A retrospective study of physician-managed hypertension in a tertiary hospital in Southwestern Nigeria

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ABSTRACT

Background: Hypertension is a cardiovascular disease of public health concern that has caused severe mortality and morbidity. Information on costs of managing hypertension is very essential. Data on factors that influence physicians' choice of antihypertensive drugs are scarce.

Objectives: To determine costs and classes of antihypertensive drugs used by physicians and assess factors that influence physicians' choice of such drugs in a tertiary hospital in Southwestern Nigeria.

Methods: Six hundred and eighty-four case notes of hypertensive patients were retrospectively reviewed within a three-month period. A prospective interaction with 85 randomly selected physicians was undertaken using a pretested questionnaire to obtain their demographic characteristics and their views on the class of drugs used in managing hypertension. Data were summarized using descriptive statistics. Inferential statistics was used to determine the associations between variables.

Results: Physicians and patients mean ages were 45.74±10.63 and 65±11.12 years respectively. Average monthly costs of antihypertensive drugs in patients without and with comorbidities were $9.11±0.15 USD and $12.56±0.06 USD, respectively. These different costs were significant at p=0.001. Classes of antihypertensive drug used were thiazides (60.8%), calcium channel blockers (57.6%), angiotensin converting enzymes inhibitors (50.7%), α-blockers 15.2%), and β-blockers ((6.1%). Physicians' choice of anti-hypertensive medications was significantly influenced by cost of medication (p=0.003), patients' economic status (p=0.004), presence of comorbidities (p=0.026), among others.

Conclusion: Cost of managing hypertension was high compared to average monthly income of patients. Classes of drugs used were in line with JNC 7 guidelines. Physicians' choice of medications was mostly influenced by costs of medication, patients' physical and economic status. The implications of these findings in clinical practice are that physicians should continue to focus more on generic prescribing and substitution as cost-reduction strategies.

Keywords: Cost, Antihypertensive drugs, Hypertension, Nigeria

Une étude rétrospective de l'hypertension gérée par un médecin dans un hôpital tertiaire du sud-ouest du Nigéria

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RESUME

Contexte : L'hypertension est une maladie cardiovasculaire préoccupante pour la santé publique qui a entraîné une mortalité et une morbidité graves. Les informations sur les coûts de gestion de l'hypertension sont très essentielles. Les données sur les facteurs qui influencent le choix des médicaments antihypertenseurs par les médecins sont rares.

Objectifs : Déterminer les coûts et les classes de médicaments antihypertenseurs utilisés par les médecins et évaluer les facteurs qui influencent le choix de ces médicaments par les médecins dans un hôpital tertiaire du sud-ouest du Nigéria.

Méthodes : Six cent quatre-vingt-quatre dossiers de patients hypertensifs ont été revues rétrospectivement dans une période de trois mois. Une interaction prospective avec 85 médecins sélectionnés au hasard a été entreprise à l'aide d'un questionnaire pré-testé pour obtenir leurs caractéristiques démographiques et leurs points de vue sur la classe de médicaments utilisés dans la prise en charge de l'hypertension. Les données ont été résumées à l'aide de statistiques descriptives. Des statistiques inférentielles ont été utilisées pour déterminer les associations entre les variables.

Résultats : L'âge moyen des médecins et des patients était respectivement de 45,74±10,63 et 65±11,12 ans. Les coûts mensuels moyens des médicaments antihypertenseurs chez les patients avec et sans comorbidités étaient respectivement de 9,11$±0,15 USD et de 12,56$±0,06 USD. Ces différents coûts étaient significatifs à p=0,001. Les classes de médicaments antihypertenseurs utilisés étaient les thiazides (60,8%), les inhibiteurs des canaux calciques (57,6%), les inhibiteurs des enzymes de conversion de l'angiotensine (50,7%), les α-bloquants (15,2%) et les β-bloquants (6,1%). Le choix des médicaments antihypertenseurs par les médecins était significativement influencé par le coût des médicaments (p = 0,003), le statut économique des patients (p = 0,004), la présence de comorbidités (p = 0,026), entre autres.

