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# Implementation of a Pictorial Asthma Action Plan (PAAP) in a Special Population

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**To cite this article:**

Yesenia Ochoa, Linda Summers, Stephanie Lynch, Conni DeBlieck, Karen Kopera-Frye. Implementation of a Pictorial Asthma Action Plan (PAAP) in a Special Population. *Clinical Medicine Research*. Vol. 10, No. 6, 2021, pp. 197-206. doi: 10.11648/j.cm.20211006.15

**Received:** July 15, 2021; **Accepted:** July 28, 2021; **Published:** December 2, 2021

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**Abstract:** Asthma action plans should be standard practice amongst asthmatics. According to a new report from the American Academy of Pediatrics, a lack of AAP implementations could lead to increased asthma-related hospitalizations. Many written AAPs are written at a seventh to ninth grade reading level leading to less control of asthma symptoms, potentially resulting in increased asthma-related hospitalizations. A pictorial-based curriculum and its benefits will be discussed, along with background information concerning the implementation of such intervention and desired goal to increase asthma control. Implementation of a Pictorial Asthma Action Plan and Curriculum to improve Asthma Control utilizing "Iggy and the Inhalers" by Booster Shot Media was conducted in a predominantly Spanish speaking and low income-based population. Iggy and the inhalers have published results of implementing their Pictorial Asthma Action Plan and Curriculum and improved outcomes documented on their site. The objective of implementation was to determine whether incorporating a pictorial based approach would improve control and knowledge amongst students with asthma in a special population. All identifiable participant information was kept private per site guidelines with exception to age and grade range and demographic information. Sixteen children participated in the implementation. Nine participants scored in the "well controlled" category while seven participants were "not controlled" according to ACT guidelines. Overall, five of seven (71%) improved their asthma control enough to bring them into the "controlled" state according to the ACT. Of those who improved, 16 (81%) improved with the Asthma Knowledge test. **Conclusion:** By utilizing appropriate educational methods, you can also increase participation and engagement, which results in increased compliance and control. Control and knowledge of asthma were improved because of this implementation project. Recommendation is that a PAAP curriculum should be promoted system wide.

**Keywords:** Asthma Action Plan and Education, Low-Literacy Asthma Plan Effectiveness, Picture Based Asthma Curriculum

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## 1. Introduction

Asthma is a chronic disorder Asthma is a chronic condition characterized by airway obstruction, which results in chest tightness, wheezing, coughing, and shortness of breath [3]. Students who must carry their inhalers to school or hold them in the health office for medication administration must have asthma action plans (AAPs) [1, 4, 5]. AAPs aims are to increase self-management of asthmatics, and they act as a guide for individuals to know and understand how to manage their asthma in different stages of the process [27, 29, 41, 45]. Despite this, many students are getting the AAPs faxed to the

schools directly by the provider, and they are not receiving the asthma education they need firsthand to understand how and when to refer to their AAP for treatment guidance. The lack of education hypothetically means less control of asthma symptoms, potentially resulting in increased Asthma-related hospitalizations [37, 40, 55, 70, 82].

Research shows that pictograms are an excellent educational gateway beyond disparities such as language and literacy barriers [10, 20, 23, 30, 33, 36, 38, 63, 64]. The evidence establishes Pictograms, as evidenced by research,

are an excellent educational tool for bridging disparities such as language and literacy barriers [57]. A pictorial-based curriculum and its benefits will be discussed, along with background information concerning the implemented intervention and desired objective to increase asthma control. The implemented project included implementing a Pictorial Asthma Action Plan and Curriculum to Increase Asthma Control among school-age children with asthma in a special population.

In 2013 over 13.8 million school days were missed by children in the United States [16]. There were 3,418 deaths in 2016 due to Asthma [2]. Written Asthma Action Plans and curriculums can be complicated for limited English speaking and low-literacy parents and children to understand. The aim of the quality improvement project was to implement a Pictorial Asthma Action Plan (PAAP) and curriculum to see if it improved understanding and compliance of Asthma care. The PAAP and curriculum has pictures, cartoons, and stickers that encourage interaction and engagement by patients.

