



COST COMPONENTS ILLNESS ANALYSIS OF TYPE 2 DIABETES MELLITUS BY CLASS OF CARE

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ABSTRACT

The cost of treating DM disease is one of the portraits of chronic diseases that require significant medical expenses. The burden of treatment costs for DM patients will be more expensive if complications occur because it has an impact on the need for drugs and therapies that last a lifetime. This study aimed to identify the cost components of inpatient treatment of Type II DM patients with Peripheral Circulation complication according to treatment class at PKU Muhammadiyah Bantul Hospital. Qualitative research design with case study design. The sampling technique was carried out by purposive sampling and the data collected were 50 patients. The main data sources were obtained from Medical Records and Financial Administration data from Medical Records, Pusjamkes, and Finance units. The cost components analyzed included consultation fees, action fees, treatment fees, support and accommodation with comparisons between inpatient classes. This study showed that the largest cost treatment component of DM patients was Very Important Person (VIP) patients with an average doctor's consultation fee per patient (Rp.660.500), accommodation costs (Rp2.006.000), and action costs (Rp.4.415.000). Meanwhile, the largest average supporting costs (Rp.3.300.844) and treatment (Rp527.695) were found in class II patients. This indicates that the tendency of the supporting cost components is very dominant because it is influenced by the specifications of the services needed such as laboratory examination costs, and radiology costs which are influenced by blood transfusion factors, hemoglobin and albumin, and the types of antibiotics needed during treatment. Hospital managers can carry out quality control and especially control the costs of drugs and medical consumables by complying with the provisions of patient treatment and care.

Keywords: cost; diabetes mellitus; complications

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INTRODUCTION

Apart from being the cause of 6.7 million deaths in the world, diabetes is also the cause of at least USD 966 billion in health expenditure or 9% of total expenditure for adults, (IDF, 2021). Type 2 diabetes mellitus is a common disease with prevalence increasing every year. Research (Riamah, 2022) states that in Type 2 DM patients the incidence of complications is greater, namely 85% compared to Type 1 DM which is 15%. Peripheral Arterial Disease (PAD) in Type 2 diabetes mellitus (T2DM) patients has diverse clinical characteristics and various consequences. PAD is one of the main macrovascular complications of T2DM (Rhee and Kim, 2015). Direct costs are costs that are easy to trace directly to the product because there is an object to be financed, while indirect costs are not easy to obtain directly when tracing the product because indirect costs are not only caused by something being financed, (Nursanty *et al.*, 2022). Direct costs for inpatients are costs that function directly in treatment and care activities in hospitals which include Very Important Person (VIP) class, First Class I,

Second Class, and Third Class of treatment rooms with cost components including inpatient costs, diagnostic support examination costs, costs for medicines and consumable treatment equipment, as well as administration costs, (Darmawan, 2021). Based on research data (Megawati, Suwantara and Suryani, 2020) the highest treatment costs for DM patients are in VIP B class rooms at Rp. 12,491,204 for 6 days of stay with details of the highest costs being the treatment costs, the average cost of which is Rp. 5,365,513 (54%).

The cost burden on T2DM patients can increase, especially complications requiring higher health costs compared to those without complications and not diabetes mellitus patients, (Pramasari, Endarti and Widayanti, 2022). Research (Baroroh, Solikah and Urfiyya, 2016) at PKU Muhammadiyah Bantul General Hospital shows that inpatients with type 2 DM with complications produce greater therapy costs which are influenced by the costs of hospitalization, supporting measures, medical equipment and laboratories compared to inpatients with type 2 DM without complications, outpatient type 2 DM patients with complications and without complications. Based on research data (Ratnasari, Andayani and Endarti, 2019) patients with Type 2 DM with macrovascular complications generate the highest direct medical costs. High rates have a significant impact on hospital progress. So it is important to set real rates that are in line with INA-CBG's rates to prevent large losses for hospitals and ensure sustainable financial balance, (Monica *et al.*, 2021).