Conclusion : Le coût de la prise en charge de l'hypertension était élevé par rapport au revenu mensuel moyen des patients. Les classes de médicaments utilisées étaient conformes aux directives JNC 7. Le choix des médicaments par les médecins était surtout influencé par le coût des médicaments, la situation physique et économique des patients. Les implications de ces résultats dans la pratique clinique sont que les médecins devraient continuer à se concentrer davantage sur la prescription et la substitution génériques comme stratégies de réduction des coûts.

Mots-clés : Coût, médicaments antihypertenseurs, hypertension, Nigéria

INTRODUCTION

Hypertension is a cardiovascular disease that kills without prior warning. Hence it is usually referred to as a silent killer and thus, a major public health concern.[1] Hypertension requires a life time treatment with appropriate medications which sometimes may be expensive and could constitute huge economic burden to patients. In fact, in developing countries, about 60% of hypertensive patients make out-of-pocket payments for their medications.[2-5] Furthermore, in developed countries including the United States of America, the direct (medications) and indirect costs (laboratory and transportation) of managing hypertension was about $51 billion in 2009.[6] This substantial cost has been linked with the pathophysiology of the disease which often times are associated with co-morbidities and other compelling indicators.[7] Risk factors that could increase incidents of hypertension are high body mass index, patients' sex, age, race, economic status, feeding habits, sedentary life style, family size, stress, and perhaps inheritance.[8-10] Various studies highlighted factors that could influence physicians' prescribing decisions for hypertension, but none of such studies gave in quantitative terms, the contributions of these factors[11-14] Specifically, most studies about hypertension in Nigeria dwelt on its' prevalence, control and determinants, in population setting and posited that safety, efficacy and cost of medication could also affect prescription patterns of antihypertensive medications.[13,15-19] However, the extent to which the identified variables influence the choice of anti-hypertensive medicines used by physicians remains unknown. Furthermore, efforts made by some researchers to understand the prevalence of hypertension, mainly focused on cost of antihypertensive medications in towns, pharmacists-managed clinics, and in secondary health facilities.[20-24] Research on the costs of managing hypertension in tertiary hospitals is rare in Southwestern Nigeria; hence this study was undertaken to identify a profile of antihypertensive class used for managing hypertension, determine the costs of treating the disease, and evaluate factors influencing physicians' choice of antihypertensive drugs for the patients in a tertiary hospital in Southwestern Nigeria. This was with a view to providing useful information on physicians-managed hypertension especially in resource- limited setting where this study was undertaken.

MATERIALS AND METHODS

Study design

A cross-sectional retrospective review of case notes of 684 hypertensive patients from the outpatient records department of Ladoke Akintola University teaching hospital and a prospective interaction with 85 randomly selected physicians were carried out from September to November, 2019.

Settings

Ladoke Akintola University of Technology (LAUTECH), teaching hospital is a tertiary health care institution that is jointly-owned by two state governments in Southwestern Nigeria. It was designed as a 1000 bedded hospital for inpatients but presently and actively has less than 300 beds. The average number of patient per week for outpatients is 923 patients. On the whole, the hospital has 35 clinics. The hospital acts as a referral centre for health care services to residents of Ogbomoso and its' surrounding areas.

Study area

Ladoke Akintola University of Technology (LAUTECH), teaching hospital Ogbomoso was founded in 1996. Presently, Ogbomoso is a medium size town with four local government councils. The population of the town was estimated to be 645,000 people by 2006 censors.[25]

Inclusion criteria

Case notes of adult patients with hypertension who had received treatment for more than four times within the last one year were included in the retrospective review. Hypertensive patients with co-morbidities were also considered. From the official roosters and postings, physicians who treated hypertensive patients in the last one year were identified and included in the study.

Exclusion criteria

Physicians who were not among those that were randomly selected did not take part in the study.

Sampling techniques

A total of 3572 patients' case notes in the outpatient records department of the hospital were examined and 684 hypertension cases were identified and selected using convenience sampling technique, based on the study criteria. Complete Enumeration Survey Method (CESM) was adopted in this study instead of computing sample size, for the following reasons: (i) The main item of interest in this study is the management of hypertension, which occurred at varying degrees in all the case files. Leaving out any case file arising from working with computed sample size, could affect the integrity of the final research results. Moreover, sample size depends on the phenomenon a researcher is trying

to detect; and the precision of the sample statistics.[26] (ii) CESM though expensive and time wasting, is more accurate than any survey method because the degree of correctness of information increases with more data collection; and above all, it minimizes bias.[27] (iii) Moreover, CESM has been used for a similar study.[28] Random sampling method was employed with the aid of Table of Random Numbers, to select 85 physicians out of the list of 147 physicians (Sample Frame) who had worked in the outpatient department based on the records from the hospital management.

