RESEARCH ARTICLE

Awareness and use of medication management services in relation to medication adherence prior to hospitalisation among older adults in Regional Australia

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Abstract

Background Ageing is associated with changes in physiology, functional ability, declined in cognition and multiple co-morbidities. Alterations in pharmacodynamic and pharmacokinetic aspects also occur. Medications can improve the quality of life in people with multiple co-morbidities; polypharmacy and ageing could increase risks of medication misadventures and adverse events leading to hospital admissions. Medication management services (MedsCheck, Diabetes MedsCheck and Home Medication Review) were implemented in Australia to: increase patients' knowledge about their medicines, increase patients' confidence in using their medicines, and reduce avoidable hospital admissions. *Objective* This study aims to investigate patients' awareness, understanding and uptake of medication management services in relation to medication adherence. *Setting* Study was conducted at the Maryborough hospital, Queensland, Australia. *Method* This was a questionnaire based prospective study. A questionnaire was developed based on the questions used in the evaluation of the MedsCheck and Diabetes MedsCheck pilot program. *Main outcome/Result* We identified 243 participants of which 198 patients agreed to participate. Of the participants, 68.1% were taking more than five different medications a day and 34.3% of participants were taking more than 10 different medications a day. Those that consumed five or more doses of medication a day constitutes 72%. Only 3% had accessed medication management services prior to hospital admission. Many of participants (76.3%) noted that they had issues with different generics/brands of medication and only 23.2% of participants stated that they had a good understanding of drug–drug interactions. *Conclusion* Hospitalised patients are unaware of medication management services that could reduce frequency of re-hospitalisation. Community and hospital pharmacists can play a major role increasing patients' awareness of the availability of these services.

Impacts on Practice

- Hospitalised patients in Maryborough, Australia are unaware of the availability of medication review services that could prevent medication related admission.
- The brand substitution is a cause of confusion for majority of patients.
- Patients do not have an adequate understanding of adverse effects or interactions associated with medications.
- Patients are willing to accept a hospital pharmacist's referral for medication management services upon hospital discharge.

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Introduction

There is a steady increase in the ageing population in Australia because of an increase in life expectancy [1]. It is projected that by the year 2055 the population of older adults will increase from 3.6 million in 2015 to 8.9 million [1]. In the 2007–2008 National Health Survey more than 60% of people aged 65 years or older reported having more than one long-term condition managed with multiple medications [2]. Another survey exploring the use of conventional and complementary medicines in Australians aged 50 years or older confirmed a trend of five or more medications [3].

Ageing is associated with changes in physiology, functional ability, and a decline in cognition. Alterations in pharmacodynamic and pharmacokinetic aspects also occur [4, 5]. Although medications can improve the quality of life for people with multiple co-morbidities, poly-pharmacy and ageing could increase risks of medication misadventures and adverse events leading to hospital admissions [6, 7]. Therefore, pharmacists are crucial in ensuring that patients understand their medications and how to manage them appropriately [8].

The definition of medication misadventure includes errors that could occur at any stage of medication use, adverse drug reactions (ADRs) or events that could cause potential harm [9]. In Australia there are up to 230,000 admissions to hospital due to medication problems, costing about $1.2 billion (Australian dollars) per year and at about 50% of these admissions could be avoided by better medicine management [10].

An average of five to seven changes to medication occur when older persons are admitted to hospital [11, 12]. Timely communication of these changes to patient, care giver and primary health provider is essential, otherwise general practitioners who take over the care following the patient's discharge from hospital may fail to continue or monitor patients for newly prescribed medications [13]. Patients could also be at an increased risk of medication related problems, such as medication non-adherence, duplication and treatment failure [11, 14].

The MedsCheck and Diabetes MedsCheck programs were implemented nationally from 1 July 2012 to: increase patients' knowledge about their medicines, increase patients' confidence in using their medicines, and reduce avoidable hospital admissions [15]. The MedsCheck and Diabetes MedsCheck programs are patient-centred services that occur within the pharmacy. MedsCheck involves the review of patients' medications with emphasis on education and self-management to identify medication related problems experienced by the patient; improve the effective use of medicines and educate patients on proper storage of their medicines [15]. The Diabetic MedsCheck is for patients who are not able to access community based diabetes education or health services. It focuses on the patient's type 2 diabetes medicines management, monitoring of devices, patient's education, self-management and reducing the risk of developing complications associated with type 2 diabetes [15].

Unlike the MedsCheck and Diabetes MedsCheck Programs which are initiated by the community pharmacy, the Home Medication review (HMR) involves a referral from the patient's general practitioner (GP) for a comprehensive clinical review of a patient's medicines in their home by an accredited pharmacist. It entails collaboration between the patient or carer and their GP, pharmacist and other health professionals [16].

All patients could benefit from medication management services (MMS) to reduce their risks of misadventure. In Australia, due to high cost and to ensure sustainability, a cap was introduced in 2014 limiting the number of HMR that can be performed by an accredited pharmacist to 20 per calendar month [17]. The number of MedsCheck/Diabetes MedsCheck services was also capped at a combined total of 10 per calendar month [17].

