help students improving their perception to be aware of the current state of the system, and increasing their comprehension of implications of the perceived variables of the system.

Moreover, SBAR situation awareness training helps students enhancing projection that depicts their expectation of consequences for the system which is finally enable students to identify requirements that guide them, thus preventing errors due to misjudgment of a given situation. In this regard, Shalaby et al. (2018)^[32] studied the critical care nurse students' perception and practices to patient safety, they found that students had a practice level ranged from poor to fair level related to their practices. In contrast with this finding,

Langari et al. (2017)^[33] examined and compared the patient safety competence between British and Finnish nursing students. They found that both groups of students rated their competence of patient safety as a high competency.

The current study approved the hypothesis that using SBAR situational awareness educational intervention helps the critical care nurse students to improve their patient safety skills. Therefore, the main focus of this study is to increase the critical care nurse students' situational awareness level thus being able to early detection of deterioration, and prevent errors and adverse events.

Limitations to the study

The clinical trial in the current study lacked the randomization. Moreover, the sample size was not large enough to allow the generalization of the findings.

5. CONCLUSION

Critical care nursing specialty is known to be susceptible to errors and, occasionally, unfavorable patient outcomes especially with novice students. Accordingly, in the current study, the SBAR situation awareness technique was used in

training critical care nurse students to improve their situation awareness level to patient safety skills. Situation awareness perception, process and skills level were significantly increased for critical care nurse students who are subjected to the training program. Also, the students' skills regarding patients' safety standards practices were significantly improved.

Recommendations

The findings of the current study support the need to incorporate SBAR situation awareness educational technique into the undergraduate courses to increase critical care nurse students' situational awareness skills and improve their safety skills. Applying such technique to increase the novice students' awareness of patient rescuing should be a curricular focus. Further studies should be directed to examine the impact of SBAR situation awareness on other issues in the clinical practice. Replication of this examination on bigger examples is guaranteed to permit speculation of the discoveries and affirm the adequacy of the preparation program.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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