Questionnaire design
The questionnaire used for this study was adapted after an extensive review of similar studies.[14,29,30] The questionnaire consisted of two sections. The first section explored demographic information, such as age, gender, year of qualification, educational qualification, and years of physicians' experience in practice. The second section contained factors that could influence the choice of medications prescribed by physicians These factors were safety of medication, cost of medication, effectiveness of medication, patients' preference, existing treatment guidelines, economic status of patients, recommended daily dose, previous medications used by patients, physicians practice experience, medications suitable for the patient, and presence of comorbidities.[11-14] The possible degree of influence such factors would have on physicians' choice of antihypertensive medications for managing patients with hypertension were presented in a 5-point Likert scale as no influence (1), little influence (2), moderate influence (3), high influence (4), and very high influence (5).

Validation of the questionnaire
The questionnaire was pre-tested on ten (10) Physicians in University of Ilorin Teaching Hospital (UITH) Ilorin, Kwara State which was outside the study area. Construct validity of the questionnaire was ensured by ascertaining that the research instrument measured what it was assumed to measure. Internal reliability of the questionnaire was ensured using test-retest method of reliability.[31] Thereafter, comments, suggestions and corrections made by the physicians in the pretested questionnaire were used to improve the quality of the questionnaire where necessary. In addition, written consent of the physicians to participate in the study was sought and obtained before questionnaire was self-administered to them by hand by the researchers themselves. The average time spent in filling the questionnaire was 11 minutes.

Data collection and recruitment procedure
Information about patients' age, gender, occupation, and pattern of drugs used for their treatment were obtained from each patient folder. Also retrieved, were, names and number of drugs, strengths of the drugs used, their dosage forms, frequency of administration, duration of treatment, class and drug combinations and the number of generics and brands given to the patients. Patients with co-morbidities were documented. Cost of medication was determined. Cost of antihypertensive medications were grouped into low, medium, and high.

Ethical clearance
The Ethical Review Committee of Ladoke Akintola University Teaching Hospital (LAUTECH/HREC/23/2019) Ogbomoso, granted approval for the study.

Data analysis
Data was analysed using the Statistical Package for Social Sciences (SPSS for windows) version 18. Then data was presented as frequency, percentages, median and mean±SD. Costs for a month's treatment of hypertension was computed based on the recommended daily dose and the prevailing price of such drugs in the hospital pharmacy at the time the treatment was given. Inferential statistics such as Chi-square and Pearson correlation were used to determine the relationships between variables. Ordered logistic regression was used to predict contribution of factors that influenced physicians' choice of medications used in managing hypertensive patients in the tertiary hospital. Level of significance was acceptable at $p < 0.05$.

RESULTS
A survey of the physicians revealed that 85 of them participated in the study with a female to male ratio of 1:1.18 and a mean age of 45.74±10.63 years. Therefore, 100% response rate was obtained from the questionnaire issued to the physicians. Physicians' average practice experience was 13±5.69 years (Table 1). There was significant association between age and marital status of the physicians (X2 = 6.831, p=.023). There was also high and significant correlation between age and practice experience of the physicians (r=0.894, p=.000).

Furthermore, patients profile show that the mean age of the patients was 65±11.12 years. Patients' male to female ratio was about 1:214. The majority of the patients were artisans 110(16.1%), Farmers 121(17.7%), petty traders 163(23.8%), and pensioners 102(14.9%). Other respondents constitute 47(6.9%). There was

significant association between age of patients and their marital status (X2 = .638, p=.003) and a high but significant correlation between occupation of the patients with their monthly income (r=0.0891, p=.002) Table 2. Most of the patients had stages 1 and 2 hypertension. About 53.4% had diabetes while 44% were obese (Table 3). Their mean systolic blood pressure reading was 159.5±14.12 mmHg; while the mean diastolic blood pressure reading was 99.5 ±10.32 mmHg; when treatment commenced.