PKU Muhammadiyah Bantul Hospital is a hospital that has collaborated with Social Health Insurance Administration Body (Dinas Kesehatan DIY, 2017). The results of a preliminary study at PKU Muhammadiyah Bantul General Hospital showed that payments for inpatients with Diabetes Mellitus Type 2 Peripheral Circulation Complications used Social Health Insurance Administration Body more than the general population. Several studies have analyzed the medical costs of type 2 DM, but so far no studies have analyzed the components of medical costs according to treatment class. This study aimed to identify the cost components of inpatient treatment of Type 2 DM patients with Peripheral Circulation complication according to treatment class at PKU Muhammadiyah Bantul General Hospital.

METHOD

This research is a qualitative study with a retrospective case study research design through secondary data namely medical record data and administrative data on costs of inpatients with T2DM Peripheral Circulation Complications in the medical records section, health center unit and finance section. The data collected is data that includes patient history and details of patient costs at PKU Muhammadiyah Bantul General Hospital in January 2023 to May 2023. The sample used was the entire target population, namely medical record data T2DM patients with Peripheral Circulation Complications in hospitalization along with their financial records that met the inclusion criteria including Social Health Insurance Administration Body T2DM inpatients with Peripheral Circulatory Complications with a diagnosis code (E11.5) recorded in the Puskesmas section along with their medical record data in the medical record data section, with inpatient treatment completed (not currently being treated). Meanwhile, the exclusion criteria are patients leaving the hospital who have been forced to go home (unfinished treatment), have been referred, or have died, as well as incomplete medical record data. To support and complete the results of the cost data analysis, researchers carried out probing through in-depth interviews with several informants, namely the Doctor in Charge of the Patient (DPJP), the financial department and the health center regarding details of the cost components for T2DM patients with Peripheral Circulation Complications from the patient care class specifications.

RESULTS

PKU Muhammadiyah Bantul General Hospital in the Ministry of Health's SIRS (IT Ditjen Yankes, 2022) states that it is a class C general hospital owned by an Islamic organization whose main director is currently Dr. Nurcholid Umam Kurniawan., Sp.A., M.Sc. with a complete accreditation level and includes a bed capacity of 170 beds, (Alkes, 2023). In 2023, there will be 84 cases of Type 2 DM with Peripheral Circulation Complications, from January 1 to May 30, which will be treated in various units including the Al Araf, Al Kahfi, Al Kautsar, Al Insan, Al Fath, Al Ashr, An-Nisa, Non-Isolation ICU, and Emergency Room. Based on the results of the analysis carried out, it is known that the general description of Type 2 DM patients with Peripheral Circulation Complications is that most of them are aged 15-65 years (78%), male (52%), high school education level (52%), working (96%), and married status (90%). Details can be seen in the table below:

Tabel 1.
General Description of Patients with T2DM with Peripheral Circulation Complications

Variable Name	f	%
Age		
15-65 years old	39	78
>65 years old	11	22
Gender		
Male	26	52
Female	24	48
Education		
Not in School	4	8
Elementary School	12	24
Junior High School	4	8
High School	26	52
Bachelor	4	8
Jobs		
Work	48	96
Not Working	2	4
Status		
Marry	45	90
Unmarried	5	10

Analysis of Patient Financing Based on Cost Components

Doctor Consultation/Visit Cost Analysis

Based on the research, the results of the cost data for Doctor's Consultation/Visit for patients T2DM with Peripheral Circulation Complications can be seen in the following table.

Tabel 2.
Analysis of Doctor Consultation/Visit Costs for Patients T2DM with Complications of Peripheral Circulation

Class	Total Cost	Average	Percentage
VIP	Rp.660.500	Rp.660.500	3%
I	Rp.3.624.500	Rp.402.722	19%
II	Rp.5.127.000	Rp.427.250	26%
III	Rp.10.031.000	Rp.358.250	52%

Table 2. above, it shows that the largest doctor's consultation/visit fee is Rp. 660,500 with an average of Rp. 660,500 (3%), while the highest consultation/visit fees are in class III amounting to Rp. 10,031,000 and an average of Rp. 358,250 (52%). From the results of the

interview, the informant explained that the difference in doctor's consultation/visit fees is adjusted based on the tariff class. The informant also explained that the cost of a doctor's visit includes doctor services and hospital services, the calculation of which is adjusted to the tariff conditions, as stated by the following informant.

"For visits, the rates are adjusted according to class. Visit/Consul includes doctor services and hospital services. There is no provision for how many months so it adjusts if there is a tariff increase, it will increase." (Informant 3).

