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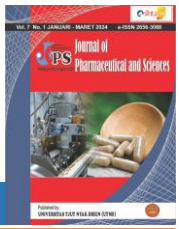

Evaluation of Antihypertensive Drug Use in BPJS Patient Prescriptions from Mataram City Hospital Dispensed at KF 134 Pejanggik Pharmacy and KF 458 Catur Warga Pharmacy Based on ATC/DDD and DU 90%

Evaluasi Penggunaan Obat Antihipertensi pada Resep Pasien BPJS RSUD Kota Mataram yang Ditebus di Apotek KF 134 Pejanggik dan KF 458 Catur Warga Berdasarkan ATC/DDD dan DU 90%

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Abstract

Background: Hypertension is a persistent condition of high blood pressure (systolic >140 mmHg or diastolic >90 mmHg). As a chronic disease requiring long-term treatment, the therapy for hypertensive patients needs to be evaluated regularly. **Objective:** This study aimed to determine the consumption profile of antihypertensive drugs using the ATC/DDD and DU 90% methods and to assess their compliance with the National Formulary (FORNAS). **Methods:** This research used a cross-sectional design with retrospective data collection. The samples were prescriptions for BPJS hypertension patients from Mataram City Hospital for the period of January-December 2024, redeemed at KF 134 Pejanggik Pharmacy and KF 458 Catur Warga Pharmacy. The data were analyzed using the Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) and Drug Utilization 90% (DU 90%) methods. **Results:** The results showed that the most consumed antihypertensive class was ARBs, specifically candesartan, with a value of 13,082.25 DDD/1000 PPD at KF 134 Pejanggik and 7,215.33 DDD/1000 PPD at KF 458 Catur Warga. The drugs included in the DU 90% segment were candesartan, ramipril, amlodipine, and bisoprolol at both pharmacies, with the addition of valsartan at KF 134 Pejanggik. Compliance with drug use guidelines for FORNAS was 92% at KF 134 Pejanggik Pharmacy and 90% at KF 458 Catur Warga Pharmacy. **Conclusion:** The use of antihypertensive drugs in both pharmacies is in accordance with FORNAS, with high compliance percentages, indicating rational drug prescribing practices.

Keywords: Antihypertensives, ATC/DDD, DU 90%, Candesartan, Pharmacies.

Abstrak

Latar Belakang: Hipertensi merupakan kondisi tekanan darah tinggi yang menetap (sistolik >140 mmHg atau diastolik >90 mmHg). Sebagai penyakit kronis yang memerlukan pengobatan jangka panjang, terapi pada pasien hipertensi perlu dilakukan evaluasi secara berkala. **Tujuan:** Penelitian ini bertujuan untuk mengetahui profil konsumsi obat antihipertensi dengan metode ATC/DDD dan DU 90% serta mengevaluasi kesesuaiannya dengan Formularium Nasional (FORNAS). **Metode:** Penelitian ini menggunakan desain cross-sectional dengan pengambilan data secara retrospektif. Sampel berupa resep pasien hipertensi BPJS dari RSUD Kota Mataram periode Januari-Desember 2024 yang ditebus di Apotek KF 134 Pejanggik dan Apotek KF 458 Catur Warga. Data dianalisis menggunakan metode Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) dan Drug Utilization 90% (DU 90%). **Hasil:** Hasil penelitian menunjukkan bahwa golongan antihipertensi yang paling banyak dikonsumsi adalah ARB, khususnya candesartan, dengan nilai 13.082,25 DDD/1000 KPRJ di Apotek KF 134 Pejanggik dan 7.215,33 DDD/1000

KPRJ di Apotek KF 458 Catur Warga. Obat-obat yang masuk dalam segmen DU 90% adalah candesartan, ramipril, amlodipine, dan bisoprolol pada kedua apotek, dengan tambahan valsartan di Apotek KF 134 Pejanggik. Kesesuaian penggunaan obat dengan FORNAS adalah 92% di Apotek KF 134 Pejanggik dan 90% di Apotek KF 458 Catur Warga. **Kesimpulan:** Penggunaan obat antihipertensi di kedua apotek telah sesuai dengan FORNAS, dengan persentase kepatuhan yang tinggi, yang mengindikasikan praktik peresepan obat yang rasional.