In Arizona, 21% of youth and 15% of adults have asthma, with it being the sixth leading cause of death among children [1, 3, 79]. One of every forty deaths among children ages 1-14 is caused by asthma [1]. In Arizona, it is essential to note that Black children are twice as likely to have asthma than white children, 1 in 5 Hispanics cannot afford the asthma medications, Black and Hispanic children visit the emergency departments for asthma more than white children, and families that make \$75,000 or less are more likely to have asthma than those with higher incomes [1, 18, 79]. Of those children with Asthma in AZ, around 51 % of parents stated they had never been given an AAP or had received education on managing their child's Asthma [1, 69]. Asthma is not only a local or state issue but a national issue as well [4, 5, 16, 17, 47, 48, 49, 50, 59]. In 2013 Asthma accounted for over 13.8 million absent days amongst school-age children, which is an increase from 10.4 million absent days in 2008 [5, 6, 7, 8, 9, 16]. Asthma remains the main reason children under age 15 are hospitalized [5, 16]. The United States healthcare costs equate to 50.3 billion dollars a year total and Mortality cost per year is 29 billion [51, 60]. Nationally, missed school days account for 3 billion dollars of the total annual cost [2, 7]. In contrast to Arizona, the indirect cost of missed school and work is approximately 6 billion [1].

### **1.1. Significance of a Pictorial Asthma Action Plan**

A pictorial asthma action plan is known to help increase asthma control and decrease symptoms in correlation to the validated Asthma Control Test (ACT) [49, 46]. Another benefit of incorporating a pictorial asthma action plan in compliance with the asthma regimen and treatment [20]. Multiple studies have tested out pictographs in educating patients with literacy and language barriers, and they have all concluded that pictorial education increases understanding [23, 31, 32, 62].

A pictorial asthma action plan can transcend the language and literacy barriers that exist [36, 66, 73, 84]. Pictograms have been evaluated for effectiveness among people from

several different language and literacy levels [66, 84]. Pictograms can effectively increase the existent gap between providers and patients in the level of understanding educational materials and were shown to be understood by all despite language [36, 73].

The implementation of a Pictorial Asthma Action Plan PAAP has resulted in increased compliance. AAPs have shown an increase in control of up to 93% [47]. The studies have shown a correlation between a PAAPs and an increase in adherence, as well as a decrease in hospital admissions [49, 70, 72]. Arizona currently does not have a specific PAAP, and not all schools have a PAAP incorporated into practice. Not having an AAP has resulted in a 39% compliance rate [84]. Utilizing all levels of evidence gives strength to implementing a PAAP to increase asthma control. The goal was to implement an Evidence-Based model that has shown improvement in asthma control and reduces the number of acute care visits [58, 85]. In addition, studies show that pictorial asthma action plans can and have been correlated with increased understanding despite language and cultural barriers [20, 33, 48, 50, 61].

An intense educational intervention such as giving families a written asthma action plan (WAAP) or pictorial asthma action plan (PAAP), along with education on self-management and follow-up visits, has shown improvement in outcome measures [34, 49, 35, 52, 53, 68]. The intended tool to be implemented is the "Iggy and the Inhalers" Asthma Action Plan and Curriculum [78].

### **1.2. Purpose**

This project aimed to implement the PAAP and curriculum to increase control and self-management of asthma among children in an underserved population [11, 20, 31, 56, 69]. Asthma Action Plans vary depending on the provider, but several point out the green, yellow and red zones of asthma and what measures the participant should take in terms of care for each zone [24, 30, 58, 65, 86]. The "Iggy and the Inhalers" curriculum has been implemented and studied in various ways, including in-school studies, camp studies, and hospital studies [13, 42, 78]. In each study, evidence showed increased knowledge of the asthma topic [42]. The aim of implementing this curriculum into practice is to show that control and knowledge can improve by utilizing a pictorial-based asthma action plan.

## **2. Methods**

### **2.1. Project Implementation Design and Sample**

The "Iggy and the Inhalers" PAAP and curriculum implementation site was a charter school located in a surrounding area with most of the population being Hispanic or Latinos and more than 35% of the target population lives beneath the poverty line levels [79]. Recruitment took place through the mass distribution of brochures with consents to all families with the Administration's help. The inclusion criteria were that the participant has asthma.