Accommodation Cost Analysis

Based on the research, the results of the cost data accommodation for patients T2DM with Peripheral Circulation Complications can be seen in the following table.

Tabel 3.
Analysis of Accommodation Costs for Patients T2DM with Peripheral Circulation Complication

Class	Total Cost	Average	Percentage
VIP	Rp2.006.000	Rp2.006.000	7%
I	Rp6.289.000	Rp698.778	21%
II	Rp8.457.840	Rp704.820	28%
III	Rp13.570.000	Rp484.643	45%

Table 3. above, it shows that the largest accommodation costs are for the VIP class at IDR. 2,006,000 with an average of Rp. 2,006,000 (7%), while the highest costs are in class III amounting to Rp. 13,570,000 and an average of Rp. 484,643 (45%). From the results of interviews with informants, it was stated that differences in accommodation costs were defined as accommodation costs based on class which included the costs of patient meals, laundry, electricity and room rental which were adjusted based on the facilities available in the patient's room. This is as stated by the following informant.

"What differentiates between accommodation classes is the facilities in the room. Class accommodation costs include the costs of patient meals, laundry and room rental. The costs of treatment is probably room accommodation." (Informant 2)

Another informant added that *nutritional* costs are included in the accommodation cost component. This is as stated by the following informant.

"OK rental includes OK treatment rates, accommodation nutrition, supporting pharmacy." (Informant 3)

Support Cost Analysis

Based on the research, the results of supporting cost data for patients T2DM with Peripheral Circulation Complications can be seen in the following table.

Tabel 4.
Analysis of Support Costs for Patients with T2DM with Peripheral Circulation Complications

Class	Total Cost	Average	Percentage
VIP	Rp2.480.850	Rp2.480.850	2%
I	Rp17.400.925	Rp1.933.436	12%
II	Rp39.970.124	Rp3.330.844	28%
III	Rp83.921.597	Rp2.997.200	58%

Table 4. above, it shows that the largest supporting costs are in class II with a total cost of Rp. 39,970,124 with an average of Rp. 3,330,844 (28%), while the highest costs are in class III with a total cost of Rp. 83,921,597 and an average of Rp. 2,997,200 (58%). The results of interviews with informants explained that medical support costs were laboratory, radiology and pharmacy examination costs. Another informant added that supporting costs consisted of laboratory fees, pharmacy fees and radiology fees. Meanwhile, pharmaceutical costs include medicines, medical devices and consumables used in addition to inpatient care as well as during surgery. This is as stated by the following informant.

"What is meant by medical support costs includes laboratory, radiology and pharmacy examination costs. "For supporting costs, laboratory, radiology, because our standard is for inpatients, usually for patients over 40 years old we also do X-rays." (Informant 2)

"The OK rent includes the OK treatment rates, accommodation nutrition, supporting pharmacy. Yes, medical devices are also pharmaceuticals. "The component of medical equipment is a combination of medicine and medical equipment." (Informant 3)

"In the pharmacy, there are also anesthetics for operations, medical equipment also costs money. "That's where the medical equipment is, then the BHP goes there, all the medical equipment goes to the pharmacy." (Informant 1)

Informants also explained that pharmaceutical costs are influenced by blood transfusion factors, hemoglobin and *albumin*, as well as the type of antibiotic. The type of antibiotic given to the patient can affect hospital costs, where the type of antibiotic given to the patient in certain cases has a more expensive price. This is as stated by the following informant.

"That's Pharmacy, because it is influenced by blood transfusion factors, usually for patients who lack hemoglobin, then albumin for patients who need albumin, and types of antibiotics." (Informant 1)

"In some cases where the infection is very bad, for example the doctor wants to give a good antibiotic, which is very good, but the price is more expensive than the antibiotics that are usually used."

The informant stated that regarding high pharmaceutical costs, hospitals control this by using the BPJS E-catalog guide to select medicines that are really needed and prioritized for patients, giving medicines based on the duration of drug administration, where when the medicine given by the patient is already in its term. At a certain of time the patient's condition improves, then the medication given is changed to a more generic or cheaper drug, or by referring the patient to another hospital if his condition no longer allows him to be treated at PKU Muhammadiyah Bantul General Hospital. This condition was explained by the informant when the doctor who was treating the patient was beyond his capacity and needed medicines that were not available at the hospital or was sent home if the patient was able to do so and was declared fit to go home and then the patient made a referral to the polyclinic. This is as stated by the following informant.