Keywords*: *Antihipertensi, ATC/DDD, DU 90%, Candesartan, Apotek.

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Introduction

Hypertension is an increase in systolic blood pressure above normal levels, namely more than 140 mmHg, and diastolic blood pressure more than 90 mmHg [1]. According to the World Health Organization (WHO), in 2015, one in five adults worldwide had high blood pressure, causing 9.4 million deaths worldwide each year. It is estimated that by 2025, 1.5 billion people will have hypertension. An estimated 9.4 million people die each year from hypertension and its complications [2].

Hypertension has a high mortality rate if left untreated or if it persists for a long time, and if not adequately treated, it can cause kidney, heart, and brain damage. Drug shortages will occur if this is left untreated, and drug planning is not implemented [3]. Pharmacies must evaluate and align drug use with the national formulary. This is done to determine whether drug use is rational, thereby increasing efficacy and reducing the incidence of adverse drug reactions (ADRs). This can be used as a reference for short- and long-term drug planning and procurement [4]. Evaluation using the ATC/DDD (Anatomical Therapeutic Chemical/Defined Daily Dose) and DU 90% (Drug Utilization 90%) methods is one of the quantitative methods recommended by the WHO for evaluating drug use. This method will display the amount of drugs used that reaches 90% of all prescription drugs dispensed after calculating the DDD/1000 KPRJ [5]. ATC (Anatomical Therapeutic Chemical) classifies drugs based on pharmacological classification, chemical compounds, and therapeutic functions, then interprets them into DDD (Defined Daily Dose) units, the average daily dose with specific indications [6]. Evaluation of use using the ATC/DDD and DU 90% methods was developed as a drug utilization study tool to facilitate the review and assessment of drug prescriptions, distribution, and use [7].

From a preliminary study conducted directly at the Mataram City Regional General Hospital, hypertension is one of the most common chronic diseases that can be treated in several BPJS network pharmacies in the Mataram City area. There is inappropriate use of antihypertensive drugs, and the availability of antihypertensives that are often out of stock can cause a spectrum of toxicity, failure of treatment therapy for hypertension complications, and death in patients. Based on research conducted by Tuti et al., the availability of drugs in 10 pharmacies in the cities of Surabaya, Trenggalek, Tulungagung, and Blitar in May-June 2016 experienced drug shortages [8]. This aligns with research conducted by Murni et al., which found drug shortages at Sana Farma Pharmacy in Semarang from January to July 2018, raising concerns that the pharmacy might not be able to provide optimal patient care. Therefore, a sound medication plan is crucial [9].

Research on the quantity of antihypertensive use in hospitalized patients was conducted by Adolof et al. at S K Lerik Kupang Regional General Hospital, showing that amlodipine was the most frequently

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prescribed antihypertensive with a value of 69.06 DDD/100 hospital days [10]. In addition, research conducted by Wahyu et al. at the District A Pharmacy also showed that amlodipine was the most frequently prescribed antihypertensive with a value of 3212.5 DDD/KPRJ [11].

However, research focusing on this area in Mataram City, West Nusa Tenggara Province, to our knowledge, has never been conducted. Based on this, researchers are interested in evaluating the use of antihypertensives in hypertensive patients prescribed by physicians and specialists at Mataram City Regional Hospital using the ATC/DDD and DU 90% methods and compliance with the national formulary because this study is the first to evaluate the use of antihypertensives in pharmacies, especially in Mataram City.

Experimental Section

Materials and Apparatus

This study design is descriptive observational with a quantitative approach. This study was conducted at the BPJS network pharmacy of Mataram City Hospital from January to December 2024. The population in this study was all prescriptions for antihypertensive patients at Mataram City Hospital who received antihypertensive treatment from January to December 2024 at the KF 134 Pejanggik pharmacy and the KF 458 Catur Warga pharmacy. The sample of this study was patient prescriptions that met the established inclusion criteria. In this study, the inclusion criteria were BPJS patient prescriptions who received antihypertensive treatment by doctors, specialist doctors at Mataram City Hospital from January to December 2024, while patients with incomplete prescriptions were excluded. The samples obtained were compiled into primary data and processed using Microsoft Excel software.

