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Exploring the Effect of Trauma Care Simulation on Undergraduate Critical Care Nursing Students' Attitude at A College of Nursing, in Jeddah- An Intervention Study

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Abstract
Background: Patient safety has become a priority and pre-requisite for the provision for effective quality care. Simulation is seen as one method to ensure patient safety as this method allows for the attainment of skills and promotes the transference of these skills into safe clinical practice.**Method:** A pretest posttest research design was used. 34 Female critical care students were conveniently sampled from the College of Nursing, Jeddah, at the King Saud bin Abdul-Aziz University for Health Sciences. Data collection occurred in three phases: first phase pre simulation phase which included administering the KIDSIM Attitudes Questionnaire; second phase was the simulation on a trauma patient with hypovolemic shock; third phase was administering the KIDSIM Attitudes Questionnaire and Simulation Design Scale. **Results**: The majority of the students have positive attitudes in both pre and post simulation practice in relation to the relevance of simulation (with Mean + SD 4.3 + 0.6 pre & 4.4 + 0.5 post) with no significant difference between pre and post simulation practice. Approximately two thirds of students were able to able to care for a trauma patients with hypovolemic shock. Student's feedback about the simulation practice highlights that the majority of students provided positive feedback regarding the simulation session attended.**Discussion**: One of the significant finding related to leadership provided during simulation was to ask non- response team members to leave when they are distracting. In addition, the results of this study revealed that within a team context, the roles on non- leading members of the team are just as important for good team functioning as the role of the leader.**Limitations and recommendations:** Limitations include space triangulation with a small sample size. Recommendations for future research propose qualitative studies to address the phenenomon at hand especially within a Saudi Arabian context.
Keywords: Critical care students, simulation, trauma care, trauma care simulation.

1. Background:

High quality patient care is one of the requirements for nursing which is dependent on nursing competency. Nursing competency means "competence and qualification in areas of cognitive and psycho- physical, clinical skills, critical thinking decision making and the ability to enhance learning through academic knowledge and clinical experience, leading to standards of safe care (Sharghi, Alami, Khosravan et al, 2015). Characteristics of a competent nurse include the ability to think critically and to reason clinically in order to make sound clinical judgment (Botma, 2014). Incompetent nurses in the clinical environment would be a danger to patients' health (Sharghi et al, 2015). Early recognition and management of patient deterioration are essential to nursing competence and can be improved through education such as simulation (Buykx et al, 2012).

Patient safety has become a priority and pre-requisite for the provision for effective quality care. The measures of quality are defined in terms of safe patient and practices that prevent harm (Shearer, 2013). In addition, a positive work environment for nurses and nurse education levels are all seen to impact on patient safety outcomes (Kirwan Matthews & Scott, 2013). Simulation is seen as one method to ensure patient safety as this method allows for the attainment of skills and promotes the transference of these skills into safe clinical practice (Grady, Kehrer, Trusty, Entin et al, 2008).

Simulation are defined as activities that resembles the reality of the clinical environment that aim to demonstrate procedures, decision making and critical thinking through methods such as role playing, videos or mannequins (Jeffries, 2005). According to Durham and Alden (2008), simulation creates characteristics of the real world which allows the educator to control the learning environment through practice, feedback and minimizing environmental distractions. In addition, the purpose of simulation is to achieve goals related to learning or evaluation and does not replace learning in the clinical area. Simulation also allows students to develop assessment, critical thinking and decision making skills in a safe environment. The aim of simulation is to correct and prevent mistakes, prevent in accurate assessments, and improve clinical decision making in a

context where the patient's health is not affected, with students having the opportunity to learn from the experience (Edgecombe, Seaton, Monahan et al, 2013).

Simulation learning has become a widely accepted teaching method within nursing education. In the past two decades, there has been an increase in the use of simulation- based learning to support elements of teaching and learning in health science programmes. In nursing, simulation is now widely accepted teaching method for clinical learning (Landeen, Pierazzo, Akhtar-Danesh et al, 2015). Nurse educators can bring theory to life in a controlled setting in which it is safe for students to learn from mistakes without fear of causing actual harm. Simulation is an ideal venue for developing and practicing the complex skills of critical thinking and problem solving (Gore, Hunt, Parker et al, 2011) and provides many opportunities for students to learn and apply theoretical principles of nursing in a safe environment increasing their self-efficacy (Bambini, Washburn & Perkins, 2009).