"From the pharmacy, we have minimized the medicines that are included in the BPJS E-catalogue, so we don't give medicines that we don't think are important on the one hand, then from the generic pharmacy we use all generics. Then, at the pharmacy, we control the duration of administration so there is a warning sign. "In the pharmacy, there are also anesthetics for surgical procedures, medical equipment also costs money too." (Informant 1)

"...because the culture explained that the antibiotics, we had given were all resistant so none of them worked, so the antibiotics had to be better I think and we didn't have any, well this was yesterday so let's just refer to it, it's up to us where we can get it later, OK? This patient's condition when he was referred for sepsis, means that the infection has gotten worse, meaning that the wound is getting wider, the smell is still distinctive, and the patient's condition is not completely improving, well maybe sometimes the hospital asks for an indication of the reason for the referral, this is just an example of a case because it's just now. Yesterday, sometimes if the patient was fit to go home, we would send him home but then we would refer him through a clinic like that. So, it will be easier." (Informant 1)

Action Cost Analysis

Based on the research, the results of action cost data for patients T2DM with Peripheral Circulation Complications can be seen in the following table.

Tabel 5.
Analysis of Action Costs for Patients with T2DM with Peripheral Circulation Complications

Class	Total Cost	Average	Percentage
VIP	Rp4.415.500	Rp4.415.500	3%
I	Rp30.153.500	Rp3.350.389	20%
II	Rp36.541.000	Rp3.045.083	24%
III	Rp79.593.525	Rp2.842.626	53%

Table 5, it shows that the largest cost of action is in the VIP class with a total cost of Rp. 4,415,500 with an average of Rp. 4,415,500 (3%), while the highest costs are in class 3 with a total cost of Rp. 79,593,525 and an average of Rp. 2,842,626 (53%). The results of interviews with informants explained that the costs of the procedure included the costs of surgery, OK rental, hemodialysis, anesthesia and patient injections. This is as stated by the following informant.

"OK rental includes OK action rates, accommodation nutrition, supporting pharmacy." (Informant 3)

"Hemodialysis is a different procedure, surgery is involved. But that will later support the X-ray laboratory for HD. Anesthesia is if there is a surgical procedure, if anesthesia is included in the components of the surgery, it goes into the cost of the procedure. For injections, the nursing action is usually the action of the injection, not the pharmacy, the nursing service." (Informant 2)

Maintenance Cost Analysis

Based on the research, the results of maintenance cost data for patients T2DM with Peripheral Circulation Complications can be seen in the following table.

Tabel 6. Analysis of Maintenance Cost for Patients T2DM with Peripheral Circulation Complications

Class	Total Cost	Average	Percentage
VIP	Rp402.000	Rp402.000	2%
I	Rp2.279.500	Rp253.278	12%
II	Rp6.332.340	Rp527.695	33%
III	Rp10.154.000	Rp362.643	53%

Table 6, it shows that the largest maintenance costs are in class 2 with a total cost of Rp. 6.332,340 with an average of Rp. 527,695 (33%), while the highest costs are in class 3 with a total cost of Rp. 10,154,000 and an average of Rp. 362,643 (53%). From the results of interviews with informants, it was explained that the cost of treatment was influenced by the patient's actions and diagnosis. This is as stated by the following informant.

"So, the more complex the patient. This is type C, Type C is not expected to be a serious patient who has multiple diagnoses or who has a lot of procedures or therapies because the cost will definitely be higher." (informant 1)

DISCUSSION

The majority of T2DM inpatients with Peripheral Circulation Complications are aged between 15-65 years, which is in line with research at RSUD Karya Bakti Ujung Bandar Rantau Prapat in 2019 that the age most affected by Type II DM is between 57-65. The aging process that often occurs at the age of 55 years is the cause of less than optimal control of high blood glucose resulting in a decrease and insulin resistance, (Siagian *et al.*, 2021). Characteristics of inpatients with Type 2 DM Complications of Peripheral Circulation based on gender were male which is in line with the results of CANRISK specific material which explains that men have a greater chance of developing diabetes mellitus compared to women, (Yosmar, Almasdy and Rahma, 2018). Other characteristics show that the high school education level is more dominant. These results are in line with research conducted on non-parametric tests in Padang city communities that the risk factor with the greatest level of opportunity is high school education level or equivalent, (Yosmar, Almasdy and Rahma, 2018). In terms of job characteristics, the majority are already working, 48 people (96%). This is explained in other literature that physical activity has an influence on increasing insulin and reducing blood sugar levels. DM will arise when there is not enough insulin to convert glucose into energy, (Arimbi, Lita and Indra, 2020).