This project's author suggests that a properly written AAP in both Spanish and English with illustrations will help patients and parents understand the critical nature of controller medications and prompt response when patients enter the AAP's yellow or red zones, thereby reducing absenteeism, sick days, and hospital admissions [7, 12, 16, 18, 21, 22, 25]. Implementing a picture-based AAP should increase control and understanding of Asthma self-management amongst children located in an underserved population. The implementation site chosen is Vista College Preparatory School, a charter school in Phoenix with known and unknown asthmatics. Vista College and did not have an Asthma curriculum or education measures related to asthma in place. The measure would be the level of understanding and control as evaluation with the Asthma Control Test (ACT) [46]. The ACT will be administered before introducing the available video resources and during the final virtual session.

The PAAP designed and set forth by Booster Shot Media, Inc in 2015 would be perfect for the location and target population in the charter school. The PAAP and curriculum implementation may improve student numbers. Uniting with chosen schools in this low income, low literacy, majority Hispanic region in Phoenix may increase revenue and marketing of the School location and education offered. Overall, the strengths regarding a PAAP and curriculum outweigh the challenges and threats.

## 2.2. Pre-Work

Booster Shot Media, Inc mailed curriculum materials to include comic books, health office posters, trading cards, inhaler labels, and sticker sheets. Booster Shot Media was able to get all cartoons in English and Spanish for participants.

The inclusion criteria for participants were as follows: (1) they must be between the ages of 5 and 18, (2) they must have a known personal or family history of asthma, (3) they must currently have an albuterol prescription, (4) they must be interested in participating, (5) they must have signed parental consent, (6) child must have verbalized assent, and (7) they must not have a cognitive impairment that would preclude them from participating in the implementation project. Exclusion criteria for participants were as follows: (1) parent or guardian did not allow participation (2) participant did not have a known family history of asthma, (3) participant not currently on an albuterol prescription, (4) participant does not give assent for participation, (5) participant is unable to developmentally participate in the implementation.

Brochures and informed consents were sent home with all enrolled children by the Administration. The flyer had a brief introduction to implementation and PAAP and curriculum materials. Families then had the opportunity to read consent and fill out needed contact information for Principal Investigator (PI) to contact, obtain assent, and set up zoom meetings.

## 2.3. Project Intervention

A variety of picture-based asthma action plans were researched and evaluated for inclusion [43]. "Iggy and the Inhalers" by Booster Shot Media, Inc. (BSM) had published promising results of implementing their Pictorial Asthma Action Plan and Curriculum and improved outcomes [13]. BSM, Inc permitted using their AAP and Curriculum in a predominantly Spanish Speaking population to see if incorporating a pictorial-based AAP would improve control. BSM, Inc provided supplies at no cost to PI in exchange for any unidentifiable results of implementation. Administration at the site agreed to the implementation project and terms so long as we ensured participant identifiers that would compromise identity would not be used. Only the Administration had identifiable information to distribute supplies and get PI and participant and guardian in contact.

"Iggy and the Inhalers" is a Picture Based Asthma Curriculum that includes the AAP and an Asthma Knowledge Test. The chosen curriculum demonstrated a significant improvement in asthma self-management, increased interest, and was recognized by the Daily Journal [35, 42, 45, 57].

"Iggy and the Inhalers" curriculum that was provided to each participant included: A Comic Book containing activity sheets and a PAAP that the patients could fill out with their parents following their medication prescription. A sticker sheet with all comic characters aimed at teaching participants to recognize triggers/medications. The curriculum included two inhaler labels (one for the controller and one for the bronchodilator) (Figure 1). Trading Cards were given to all participants as an interactive way of learning the characters formulated in the comic to include the "triggers," "bronchodilator," "rescue," and "controller." Parents and participants were given the link to five educational videos integrated with Google Classroom in English and Spanish. The ACT/Asthma Knowledge Test was verbally completed by PI with participant and parent before distributing materials and after the implementation [46, 78].

## 2.4. Teaching Framework/Implementation Components: Social Cognitive Theory

Through Bandura's Social Cognitive Theory, the project aims were to encourage change without causing a conflict in the participants' values or beliefs [69]. Cognitive Theory looks for and identifies social factors that affect learning, which in this project include English as a second language and low literacy [21]. The goal of implementing a PAAP and curriculum was to increase asthma awareness, understanding, and control [14, 19]. The primary intervention was to educate and teach directed at participants with asthma, with an emphasis on self-efficacy and its relationship to outcome expectations [21, 67].