Method Analysis

The patient's prescriptions used are classified based on the ATC code, and the quantity of use is calculated using DDD units and the DU segment is 90% [12]. This was followed by an analysis of drug use compliance with the 2023 national formulary.

The analysis was based on the usage profile, quantity of use, antihypertensive use based on the 90% DU profile, and compliance with the national formulary. The analysis continued by determining the antihypertensive use profile, which included data on the number of drug classes, types, and routes of administration classified according to the ATC.

The quantitative value of antihypertensive use was then calculated using the DDD unit on the official WHO website. (https://atcddd.fhi.no/atc_ddd_index/?code=C&showdescription=no) ATC codes are obtained together with the standard DDD values of each type of antihypertensive [13]. The classified antihypertensive can then be calculated using the formula:

$$\text{Total DDD} = \frac{\text{Quantity of drug use (gram)}}{\text{DDD WHO (gram)}}$$

$$\text{DDD per 1000 KPRJ (Outpatient Visits)} = \frac{\text{Total DDD}}{\text{Total patient prescriptions}} \text{x } 1000$$

$$\text{Percentages according to FORNAS} = \frac{\text{Appropriate amount}}{\text{Overall total}} \text{x } 100\%$$

Sample Calculation

The sample calculation used in this study was the Lameshow formula. This formula is considered applicable when the population size is unknown. A sample size of 100 patient prescriptions was obtained in one month, and 1.200 patient prescriptions were obtained in one year at each pharmacy that met the inclusion criteria. The sample was then used to evaluate antihypertensive use quantitatively. Data were collected retrospectively using a total sampling technique. This study was approved by the Research Ethics Committee of Mataram City Hospital with ethical permit number 052/Etik Pen/RSUD/XII/2024 and issued on December 31, 2024.

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Results and Discussion

Antihypertensive Use Profile

The collected antihypertensive patient prescription data is classified based on the Anatomical Therapeutic Chemical (ATC) to facilitate the identification of the antihypertensives used so that the DDD value can be calculated.

Table 1. Profile of Antihypertensive Drug Use at KF Pharmacy for the Period January-December 2024

Group	Drug Name	KF 134 Pejanggik		KF 458 Catur Warga	
		Total (tab)	Percentage (%)	Total (tab)	Percentage (%)
ACE Inhibitor	Captopril 12,5 mg	300	0,06%	2.724	0,84%
	Captopril 25 mg	882	0,17%	1.104	0,34%
	Captopril 50 mg	1.506	0,28%	-	-
	Lisinopril 5 mg	2.967	0,56%	3.312	1,02%
	Lisinopril 10 mg	4.166	0,78%	2.760	0,85%
	Ramipril 2,5 mg	17.969	3,37%	13.560	4,19%
	Ramipril 5 mg	11.704	2,20%	10.872	3,36%
	Ramipril 10 mg	18.840	3,54%	10.488	3,24%
	Bioprexum	30	0,01%		
ARB	Candesartan 8 mg	77.841	14,61%	78.904	24,40%
	Candesartan 16 mg	39.573	7,43%	3.840	1,19%
	Telmisartan 80 mg	2.865	0,54%	-	-
	Valsartan 80 mg	8.760	1,64%	2.484	0,77%
	Valsartan 160 mg	11.115	2,09%	2.208	0,68%
CCB	Adalat Oros 30 mg	11.051	2,07%	9.852	3,05%
	Amlodipin 5 mg	13.879	2,60%	29.676	9,18%
	Amlodipin 10 mg	9.965	1,87%	17.400	5,38%
	Diltiazem 30 mg	-	-	4.140	1,28%
	Herbesser CD 100 mg	12.355	2,32%	14.112	4,36%
	Herbesser CD 200 mg	2.947	0,55%	3.864	1,19%
Beta Blocker	Bisoprolol 2,5 mg	70.802	13,28%	3.048	0,94%
	Bisoprolol 5 mg	96.213	18,05%	26.964	8,34%
	Concor 1,25 mg	8.061	1,51%	2.736	0,85%
	Concor 2,5 mg	334	0,06%	-	-
	Concor 10 mg	19.495	3,66%	22.812	7,05%
	Propranolol 10 mg	7.109	1,33%	-	-
	Propranolol 40 mg	5.823	1,09%	-	-
Diuretik	Furosemid 40 mg	108	0,02%	4.632	1,43%
	Hydrochlorothiazide 25 mg	618	0,12%	-	-
	Spironolacton 25 mg	67.372	12,64%	47.352	14,64%
	Spironolacton 100 mg	4.687	0,88%	4.548	1,41%
Central Sympatholitic	Clonidin 0,15 mg	3.615	0,68%	-	-
	Total	532.952		323.392	