According to Jeffries (2005), successful learning using simulation requires alignment of the design, teaching activities, competencies, and learning outcomes. The case scenario, including simulation of actual clinical problems, provide an interactive learning environment, engaging students in the learning process and encouraging them to make connections between and among concepts. Environmental interactivity and feedback typically is achieved through the use of simulation supplemented with role play techniques. Although high fidelity patient simulation doesn't replace all clinical experiences, it gives students the chance to practice basic skills and assessments and to gain confidence in clinical situations. As students' progress through the program, simulations become more complex to teach higher level skills.

2. Objectives of the study:

To explore undergraduate critical care nursing students' attitude towards trauma care simulation at a College of Nursing, in Jeddah- pre and post of an intervention study.

2.1. To explore undergraduate critical care nursing students' attitude towards trauma care simulation at a College of Nursing, in Jeddah.

2.2. To examine the student`s feedback after simulation practice.

2.3. To determine the ability of undergraduate students to care for hypovolemic trauma patient.1.1.1

3. Hypothesis:

H1: The Students who will participate in simulation practice on trauma care will have positive attitude toward simulation practice.

H2. The Students who will participate in simulation practice on trauma care will have positive feedback toward simulation practice.

4. Methodology:

4.1 Setting:

The College of Nursing, Jeddah, at the King Saud bin Abdul-Aziz University was the setting for this study. The college offers two undergraduate (Baccalaureate) Programs in Nursing Science: the first is known as Stream I, catering for high school graduates and extends over a period of 4 years. The second is known as Stream II, catering for university graduates who wish to join Nursing as a second career. The two programs are preceded by a foundation program for one semester, which is followed by a one year internship program.

Within this context and within the curriculum design, clinical simulation is an innovative teaching method used by faculty and clinical teaching assistants to help teach the principles of safe effective patient care. Clinical simulation usually begins at the Fundamentals of Nursing II and continues till the last module of the nursing course which includes the critical care nursing. The critical care students were chosen as they are exposed to a theoretical lecture related to trauma care nursing and shock. In addition to this they are further exposed to the management of trauma patient with shock states within the clinical setting in which they spend 30 hours.

4.2 Population, sampling and sample size:

34 critical care students enrolled within the critical care program formed the population for this study. A convenient sampling method was used including all 34 students as the sample size was small.

Inclusion exclusion criteria:

Inclusion criteria included all students willing to partake in the study while exclusion criteria allowed for excluding all students that were absent for more than 50% of the clinical sessions held during the critical care program. Within this program a total of four simulations sessions were held focusing on critical care and trauma based scenarios.

4.3. Research paradigm and design:
This research followed as post positivist approach using a quasi-experimental research design.

4.4. Data collection tools:
Two questionnaires were used in this study. Questionnaire 1 was the Attitude Towards Teamwork in Training Utilizing Designed Educational Simulation (ATTITUDES). The Kidsim ATTITUDES questionaire was used to explore the perceptions and attitudes of critical care students towards the simulation. The ATTITUDES Questionnaire was developed to assess learners' attitudes towards relevance of simulation in teaching inter professional education (IPE) teamwork, the IPE, and the concepts of teamwork. The questionaire consists of five domains namely communication (8 items), relevance of IPE (7 items), relevance of simulation (5 items), roles and responsibility (6 items), and situation awareness (4 items). The existing internal reliability for these domains: relevance of simulation ($\alpha = 0.83$), relevance of IPE ($\alpha = 0.90$), communication ($\alpha = 0.84$), roles and responsibilities ($\alpha = 0.86$) and situation awareness ($\alpha = 0.77$). The overall internal reliability coefficient of the KidSIM ATTITUDES questionnaire was $\alpha = .95$. (Sigalet, Donnon & Grant, 2012). The tool was modified by replacing the interprofessional education team to team work and team leader roles and responsibilities.