Taking low literacy and English as a second language into consideration, a PAAP with cartoon education, interactive stickers, and trading cards is a great way to teach students how to control and manage their asthma [28, 36, 43, 71, 72, 80]. The material has minimal medical jargon and has a

transparent green, yellow and red zone in the PAAP, explaining what is to be done in each zone as far as care with pictures. If the implementation is successful, the parent and participant will self-perceive that their preventative medications for asthma will help [15, 16, 17, 25, 29, 34, 49, 52, 53, 76]. This self-perception should improve self-care and management through education using the chosen Pictorial Care Action Plan and curriculum [11, 31, 32, 56, 69]. If the patient knows what asthma is, they will understand the benefits of change and will gain self-efficacy, which will, in turn, lead them to have outcome expectations [49, 52, 53]. By becoming a facilitator in their care, the participant and family become self-efficient because they learn to manage their health, making it the best choice in implementing the proposed PAAP and curriculum [11, 24, 31, 32, 39, 56, 69].

### 2.5. Procedure

COVID 19 Implications and Considerations:

Due to COVID-19 and a higher-risk population, the project transitioned from an in-person implementation to a virtual one with Google Classroom and Zoom Meetings [83]. Due to the pandemic, the project lead adjusted education delivery to account for obstacles faced with in-person learning. Virtual learning is an effective and accepted method of delivering education while promoting self-isolation and decreasing the risk of transmission of COVID 19 in high-risk populations [44].

### 2.6. Mass Distribution and Recruitment

The Administration sent flyers and consents to all students on campus with a 1-week deadline for returning signed participation consents. 54 consents were obtained. Twenty-five persons accepted to take part, while twenty-nine rejected. Calls were made to guardians of the 25 who agreed to ensure inclusion criteria were met. Of the 25 participants, nine students were ineligible due to the child not having asthma or a history of Asthma treatment. Three participants spoke only Spanish and wanted a curriculum in Spanish, while thirteen of the guardians preferred their child receive materials in English. Of the thirteen, seven parents requested a Spanish comic book to follow along with their child. Participant assent was obtained during the initial call to ensure the desire to participate. Upon criteria confirmation, individual gallon-sized baggies containing the asthma curriculum in the language requested and additional components were delivered along with a printed paper with instructions Google classroom in English and Spanish. Poster boards were set up in the health office with sticker sheets. Each time the student came into the health office for premedication, the staff would give them a curriculum character sticker for participating.

### 2.7. Baseline Virtual Visit

Virtual call implemented with provided "Zoom" room. The Asthma Control Test (ACT) and Asthma Knowledge Test (AKT) were given to participants and guardians. Students were then taken on a virtual tour of all curriculum components provided and a virtual tour of the "Google

Classroom." To motivate participants, goals were established for them to complete components and ensure compliance at the health office in order to earn participation stickers. A review of the included PAAP was conducted by the provider, along with instructions on how to complete it with the guardian. All participants were informed of a follow-up appointment set about one month after the initial session.

### 2.8. Follow-Up Visit

ACT and AKT were gathered verbally from participants and guardians throughout the follow-up period. Participants were polled on the materials' ease of use and their general impressions of the program Responses were recorded to reinforce the theory being applied, and the participants were praised for their progress. Participants and guardians were notified that they would have continued access to videos so that they could watch any of them as reinforcement.

### 2.9. Measures

The Asthma Control Test (ACT) implementation results are measured pre and post results and asthma knowledge test pre and post results. The tool to evaluate the improved control is the Asthma Control Test (ACT) (Asthma Control Test™, 2002). The Asthma Control Test is a validated tool that is implemented globally to assess the management of Asthma [46, 54, 77, 81]. Before beginning an implementation project, the Asthma Control Test should be completed. The Asthma Control Test can be repeated throughout a project to assess the perceived asthma control's continuing progress. An asthma control test is an objective tool that helps clinicians evaluate and analyze subjective data from the ACT. The ACT scores range from 0-27 for ages 4-11 and require both parent and participant responses.