The antihypertensive drug candesartan, an ARB, was the most commonly prescribed drug at Kimia Farma pharmacies in Mataram City, accounting for 47.63%. These results align with Irmi et al.'s findings, which show that candesartan (ARB) and bisoprolol (beta-blocker) were the most commonly prescribed drugs [13]. Candesartan is effective in lowering blood pressure, thus helping to prevent complications, has relatively low side effects, and candesartan itself can be used for therapy in patients with heart failure [14]. ARB bekerja dengan cara menghambat aktivitas angiotensin II oleh reseptor blocker kompetitif [15]. The

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ARB class of drugs is effective in reducing the incidence of HMOD (Hypertension Mediated Organ Damage) and MACE (Major Adverse Cardiac Events). Also, it reduces the risk of chronic kidney disease in hypertension patients [14].

Quantity of Antihypertensive Use in DDD/1000 KPRJ

Data on antihypertensive use includes the name of the antihypertensive, the dose of antihypertensive given, the frequency of use, and the route of use, which is then used to calculate the quantitative value of antihypertensive use utilizing the calculation method established by WHO, namely the Defined Daily Dose (DDD) [5].

Table 2. Quantity of antihypertensives used at KF 134 Pejanggik pharmacy

ATC Code	Drug Name (Generic)	Route	Amount of use per year (gram)	DDD WHO (gram)	Total DDD	DDD/1000 KPRJ
C09AA01	Captopril	Oral	101,10	0,05	2.022	168,50
C09AA03	Lisinopril	Oral	56,50	0,01	5.650	470,79
C09AA05	Ramipril	Oral	291,83	0,0025	116.737	9.728,10
C09CA06	Candesartan	Oral	1.255,90	0,008	156.987	13.082,25
C09CA07	Telmisartan	Oral	229,20	0,04	5.730	477,50
C09CA03	Valsartan	Oral	2.479,20	0,08	30.990	2.582,50
C08CA01	Amlodipin	Oral	169,05	0,005	33.809	2.817,42
C07AB07	Bisoprolol	Oral	658,07	0,01	65.807	5.483,92
C07AA05	Propranolol	Oral	304,01	0,16	1.900	158,34
C03CA01	Furosemide	Oral	4,32	0,04	108	9,00
C03AA03	HCT	Oral	15,45	0,025	618	51,50
C03DA01	Spironolacton	Oral	2.153,00	0,075	28.707	2.392,22
C02AC01	Clonidin	Oral	0,54	0,00045	1.204	100,37

Table 3. Quantity of antihypertensives used at the KF 458 Catur Warga pharmacy

ATC Code	Drug Name (Generic)	Route	Amount of use per year (grams)	DDD WHO (gram)	Total DDD	DDD/1000 KPRJ
C09AA01	Captopril	Oral	61,65	0,05	1.233	102,75
C09AA03	Lisinopril	Oral	44,16	0,01	4.416	368,00
C09AA05	Ramipril	Oral	193,14	0,0025	77.256	6.438,00
C09CA06	Candesartan	Oral	692,67	0,008	86.584	7.215,33
C09CA03	Valsartan	Oral	552,00	0,08	6.900	575,00
C08CA01	Amlodipin	Oral	322,38	0,005	64.476	5.373,00
C08DB01	Diltiazem	Oral	124,20	0,08	1.553	129,38
C07AB07	Bisoprolol	Oral	142,44	0,005	28.488	2.374,00
C03CA01	Furosemide	Oral	185,28	0,04	4.632	386,00
C03DA01	Spironolacton	Oral	1.638,60	0,075	21.848	1.820,67