Questionaire 2 was the Simulation Design Scale. The Simulation Design Scale (student version), is a 20-item instrument using a five-point scale, which was designed to evaluate the five design features of the instructor-developed simulations used in the NLN/Laerdal study. The five design features include: 1) objectives/information; 2) support; 3) problem solving; 4) feedback; 5) fidelity. The instrument has two parts: the first part explores about the presence of specific features in the simulation, the seconds expores about the importance of those features to the learner. This study only used the first part of the tool which represents the presence of specific features in the simulation. Content validity was established by ten content experts in simulation development and testing within the college. The instrument's reliability was tested using Cronbach's alpha, which was found to be 0.92 for presence of features, and 0.96 for the importance of for the importance of features. Both these tools was piloted using critical care students from the previous groups who were currently in the internship programme. Any comments/suggestions received from the students involved in the pilot study was addresssed where applicable to ensure that the content of the tool was acceptable.

4.5. Data collection process and analysis:
Data collection occurred in three phases. The first phase was the pre simulation phase which included administering the KIDSIM Attitudes Questionnaire. The second phase included the simulation and a debriefing session. During the simulation session, the students were given a scenario that focussed on trauma and hypovolemic shock assessment and management. The expected run time of the session was 30 minutes. The scenario was made up of two tasks. Each task was accompanied with a mini scenario and instuctions for the students to manage that particular mini scenario. Based on the expected outcomes for assessment and mangement of the given scenario, the students were assessed during the simulation session against a checklist . A debriefing session was held after the simulation session. As there was 34 students, the simulation session was done in four groups (8 students in two groups and 9 students in two groups). This was done as the trauma management of patients involves the tbe trauma interprofessional team which is generally made up of nine members. Each of these nine members have specific assigned roles. The researchers also try to ensure that during the simulation session each student was assigned a role as part of the trauma team. For the two groups that had eight members, the researchers ensured that the In addition, there were currently four teaching staff within the critical care programme. All four staff members were involved with all groups. Each teaching staff was allocated a specific role and remained in the same role for all simulation sessions so as to ensure standardisation. These research phases was carried out over two days: 2 groups per day. The third phase included the Questionaire on attitudes towards simulation- post simulation session and the Simulation Design Scale. In this phase, after debriefing the students were given the tool that explored the features of the designed simulation.
Data analysis involved descriptive and inferential statistics.

5. Ethical considerations
Research ethical clearance: Data collection commences only after permission was granted from the Ethics Committee and The College of Nursing, Jeddah, ethical clearance number: CON-JRC10-031.

Informed consent: All respondents were presented with a written information document explaining the purpose and significance of the study. The document was available in English. Written permission was obtained from all respondents. Respondents were made aware that participation is voluntary and that they have the right to withdraw from the study at any time. No names were used so that data could not be connected to any particular respondent. Respondents were assured that whatever was documented on the questionnaire was kept confidential. The contact details of the researchers were made available to the participants. Data collected was treated with confidentiality and will be available only to the researcher. No identifying information was obtained,

such as respondents' names and other personal details, in order to safeguard their confidentiality and anonymity. The data was stored in a password protected computer. All hard copies of available data were locked in a safe known only to the researchers. The data will be destroyed by fire after 5 years after completion of the study.

6. Results

A total of 34 (100%) female undergraduate nursing students reported a previous team-based learning exposure, as a training through course-related activities. Also all of them reported that they had a previous experience in clinical simulation apart from critical care simulation.

Student`s attitude towards trauma care simulation:

In relation to objective 1, the following table (1) shows that overall students had positive attitude towards simulation practice based on their previous experience with no significant difference between pre and post simulation practice.

The majority of the students have positive attitudes in both pre and post simulation practice in relation to the relevance of simulation (with Mean + SD 4.3 + 0.6 pre & 4.4 + 0.5 post), Leadership ability for team leader (with Mean + SD 4.2 + 0.5pre & 4.2 + 0.8post), communication (with Mean + SD 4.2 + 0.5 pre & 4.4 + 0.6 post), roles and responsibilities (with Mean + SD 4.2 + 0.5pre & 4.4 + 0.6 post), and situational awareness (with Mean + SD 4.2 + 0.6 pre & 4.3 + 0.7 post) with no statistical difference between pre and post subtotal scores. In addition, there was a significane difference in the following sub-items:

- The team leader asks non-response team members to leave when they are distracting (with P value 0.04*) .
- Communication within the team is as important as technical skills (with P value 0.05*)
- The roles of non-leading members of the team are just as important for good team functioning as the role of the leader (with P value 0.005*)
- Monitoring what each team member is doing is important to optimize patient safety (with P value 0.03*)