BSM, Inc. implemented "The Asthma Knowledge Test" during their study as well as in this implementation [42]. It is important to note that the ACT is validated for use with children ages 4-11 and >12 and is version and question specific [46]. Although the Asthma Knowledge Test has not been validated, it was included in the initial research for "Iggy and the Inhalers." It comprises six questions at two points each, for a maximum score of twelve points.

## 3. Results

During the project period, 16 participants with asthma received a PAAP, Comic book, trading cards, inhaler labels, and access to online educational videos in Spanish and English. Nine participants scored as "well controlled," and seven participants were "not controlled." Overall, five of seven (71%) improved their asthma control enough to bring them into the "controlled" state according to the ACT (Figure 1). To expand on overall results, we can conclude that according to the Asthma Control Test (ACT), five patients that were "not well controlled" moved into the "well controlled" category. Six participants kept the same ACT score, with three having the highest possible score. If we look

only at patients who changed their score, whether in controlled or uncontrolled, nine of ten improved. Of those who improved on the Asthma Control Test (n=9, improved score; n=1, lower score), we can conclude that 90% improved. With the Asthma Knowledge test, a total of sixteen (81%) improved their knowledge based on the pre and post results (Figure 2).

Overall, implementing a PAAP and curriculum in an underserved population is favorable in respect to desired outcomes and aims to improve asthma control and knowledge.

A relevant cost-benefit analysis question for the school includes: "What is the added cost for a school to adopt and implement the "Iggy and the Inhalers" PAAP and curriculum measured in dollars. (e.g., on-site asthma education and walk-through of curriculum, additional time to pay staff to attend training on the asthma curriculum components and PAAP use. Potential time away from the classroom to watch provided videos if incorporated as a school-based asthma curriculum), compared to the benefits to the school in reduced student missed days related to asthma?" Additional costs anticipated include training and onboarding staff in PAAP and asthma management of students. The implementation site has increased funding and allowed a district nurse to manage children with asthma and other chronic diseases.

Additionally, the increased number of potential admissions of students with asthma in a school with an asthma curriculum instead of one without could generate new revenue and advertisement perks [55, 74]. By looking at the Asthma Control Test results and improvement in overall control of participants, we can argue that the benefits outweigh the risks in the utilization of a PAAP and Curriculum in an underserved population.

## 4. Discussion

### 4.1. Limitations

The small number of students enrolled with asthma and not knowing if all asthmatics participated in the implementation of the project, is a limitation. Equally limiting, PAAP results were self-reported, and there is no way to know definitively if the participants followed the PAAP or how closely they followed it [26, 44, 46, 47, 54, 55, 62]. Through the Asthma Knowledge test, it is evident that they did view some of the material and the PAAP, which potentially helped participants understand when to use their medications based on symptoms and trouble zones. Suppose the patient was unable to recall symptoms during the period of the quality improvement project. Potential inaccuracy in initial scores could also underestimate the severity of patient control, even with the use of a validated ACT [48, 49]. This underreporting could potentially affect the intervention on asthma control, and results may also be underreporting. Additionally, this was the first "health-based education" implemented at the school; parents and administrators were interested in only one follow-up appointment. Although

results were significant in improvement, the author believes that in-person learning and one-on-one time with the participants that did not improve would likely improve.

### 4.2. Practice Implications

This evidence-based implementation project brought several variables in comparison to national recommendations and standards. Although asthma curriculums are encouraged according to national aims in school settings, one variable includes charter and private schools. Charter and private schools do not have the same rules and regulations as public schools. Despite the 2007 NHBLI EPR3 recommending a written or pictorial AAP as a standard of care, many school settings may not have this available or mandated due to lack of resources and healthcare personnel. Initially, the implementation site did not have a nurse on-site, but through the year, with the rising number of students with chronic diseases requiring management, the site now has a district nurse and a health assistant at every site. In the future, with curriculum implementation and with more time, it would be interesting to see how much improvement would increase with an additional number of follow-up visits and incorporation of teach-back of PAAP by participants. Continuation of PAAP and curriculum is encouraged in the implementation site as the results are ultimately favorable.