Table 1:Socio-demographic characteristics of physicians (N=85)

Variables	Frequency	Percentage
Age range (years)		
20 - 30	11	12.9
31 - 40	14	16.5
41 - 50	22	25.9
51 - 60	38	44.7
Gender		
Male	46	54.1
Female	39	45.9
Marital status		
Single	17	20.0
Married	61	71.8
Divorced	4	4.7
Widowed	3	3.5
Educational qualification		
MBBS	75	88.2
MSc*	4	4.7
MPhil*	6	7.1
Years of experience		
1 - 5	16	18.8
6 - 10	7	8.2
11 - 15	23	27.1
16 - 20	39	45.9

* These degrees were obtained as additional qualifications after the MBBS

After one year of treatment, the mean systolic blood pressure became 127.2±11.35 mmHg; while the mean diastolic blood pressure reading was 78.3 ±10.14mmHg. The percentage number of patients that were obese dropped from 310(44%) to 198(29%). A majority of the patients 613 (89.6%) were initially on single drug therapy that with diuretics or calcium channel blockers or angiotensin converting enzyme inhibitors. As the management of their condition progressed, more drugs were added to their initial regimen in a step-wise manner based on the clinical condition of the patient. About 42(1.6%) of the patients had β-blockers. The profile or class of antihypertensive medications used by the physicians was diuretics 416(60.8%), calcium channel blockers 394(57.6%), angiotensin converting enzyme inhibitors(ACEI) 347(50.7%), and alpha receptor blockers 269(39.3%) (Table 4).

Table 2: Socio-demographic characteristics of patients (N=684)

Variables	Frequency	Percentage
Age range (years)		
20-40	214	31.3
62-82	461	67.4
83-103	9	1.3
Gender		
Male	218	31.9
Female	466	68.1
Marital status		
Single	49	7.2
Married	526	76.9
Divorced	78	11.4
Widowed	31	4.5
Occupation		
Civil servant	61	8.9
Trading	163	23.8
Teaching	80	11.7
Artisans	110	16.1
Farming	121	17.7
Pensioners	102	14.9
Others	47	6.9
Monthly income in ₦'000		
1-10	352	51.46
11-20	165	24.12
21-30	141	20.61
31-40	26	3.80

Exchange Rate: ₦390 = 1USD   Average monthly income of patients' ₦ 13,940

Table 3: Blood pressure status of patients and associated co-morbidities (N=684)

Variables	Frequency	Percentage
Blood pressure status		
Pre-hypertension: 140/90 (mmHg)	65	9.5
Stage 1: 140-159/ 90-99 (mmHg)	349	51.0
Stage 2: >160/100 (mmHg)	270	39.5
Co-morbidities		
Diabetes	365	53.4
Obesity	301	44.0
Stroke	12	1.7
Sickle cell disease	6	0.9

Table 4: Drug combinations, treatment pattern and costs of medications in the hospital

Variables		Frequency	Percentage
Number of medications			
Monotherapy	A or C or D	613	89.6
Two drugs combination	A+ C or A+ D	352	51.5
Three drugs combination	A+C+D	347	50.7
Four drugs combination	A +C+D + O	54	7.9
Pattern (class of antihypertensive)			
Diuretics		416	60.8
Calcium channel blockers		394	57.6
ACEI		347	50.7
Alpha -2 receptor agonist		269	39.3
Alpha receptor blockers		104	15.2
β-blockers		42	6.1
Cost of antihypertensive medication(Range)			
Low ₦390-4000		479	70.0
Medium ₦4001-7000		121	17.7
High >₦7000		84	12.3

Exchange rate ₦390=$1 US Dollar

ABREVIATIONS

A = ACE inhibitors e.g. Captopril (Capoten[®])

C = Calcium channel blockers e.g. Nifedipine (Adalat[®]) , Amlodipine besylate e.g.(Norvasc[®])

D = Diuretics e.g. Furosemide (Lasix[®]), Spironolactone (Aldactone[®]), Hydrochlorothiazide (Esidrix[®])
       Hydrochlorothiazide + Amiloride hydrochloride (Moduretic[®])

O = Others:
       α-Blockers e.g. Prazosin (Minipress[®]),
       Alpha -2 Receptor Agonist e.g. Methyldopa (Aldomet[®])
       β -blockers e.g. Propranolol Hydrochloride (Inderal[®]), Atenolol (Tenormin[®])