Then, for married status, the majority were married with 45 people (90%). In family-based research conducted in Brazil, it was found that only marital status was independently associated with the incidence of T2DM. Individuals who are married are less likely to develop diabetes than those who are divorced, even though their body weight has increased significantly. The study also explained that based on age and gender adjusted estimates, being married was associated with a 0.39 chance of developing diabetes and being single was associated with a 0.33 chance of developing diabetes. Based on the results of the analysis, the largest doctor's consultation/visit costs are in the VIP class. Consultation fees are one of the direct medical costs in patient care where the costs are calculated for each consultation or treatment service the patient receives at each visit, (Fitriyani, Andrajati and Trisna, 2021). From the results of the interview, it is clear that the differences in doctor's consultation/visit fees are adjusted based on the tariff class and tariff conditions, which include components of the costs of doctor services and hospital services. Consultation fees for doctor services at night or during holidays are higher in value than regular consultation fees, compensation for doctor services can also change according to existing conditions, so doctors need to consider the patient's financial capabilities which are less than inadequate until they are partially or completely exempted from payment, (Majelis Kehormatan Etik Kedokteran Indonesia, 2004).

Based on the results of the analysis, the largest accommodation costs are in VIP class with a total cost of Rp. 2,006,000 with an average of Rp. 2,006,000 (7%), while the highest costs are in class 3 with a total cost of Rp. 13,570,000 and an average of Rp. 484,643 (45%). Based on the results of the interview, one of the accommodation costs at PKU Muhammadiyah Bantul General Hospital is nutritional costs and patient room costs. Based on the results of

observations made on billing for inpatients with DM Type II Complications of Peripheral Circulation, it shows that the difference in costs in the accommodation cost component is one of the class types in BPJS membership. This is inversely proportional to research (Dyah, Wahyono and Andayani, 2010) that the class of care and type of financing do not have a statistically significant relationship to the direct medical costs of Diabetes Mellitus patients. Meanwhile, according to (Erawati, Mustafa and Lazuardi, 2016) accommodation costs are one of the cost components whose size is influenced by complications or other comorbidities.

Based on the results of the analysis, the largest supporting costs are in class 2 with a total cost of Rp. 39,970,124 with an average of Rp. 3,330,844 (28%), while the highest costs are in class 3 with a total cost of Rp. 83,921,597 and an average of Rp. 2,997,200 (58%). From the results of the interview, supporting costs include pharmaceutical costs, laboratory costs and radiology costs. This is in line with research (Megawati, Suwantara and Suryani, 2020) which states that the costs of supporting DM inpatients include X-ray costs, laboratory costs, electrocardiogram costs.

The results of the interviews conducted explained that the pharmaceutical group includes medicines, medical devices and consumables which are used in addition to inpatient care as well as during surgery. Pharmaceutical costs are influenced by blood transfusion factors, hemoglobin and albumin, and the type of antibiotic. When a patient experiences a lack of blood, which usually occurs after surgery, where during surgery there are several cases that produce a lot of blood, so the patient needs a blood and albumin transfusion which is expensive and is often needed in cases of inpatients with Type II DM Complications of Peripheral Circulation. This is in line with (Megawati, Suwantara and Suryani, 2020) that pharmaceutical costs for DM inpatients include drug costs consisting of the costs of drugs and medical devices. The high cost of medicines in DM services. Inpatient complications can be caused by factors determining inefficiency which include length of stay (Long of Stay) from the standard of 7-10 days, use of patent medicines that are not in the E-catalog, and the presence of differences in surgeon standards regarding patient blood sugar values for debridement procedures, (Rahman, 2016).