## 5. Conclusion

A disparity in the lack of knowledge regarding chronic management in schools still exists [1, 2, 60, 75, 85]. Administrators at the site of implementation have the heart to reach children and ensure safety. Healthcare management and increased compliance in schools can come through implementations of curriculums such as "Iggy and the Inhalers." Ineffective control of asthma can increase missed school days and increase cost, which can be detrimental to the asthmatic. Implementation of a picture-based Asthma Action Plan (PAAP) and curriculum in a special population.

## 6. Recommendations

Improvement in asthma control and knowledge was seen as well as sustainability in the implementation at a site that had no prior asthma education implementation. There was an increase in self-management and control of asthma utilizing the "Iggy and the Inhalers" PAAP and a curriculum. Using effective educational methods promoted participation and engagement, which resulted in increased compliance and control. Asthma control and knowledge were enhanced during this implementation project. All of this promotes the idea that increasing self-management and control of asthma utilizing PAAPs and a curriculum will improve outcomes. Using effective educational methods, participation and engagement was seen which resulted in increased compliance and control. Asthma control and knowledge were enhanced during this implementation project, and implementation of the curriculum should be promoted system wide.

### Conflict of Interest Statement

The authors declare that they have no competing interests.

### Acknowledgements

Thank you to all family, participants, and administrative staff who made this possible. Thank you to Booster Shot Media, Inc

for providing the materials free of cost to all participants, including school posters and stickers for the health office to hand out to participants engaged in their asthma treatment. Thank you to the NMSU chair and faculty dedicated to the implementation and guidance of students in the continued efforts to bring Evidence-Based Projects into practice.

### Appendix

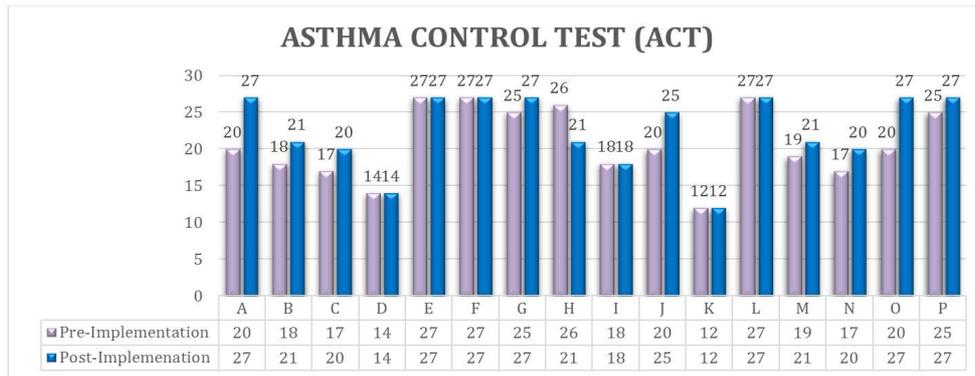
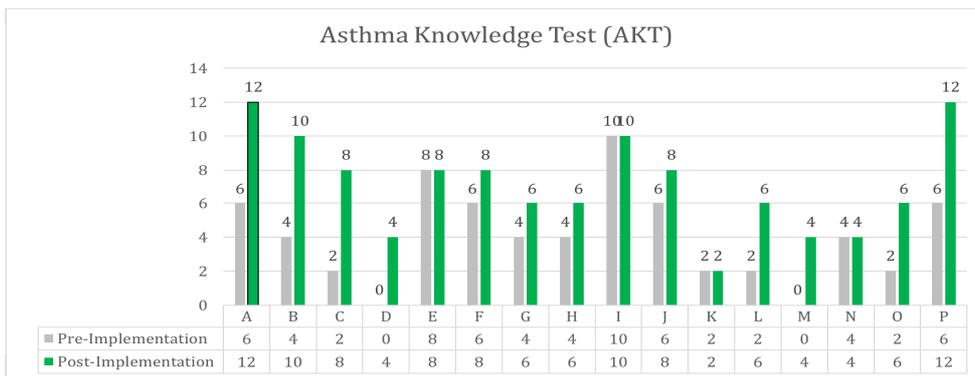


Figure 1. Asthma Control Test Pre and Post Implementation.



Booster Shot Media Curriculum

Figure 2. Asthma Knowledge Test Results Pre and Post.



Figure 3. Iggy and the Inhalers Curriculum, [77].

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