Table 2 shows that in 2024, the highest amount of antihypertensive use at the KF 134 Pejanggik pharmacy is candesartan, 13.082,25 DDD/1000 KPRJ, followed by bisoprolol, 5.483,92 DDD/1000 KPRJ, while the lowest use is furosemide, namely 9,00 DDD/1000 KPRJ. Table 3 shows that the highest amount of antihypertensive use at the KF 458 Catur Warga pharmacy is candesartan 7.215,33 DDD/1000 KPRJ, followed by ramipril 6.438,00 DDD/1000 KPRJ, while the lowest use is captopril 102,75 DDD/1000 KPRJ. From the results of this quantitative antihypertensive use study, it can be used to provide predictions regarding the rationality or irrationality in the use of antihypertensives. The results of the quantitative analysis show that in Kimia Farma pharmacies in the Mataram City area for the period January-December 2024, the antihypertensive candesartan is the most dominant antihypertensive used, namely candesartan (20.297,58

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DDD/1000 KPRJ) (Tables 2 and 3) which means that in one year there are around 20.000 patient visits from each visit who receive one daily dose every day [16].

Candesartan is an effective medication for hypertension, especially for those with complications such as kidney disease. It has been shown to reduce albuminuria, an essential indicator in patients with kidney disease. Furthermore, candesartan belongs to the angiotensin receptor blocker (ARB) class, which is recommended as first-line hypertension treatment according to the JNC 8 guidelines. [17].

Antihypertensive Use Based on DU Profile 90%

Drug Utilization 90% (DU 90%) is obtained by dividing the number of DDDs/1,000 antihypertensive patients by the total DDDs/1,000 patients of all antihypertensives used, then multiplying by 100%. The percentage of antihypertensive use is then accumulated and sorted from highest to lowest. Drugs included in the 90% DU segment are those that account for 90% of the accumulated use.

Table 4. Analysis of antihypertensive prescriptions in KF pharmacies in the 2024 period

KF 134 Pejanggik				
Drug Name	**Quantity (DDD)**	**Percentage**	**Cumulative Percentage**	**DU 90%**
Candesartan	156.987	34,87%	34,87%	
Ramipril	116.737	25,93%	60,79%	
Bisoprolol	65.807	14,62%	75,41%	✓
Amlodipin	33.809	7,51%	82,91%	
Valsartan	30.990	6,88%	89,80%	
Spironolacton	28.707	6,38%	96,17%	
Telmisartan	5.730	1,27%	97,45%	
Lisinopril	5.650	1,25%	98,70%	
Captopril	2.022	0,45%	99,15%	
Propranolol	1.900	0,42%	99,57%	-
Clonidin	1.204	0,27%	99,84%	
HCT	618	0,14%	99,98%	
Furosemide	108	0,02%	100,00%	
Total	450.269			
KF 458 Catur Warga				
Drug Name	**Quantity (DDD)**	**Percentage**	**Cumulative Percentage**	**DU 90%**
Candesartan	86584,00	29,12%	29,12%	
Ramipril	77256,00	25,98%	55,09%	✓
Amlodipin	64476,00	21,68%	76,77%	
Bisoprolol	28488,00	9,58%	86,35%	
Spironolacton	21848,00	7,35%	93,70%	
Valsartan	6900,00	2,32%	96,02%	
Furosemide	4632,00	1,56%	97,58%	
Lisinopril	4416,00	1,48%	99,06%	-
Diltiazem	1552,50	0,52%	99,59%	
Captopril	1233,00	0,41%	100,00%	
Total	297385,50			

The most commonly used antihypertensives in the DU segment are ARBs (candesartan), followed by ACE inhibitors (ramipril) and CCBs (amlodipine, bisoprolol). At KF 134 Pejanggik Pharmacy, only five drugs are included in the DU 90% segment, and four drugs at KF 458 Catur Warga Pharmacy, because the cumulative percentage does not exceed 90%. Candesartan is an antihypertensive that has demonstrated good effectiveness in lowering blood pressure and improving heart health, making it a top choice among physicians [18].