From the informant's explanation during the interview, when a patient experiences a lack of blood, this usually occurs after surgery, where during surgery there are several cases where a lot of blood bleeds, so the patient needs a blood and albumin transfusion, which is expensive and is often needed in the case of inpatients. Type II DM Complications of Peripheral Circulation. Apart from that, the length of time that injection antibiotics are administered can be a factor in the cost component, (Rahman, 2016). In line with that (Pratiwi and Sukmawati, 2019) stated that drug costs and laboratory costs are the largest and most numerous components of direct costs and medical costs. Additional drug costs are the largest medical costs that are the average burden on inpatients with T2DM. According to (Negara, Octavia and Utami, 2021) the amount of total direct medical costs is determined by the amount of patient drug costs.

Based on the results of the analysis, the largest cost of action is in class VIP with a total cost of Rp. 4,415,500 with an average of Rp. 4,415,500 (3%), while the highest costs are in class 3 with a total cost of Rp. 79,593,525 and an average of Rp. 2,842,626 (53%). From the results of the interview, the costs of the procedure include the costs of surgery, OK rental, hemodialysis, anesthesia and patient injections. The action unit plays a role in the process of healing patient wounds quickly, especially in repaired leg ulcers which have the potential for amputation and death in the patient, (Rondonuwu, Mambo and Posangi, 2020).

In interviews, information was obtained that hemodialysis is an action that can cause high costs. Hemodialysis is a complex medical procedure that requires special equipment and a trained team. In hemodialysis procedures there is the use of hemodialysis machines, drugs and other materials which cause an increase in patient costs. This is in line with research (Baroroh, Solikah and Urfiyya, 2016) at PKU Muhammadiyah Bantul General Hospital that inpatients with type 2 DM complications generate greater therapy costs which are influenced by inpatient costs, supporting measures, medical equipment and laboratories compared to type 2 DM inpatients without complications, outpatient type 2 DM patients with complications and without complications.

Based on the results of the analysis, the largest maintenance costs are in class 2 with a total cost of Rp. 6. 332,340 with an average of Rp. 527,695 (33%), while the highest costs are in class 3 with a total cost of Rp. 10, 154,000 and an average of Rp. 362,643 (53%). Based on interviews conducted, the cost of treating Diabetes Mellitus Type II Complications of Peripheral Circulation can be influenced by the patient's actions and diagnosis factors, where the more diagnoses and complexity, the more the treatment costs. Apart from that, the components of patient care costs consist of moderate care costs, moderate care costs and heavy care costs. This is not in line with research (Megawati, Suwantara and Suryani, 2020) which states that the costs of treating DM inpatients include room costs, doctor visits, consultations, nursing costs and accommodation.

The researcher's limitation is in the process of grouping cost components, namely which parts are included in inspection costs, supporting costs, accommodation costs, and action costs. So, the determination of the cost components is assisted by medical record officers and supported by the results of interviews with research informants and another limitation is in obtaining information related to the comparison of real costs with the INA CBGs rates to be able to see variables regarding cost components such as doctor's consultation/visit costs, examination costs, supporting costs, accommodation costs, and action costs.

CONCLUSION

This study identified the cost components of inpatient treatment of Type 2 DM patients with Peripheral Circulation complication according to treatment class at PKU Muhammadiyah Bantul General Hospital. The research can be concluded that the largest doctor's consultation/visit fee is in VIP class. The largest accommodation costs are in VIP class, while the highest costs are in Third Class. The largest supporting costs are in Second Class, while the highest costs are in Third Class. The largest cost of action is in VIP Class, while the highest costs are in Third Class. The largest maintenance costs are in Second Class, while the highest costs are in Third Class. The largest component of treatment costs for T2DM Peripheral Circulation Complications at PKU Muhammadiyah Bantul General Hospital is supporting costs for Social Health Insurance Administration Body Third Class patients which include pharmacy costs, laboratory costs, and radiology costs which are influenced by blood transfusion factors, hemoglobin and albumin, as well as the type of antibiotic in costs pharmacy. The largest component of treatment costs for DM patients is VIP patients. This indicates a tendency for the supporting cost component to be very dominant because it is influenced by the specifications of the services required such as laboratory examination costs, and radiology costs which are influenced by blood transfusion factors, hemoglobin and albumin, as well as the type of antibiotics needed during treatment.

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