Table 5. Ordered logistic regression results on factors that influenced choice of medications used by the physicians

Factor	No influence 1	Little influence 2	Moderate influence 3	High influence 4	V. High influence 5	Coeff.	SE	Z-Score	P>¦Z¦
1. Safety of medication	0	0	4	12	69	1.201	0.48	-2.5	0.012*
2. Cost of medication	0	0	0	4	81	2.550	0.75	-3.4	0.003*
3. Effectiveness of medication	0	0	4	11	70	1.104	0.48	-2.3	0.021*
4. Patients preference	51	24	2	3	5	1.030	1.03	-1.0	0.302
5. Existing treatment guidelines	0	0	1	28	56	-1.10	0.48	-2.3	0.021*
6. Economic status of patient	0	0	12	34	39	2.208	0.69	-3.2	0.004*
7. Recommended daily dose	1	2	3	32	47	0.900	0.75	-1.2	0.203
8. Patients use of other drugs	3	3	20	24	35	1.155	1.05	-1.1	0.041*
9. Physicians' experience	0	2	10	30	43	1.638	0.78	-2.1	0.036*
10. Medication suitable for patient	1	3	11	34	36	1.740	0.82	-2.1	0.021*
11. Presence of comorbidities	0	0	10	20	55	1.449	0.69	-2.1	0.026*

*Sig level $P<0.05$. No of observations =85. LR Chi 2(11) = 68.31. Prob >chi 2= 0.000. Pseudo R2 = 0.7367.

There was no place in the patients' file where it was documented that patients should either carry out physical exercises or embark on dieting by changing their feeding habits. Drugs used for treating the patients were mostly generics.

Table 4, shows the average monthly costs of antihypertensive medications used for patients with comorbidities N4896.68±24.47 ($12.56±0.06) and without comorbidities N3554.11±58.13 ($9.11±0.15) respectively. Results of the ordered logistic regression analysis showing the contribution of factors that would likely influence the choice of medications prescribed by the physicians are presented in Table 5.

DISCUSSION

A response rate of one hundred percent was obtained from the questionnaire administered to physicians in this study. This result is at variance with the expressed opinions of some researchers who believe that physicians are a group with low survey response rate.[32,33] However, this very high response to the study questionnaire, maybe due to the instructions given to the enumerators that they must show courtesy to the respondents and be very patience with them. Secondly, a hand written envelop affixed with postage stamp was attached to each questionnaire for mailing back filled questionnaire in case the questionnaire was not handed over to the researchers at their first contact with the respondents. In any case, there was a mini-post office annex located right inside the hospital premises. Thirdly, a period of three months for the study was long enough to send multiple reminders, to the physicians who of course were not too many. In fact, these were some of the tips that had been suggested that could increase questionnaire responds rate.[33]

Results obtained from this study revealed that the average cost for treating hypertension in the tertiary hospital was high at N3554 ± 58.13($9.11 ± 0.15) per month when compared to the average monthly income of patients N13,175.44 ($34). This result agrees with the findings from previous studies at different settings which also discovered that the cost of treating hypertension was equally high.[2,34] Findings from this study have shown that about 30 per cent of the monthly income of the patients was expended on medications for managing hypertension. This could have been more if costs of laboratory investigations were computed into the treatment cost. It has also been revealed that about half of hypertensive patients spent even more than one-tenth of their entire income on health care related expenses.[4] Expenditure for managing hypertension in Nigeria still remains high because most patients make out-of-pocket payment for their medications, coupled with the parlous state of the economy and lack of subsidy for essential medicines.[7,13,17] In fact, it was documented that about 66-70% of Nigerians still pay for their medicines from out of pocket.[32,33] The National Health Insurance Scheme (NHIS) does not cover non-government workers, peasant farmers, petty traders, and artisans who were the predominant group of people that sought health care in the teaching hospital that was studied. The NHIS should be expanded to include these set of people. The cost burden for managing hypertension may probably continue to increase in Nigeria because of the parlous economic condition, poor governance coupled with the high and unstable exchange rate of the local currency to the United States Dollar. This rising cost of managing hypertension, could cause therapeutic failure because most patients may not be able to afford the costs of prescribed medications. Therefore, the issue of non-compliance could be a major challenge. Moreover, about 80% of medications used for treating chronic ailments such as are hypertension, diabetes, arthritis among others in Nigeria are usually imported.[36] Therefore, it may not be out of place to advice pharmaceutical industries to optimize local production of antihypertensive medicines in order to reduce their prices, improve affordability, and access especially in a low income country such as Nigeria. This may improve favourable treatment outcomes. Furthermore, poor access to healthcare due to poverty has been reported to influence health outcomes negatively especially in patients with chronic diseases especially in low income countries.[37]