Table 1: The Study Subjects' attitude towards trauma care simulation: n=34 students:

Item	Mean ± SD		t	P value
	Pre	Post		
Relevance of Simulation				
1. Simulation is a good environment for learning	4.3 ± 0.8	4.4 ± 0.7	0.72	0.46
2. Simulation supports opportunities to change attitudes	4.1 ± 0.9	4.2 ± 0.7	0.79	0.42
3. Simulation is a good tool for practicing team decision-making skills	4.4 ± 0.6	4.4 ± 0.7	0.47	0.63
4. Deliberate practice can improve clinical decision-making skills	4.3 ± 0.6	4.4 ± 0.6	1.5	0.13
Leadership – The Team Leader				
5. Conducts a brief prior to patient arrival (e.g., identifies self, assigns members roles and responsibilities, discusses initial plan based on current information, anticipates interventions [e.g., chest tube, OR, etc.])	4.2 ± 0.6	4.2 ± 0.9	0.17	0.86
6. Continually renders plan of care to team	3.9 ± 0.7	4.1 ± 1.0	0.86	0.38
7. Feedback provided to team members is constructive.	4.1 ± 0.8	4.2 ± 0.9	0.29	0.76
8. Ensures task prioritization (e.g., important tasks performed first, ABC's and survey sequence are being completed)	4.2 ± 0.8	4.2 ± 0.9	0.14	0.88
9. Asks non-response team members to leave when they are distracting.	3.3 ± 1.2	3.8 ± 1.1	1.97	0.04*
10. Shared learning with other team members will improve my ability to understand clinical problems	4.3 ± 0.8	4.3 ± 0.8	0.23	0.81
Communication				
11. All students should learn how to work in the context of health care teams	4.2 ± 0.6	4.4 ± 0.8	0.42	0.67
12. Team leaders should provide frequent patient updates to other team members	4.2 ± 0.7	4.4 ± 0.7	1.07	0.28
13. Team leaders should encourage team members to ask questions	4 ± 0.8	4.3 ± 0.8	1.59	0.11
14. Communication within the team is as important as technical skills	4.5 ± 0.5	4.3 ± 0.7	1.96	0.05*
15. Team members providing immediate patient care management should verbalize their activities aloud	4.2 ± 0.8	4.3 ± 0.9	0.30	0.76
16. Team members should paraphrase or repeat back instructions to clarify their understanding	3.9 ± 0.8	4.3 ± 0.9	1.49	0.13
17. Communication in teamwork is important to patient safety	4.6 ± 0.5	4.4 ± 0.7	0.96	0.33
18. The roles of non-leading members of the team are just as important for good team functioning as the role of the leader	4 ± 0.6	4.5 ± 0.6	2.79	0.005*
Roles and Responsibilities				
19. Teamwork practice will provide me with feedback to enhance my ability to provide optimal patient care	4.3 ± 0.6	4.3 ± 0.7	0.24	0.8
20. Monitoring what each team member is doing is important to optimize patient safety	4.2 ± 0.6	4.5 ± 0.7	2.06	0.03*
21. Will enhance other team members understanding of my role in patient health care	4 ± 0.9	4.4 ± 0.7	1.76	0.78
22. Teamwork practice will help me recognize how best to help other team members complete their tasks	4.2 ± 0.7	4.3 ± 0.7	0.60	0.54
23. It is important for team members to ask for assistance if they need support in completing a task	4.2 ± 0.7	4.4 ± 0.7	1.21	0.22
24. Teamwork practice allows for flexibility in roles during times of crisis	4.3 ± 0.6	4.3 ± 0.6	0.19	0.84
Situation Awareness				
25. I will speak up if I perceive a problem regardless of who might be affected	4 ± 0.9	4.2 ± 0.8	0.84	0.39
26. Patient care is improved when all team members have a shared understanding about the assessment and treatment	4.3 ± 0.9	4.4 ± 0.8	0.07	0.94
27. Team leaders should provide frequent summaries of patient findings to keep team members oriented to patient needs	4.3 ± 0.7	4.4 ± 0.8	0.42	0.67

* P value <0.05

Performance Assessment:

With regards to student`s performance in caring for trauma patient with hypovolemic shock (objective 2), the total number of the students (n=34) were divided into five groups; each group include 7 students except one group include 6 students. two groups were scored as poor and not satisfactoy scores with percentages of (17.6% and 20.6%) respectively, while the other three groups scored as good and very good with percentages of (41.2% and 20.6%) respectively with mean score 30.4 ±6.2. This highlights that approximately two thirds of students were able to care for a trauma patients with hypovolemic shock.