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These results differ from research conducted by Wahyu et al., which showed that amlodipine was the most commonly used antihypertensive drug in pharmacies in District A, followed by candesartan and then ramipril. The difference in results is due to the availability of more dosage forms for ramipril than for candesartan [11].

Compliance of antihypertensives with FORNAS

The use of drugs in accordance with FORNAS is expected to improve the quality of pharmaceutical services and rational use of drugs, and ensure the availability, distribution, and affordability of medicines to support the successful implementation of JKN [19].

Table 5. Drug compliance with FORNAS

Drug Class	Drug Name	KF 134 Pejanggik		KF 458 Catur Warga	
		Accordance	Not Accordance	Accordance	Not Accordance
ACE Inhibitor	Captopril	✓		✓	
	Lisinopril	✓		✓	
	Ramipril	✓		✓	
ARB	Candesartan	✓		✓	
	Telmisartan	✓		-	-
	Valsartan	✓		✓	
CCB	Amlodipin	✓		✓	
	Diltiazem	-	-	✓	
Beta Bloker	Bisoprolol	✓		✓	
	Propranolol	✓		-	-
Diuretik	Furosemid	✓		✓	
	HCT	✓		-	-
	Spironolacton		✓		✓
Central Symphatolitic	Clonidin	✓		-	-
%Kesesuaian		12/13 X 100% = 92%		9/10 X 100% = 90%	

The use of drugs in accordance with FORNAS is expected to improve the quality of pharmaceutical services and rational use of drugs, and ensure the availability, distribution, and affordability of medicines to support the successful implementation of JKN [19]. According to Adolof et al., if the prescription suitability value is higher and the standards used are higher, the treatment given will be more rational [10].

Based on research findings, if the prescribed medication does not refer to FORNAS, the cost of the medication is outside the responsibility of BPJS Kesehatan, so that this causes the patient to have to pay additional fees for the prescribed medication, which, of course, burdens the patient who has previously paid monthly contributions to BPJS Kesehatan. Research conducted by Ratna et al., states that the conformity of prescription writing with FORNAS can affect the quality of pharmaceutical services in a health facility [20]. According to Nasyanka, the factors that Influence prescription writing, excluding FORNAS, are internal factors, such as the need for drug therapy that is not included in the formulary due to a lack of socialization for all doctors, or a lack of information regarding drugs included in FORNAS. [21].

Conclusions

Based on the research findings, it can be concluded that the Angiotensin II Receptor Blocker (ARB) class was the most frequently prescribed group of antihypertensive drugs in pharmacies within the Mataram City area during January–December 2024. The analysis of drug utilization (DDD/1000 PPD) showed that candesartan was the most widely used antihypertensive agent, with the highest value recorded at KF 134 Pejanggik Pharmacy (13,082.25), followed by bisoprolol (5,483.92) and amlodipine (2,817.42). At KF 458 Catur Warga Pharmacy, candesartan also ranked first (7,215.33), followed by ramipril (6,438.00) and amlodipine (5,373.00). Furthermore, the drugs included in the DU 90% segment based on cumulative percentage were candesartan, ramipril, bisoprolol, amlodipine, and valsartan at KF 134 Pejanggik Pharmacy, while at KF 458 Catur Warga Pharmacy, the DU 90% drugs were candesartan, ramipril, amlodipine, and

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bisoprolol. In terms of compliance with the National Formulary (FORNAS), the proportion of antihypertensive drug use reached 92% at KF 134 Pejanggik Pharmacy and 90% at KF 458 Catur Warga Pharmacy, indicating that prescribing practices were largely consistent with national guidelines.

Conflict of Interest

All authors declare that they have no affiliation or involvement with any organization or entity with a financial or non-financial interest in the subject matter discussed in this manuscript.

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Supplementary Materials

No additional materials are available for this paper.

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