Furthermore, hypertension cases increased as patients age increased and was prevalent among age group 62-82 years. This finding is in agreement with results obtained from various studies.[9,16,18] The profile of the class of antihypertensive medications used for hypertensive patients was in line with the guidelines prescribed by the Joint National Committee (JNC 7) on the Prevention, Detection, Evaluation, and Treatment of high blood pressure.[38] The JNC 7 guidelines recommended the prescription of low doses of different classes of antihypertensive medications rather than a high dose of one class because of adverse effects, drug-drug interactions and end organ effects especially in the presence of co-morbidities. Apart from the thiazides, other drugs that were utilised in a descending order of magnitude include calcium channel blockers, angiotensin converting enzyme inhibitors, alpha receptor blockers and ?- blockers. In this study, more than half of the patients (60.8%) were managed with diuretic agents; either as a single therapy or co-administered with other antihypertensive agents such as calcium channel blockers, and/or angiotensin converting enzyme inhibitors (ACEI). This was also the case in studies carried out in Nigeria.[22,23] However, in cases of comorbidities or compelling indicators such as diabetes, the choice of antihypertensive drug was ACEI. In this study, beta-blockers were minimally used probably because they could provoke type 2 diabetes.[39] Furthermore, direct vasodilators were hardly used. In fact, in a study that assessed antihypertensive utilisation in a private teaching hospital in Nigeria, direct acting vasodilators and alpha receptor blockers were rarely

used.[40] In pregnant women, alpha-2 receptor agonist such as Methyldopa was the first line antihypertensive drugs used for pregnant patients. This could be due to its' minimal side effects on developing fetus.

Both the single antihypertensive drugs and the multiple antihypertensive drug combinations which were mostly generics caused marked reduction in blood pressure in normal and obese patients. These outcomes are indications that hypertension could be effectively managed with low cost generics. Similar reports were seen in studies conducted in Iran and Tanzania.[14,4] The use of generic drugs could cause increased access to essential medicines since they are cheaper. However, there was no place in the patients' case files kept in the outpatient Department where patients were either asked to engage in aerobic exercises or undergo certain life style modifications such as changing feeding habits. Maybe patients were asked to do so orally which was likely to be the case. However, documenting it should have been a more proper thing to do.

Prominent among the factors that significantly contributed to the choice of medicine prescribed by the physicians were cost of medication, patients' economic status, safety of medication, existing treatment guidelines, effectiveness of medication, physicians' experience, suitable medications for patients, and presence of co-morbidities. These findings were in line with results obtained from similar studies.[11,12,14,25,41-43] except that the degrees of influence of the aforementioned factors were not computed in those studies.

Patients' preference for certain antihypertensive medications did not influence physician's choice of medication used in treating them. This is expected because in healthcare services, decision resides in the hands of the healthcare providers such as physicians, pharmacists, nurses among others. Patients do not choose medications to be used for treating them.[44]

The main strength of this study is that it is able to determine in quantitative terms, the cost of treating hypertension in a resource-limited setting. However, the major limitation was that only one tertiary hospital was examined out of many tertiary hospitals. Therefore, the study findings cannot be easily generalized.

CONCLUSION
The profile of the class of antihypertensive medications used in the treatment of hypertension in the tertiary hospital was in line with the JNC 7 guidelines. The cost of managing hypertension in the tertiary hospital examined was high compared to the average monthly income of the patients. This cost was more for patients with co-morbidities. The choice of anti-hypertensive drugs prescribed was mostly influenced by cost, and patients' economic status which are key barriers to addressing issues of non-compliance to medications. The implications of these findings in clinical practice are that physicians should continue to focus more on generic prescribing and substitution as cost-reduction strategies.

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