Table 2 : Practice Score Levels among the Study Subjects in caring for a patient with trauma and hypovolemic shock n=34 students:

Practice Level	No (34)	%
Mean ± SD	30.4 ±6.2 Min 21 Max 38	
Poor (<50%)	6	17.6%
Not satisfactory (50% to <60%)	7	20.6%
Good (70%- <80%)	14	41.2%
Very Good (80%and more)	7	20.6%

Student`s feedback:

With regards to objective 3; "student's feedback about the simulation practice" table (3) highlights that the majority of students provided positive feedback regarding the simulation session attended. In relation to objectives and information regarding simulation, 14. 7% of students disagreed that there was enough information provided at the beginning of the simulation to provide direction and encouragement. In addition to this 11.8% of students disagreed that they clearly understood the purpose and objectives of the simulation.. 11.8% students disagreed that they felt supported by the teachers's assistance during simulation, independent problem solving was facilitated and that they were encouraged to explore all possibilities of the simulation. This table also highlights that from the four componenets of feedback on simulation, the component of feedback/guided reflection was scored the most positive from all the other components. Further to this, item # 17 under feedback/ guided reflection was not scored negative at all. Students were either neutral (8.8%), agreed (29.4) or strongly agreed (58.8) that the simulation allowed them to analyse their own behaviour and actions.

Table 3: Students feedback about the simulation practice:

Objectives and Information	Strongly disagree		Disagree		Neuteral		Agree		Strongly Agree		Not applicable		X^2	P Value
	No	%	No	%	No	%	No	%	No	%	No	%		
1. There was enough information provided at the beginning of the simulation to provide direction and encouragement.	-	-	5	14.7	5	14.7	10	29.4	11	32.4	3	8.8	7.17	0.127
2. I clearly understood the purpose and objectives of the simulation.	-	-	4	11.8	5	14.7	6	17.6	17	50	2	5.9	20.4	0.00*
3. The simulation provided enough information in a clear matter for me to problem-solve the situation.	-	-	2	5.9	8	23.5	6	17.6	15	44.1	3	8.8	15.7	0.003*
4. There was enough information provided to me during the simulation.	-	-	3	8.8	6	17.6	13	38.2	9	26.5	3	8.8	10.7	0.03*
5. The cues were appropriate and geared to promote my understanding.	-	-	2	5.9	6	17.6	14	41.2	10	29.4	2	5.9	16.00	0.003*
Support														
6. Support was offered in a timely manner.	1	2.9	3	8.8	3	8.8	14	41.2	10	29.4	3	8.8	23.17	0.00*
7. My need for help was recognized.	-	-	1	2.9	5	14.7	14	41.2	12	35.3	2	5.9	20.4	0.00*
8. I felt supported by the teacher's assistance during the simulation.	2	5.9	4	11.8	7	20.6	10	29.4	10	29.4	1	2.9	13.6	0.018*
9. I was supported in the learning process.	-	-	2	5.9	6	17.6	14	41.2	10	29.4	2	5.9	16.00	0.003*
Problem Solving														
10. Independent problem-solving was facilitated.	1	2.9	4	11.8	6	17.6	11	32.4	9	26.5	3	8.8	12.58	0.028*
11. I was encouraged to explore all possibilities of the simulation.	-	-	4	11.8	5	14.7	11	32.4	12	35.3	2	5.9	11.58	0.021*
12. The simulation was designed for my specific level of knowledge and skills.	-	-	2	5.9	5	14.7	10	29.4	14	41.2	3	8.8	11.51	0.004*
13. The simulation allowed me the opportunity to prioritize nursing assessments and care.	-	-	1	2.9	6	17.6	10	29.4	14	41.2	3	8.8	16.29	0.003*
14. The simulation provided me an opportunity to goal set for my patient.	-	-	1	2.9	3	8.8	14	41.2	14	41.2	2	5.9	25.7	0.00*
Feedback/Guided Reflection:														
15. Feedback provided was constructive	-	-	1	2.9	7	20.6	6	17.6	19	55.9	1	2.9	31.88	0.00*
16. Feedback was provided in a timely manner.	-	-	2	5.9	5	14.7	7	20.6	18	52.9	2	5.9	25.7	0.00*
17. The simulation allowed me to analyze my own behavior and actions.	-	-	-	-	3	8.8	10	29.4	20	58.8	1	5.9	26.00	0.00*
18. There was an opportunity after the simulation to obtain guidance/feedback from the teacher in order to build knowledge to another level.	-	-	1	2.9	3	8.8	8	23.5	20	58.8	2	5.9	36.29	0.00*
Fidelity (Realism)														
19. The scenario resembled a real-life situation.	-	-	2	5.9	3	8.8	10	29.4	17	50	2	5.9	25.7	0.00*
20. Real life factors, situations, and variables were built into the simulation scenario.	-	-	1	2.9	4	11.8	10	29.4	17	50	2	5.9	26.29	0.00*

Based on the previous results presented in this section the hypothesis that was made was accepted.

7. Discussion of the findings:

The findings shows that overall students had positive attitude towards simulation practice based on their previous experience with no significant difference between pre and post simulation practice. One of the significant finding related leadership provided during simulation was to ask non- response team members to leave when they are distracting. Students scored higher means score (3.8) on the post test as opposed to the mean score (3.3) on the pre test. This could be attributed to the fact that students could reflect on this item immediately following their debreifing. Non – response members during simulation as a distractor could be seen as an interruption in perfromance. Feuerbacher, Funk, Spight et al (2012), found that operating room distractions and interupttions increase the likehood of errors in a simulation they conducted for novice surgeon. Further to this it was reported that human fallibilities, distractions and human interuptions increase the risk for human error as attention is diverted from the procdeure being performed or alternatively distractions results in memory loss.

In addition, the results of this study revealed that within a team context, the roles on non- leading members of the team are just as important for good team functioning as the role of the leader. This is significant

in the care of trauma patients as trauma care patients usually have life threatening problems requiring prompt treatment by the effective communication within the trauma team. Even though leadership has been described as a key factor in the trauma team's performance (Cole & Crichton, 2006) there is consensus on the important of safe and secure communication in a trauma care where time is a limiting factor (Hargestam, Hultin, Brulin & Jacobsson, 2016). According Hamilton, Freeman, Woodhouse et al (2009) during a simulation based trauma assessment of team behavior; effective team function is dependent on individual team member in order to achieve the team goals.

Further to this, another significant finding of this study highlighted that monitoring what each team member is doing is important to optimize patient safety. Sigalet et al (2012: 355) explored the perceptions of 196 medical, nursing and respiratory therapy students perceptions and attitudes towards a simulation- based interprofessional curriculum. The findings of this study revealed that the highest mean score was for the item on "communication in team work is important to patient safety". According to Garbee, Paige, Bonanno et al (2013), the use of team work among is an effective methodology that can be utilized to improve patient safety and reduce medical errors since there are few mistakes made by teams when every member of a team is aware of each team member's responsibilities.

The findings of this study also revealed that feedback/guided reflection scored that highest from all the components following feedback on simulation. Students indicated that the simulation allowed them to analyse their own behaviour and actions. Song and Jeong(2015), conducted a phenomenological study examining the expereinces of nursing students of simulation- based education on hypoglycemia. These authors reported that students can gain experience in dealing with difficult cases through simulation by having an opportunity to reflect on their performance during post simulation debriefing.

8. Limitations of the study and future research

The study was limited to only critical care students within one organization. Further to this the sample size was small. The authors of this study propose that further research being conducted using a larger sample size possibly using space triangulation. In addition furture research could include a qualitative lens into regarding the phenemon under study especially with the Saudi Arabian context.

9. Conclusion

This study highlighted that the majority of students were able to care for trauma patients with hypovolemic shock. In addition most students have positive attitudes in both pre and post simulation practice in relation to the relevance of simulation. This could be attributed to the fact that all students included in the sample had previous experience within simulation during their critical care training.

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