At a local level little or nothing is known about patients' level of awareness/knowledge, understanding and uptake of these services in relation to medication adherence prior to hospitalisation.

Aim of study

The aim of this study is to investigate patients' awareness, understanding and uptake of MedsCheck, Diabetes MedsCheck and HMR to assess medication adherence prior to hospitalisation, and to investigate patients' willingness to accept hospital pharmacists' referral to community pharmacists for MMS upon discharge.

Ethics approval

Ethics approval was granted by the Royal Brisbane Children and Women's Hospital Ethics Committees and the local Maryborough Hospital Governance Committee (HREC/14/QRBW/145). No funding was received by the authors for this project.

Method

The study was performed at a regional Hospital in Australia that provides health services including; sub-acute inpatient care, acute care, inpatient rehabilitation, mental health. In

addition, community-based services, such as mental, allied and oral health are also provided. The hospital has 88 designated sub-acute beds. Palliative care patients occupy 18 per cent of the beds on average each year at any one time. A questionnaire (see Electronic Supplementary Materia) was developed based on the questions used in the Evaluation of the MedsCheck and Diabetes MedsCheck Pilot Program [15]. Additional questions in the survey were based on the Medication Action Plan (MAP). The MAP form is a standardised tool for Medication Reconciliation used in Queensland public hospitals. This tool covers the four steps of Medication Reconciliation: medication history, confirmation, reconciliation and transfer of verified information [18].

Ward pharmacists identified eligible patients for the study during the medication reconciliation process. The questionnaire was validated through the hospital pharmacists' focus group meeting. A pilot study was also conducted over five working days (Monday to Friday). The questionnaire was administered to patients admitted during the pilot period to pre-test the questionnaire. The pilot test was carried out on the rehabilitation ward, ward 2 and ward 3—the same wards where the actual study was conducted.

The study was conducted over a period of six consecutive weeks (Monday to Friday each week) from 16 June 2014 to 25 July 2014. Patients admitted to the hospital would have their medication reconciliations completed within 24–48 h of admission by the ward pharmacists. The collated information is recorded into the Enterprise-wide Liaison Medication System (eLMS) and printed out as the Medication Action Plan (MAP) for each patient.

Eligible patients were presented with a consent form to complete/sign (see Electronic Supplementary Materia). Those that consented were provided with a copy of the questionnaire by the ward pharmacist. Patients with difficulties, due to sight or literacy deficit, were assisted by the ward pharmacist in ticking their responses in the questionnaire. Extracted data was recorded in Microsoft Excel, 2003 and analysis was carried using SPSS (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.)

Inclusion criteria

The inclusion criteria for the study (based on the eligibility criteria for MedsCheck, Diabetes MedsCheck and Home Medicines Review) include:

- Patients with Medicare or Department of Veterans' Affair (DVA) Card admitted to the wards within 24–48 h.
- The patient must be at least 16 years old.
- The patients must be living at home in the community or at independent living units.

- For Diabetes MedsCheck: Patient must be recently diagnosed with type 2 diabetes (in the last 12 months).

The Medicare card allows an eligible person living in Australia to access a range of medical services and prescriptions at a lower cost, and free care as a public patient in a public hospital [19]. DVA health card is issued to eligible veterans and former members of the Australian Defence Force (ADF), their widow(er)s and dependants. Depending on the type of DVA health card, it gives them access to a wide range of public and private health care services for treatment at the department's expense [20].

The exclusion criteria

- Pregnant women.
- Any patient admitted to Maryborough Hospital without a Medicare or DVA Card.
- Any patient on end of life care plan/terminally ill patients.
- Any patient from residential care facilities.
- Patients admitted and discharged outside of pharmacists working hours or those discharged within 24 h of admission from the ward without medication reconciliation completed by pharmacists.

Results

We identified 243 eligible patients of which 198 agreed to participate (referred to as participants). All 198 participants completed the questionnaire. One hundred and eight participants (54.5%) were female, 38.4% were between 71 and 80 years old and 50 (25.3%) were above the age of 80 (Table 1). About 52% of the participants lived alone, 171 (86.4%) participants had a regular GP and 168 (84.8%) had a regular dispensing pharmacy.

Of the 45 individuals that did not consent, 80% were male; those that were aged between 51 and 60-years-old constitute 28.9%, while 22.2% were aged more than 80-year-old.

Number of medication and doses

The majority (68%) of participants were taking more than five different medications a day, and 34.3% of participants used more than 10 different medications a day. Only 24.2% of participants were taking less than five different medications a day. When the number of doses taken per day was considered, 47% of participants consumed more than 10 doses of medication a day, and 25% participants consumed 5–9 doses of medications in a day (Table 1).

Table 1 Characteristics of participants

	Number (%)
Sex	
Male	90 (45.5)
Female	108 (54.5)
Age group (years)	
< 50	8 (4)
51–60	27 (13.6)
61–70	37 (18.7)
71–80	76 (38.4)
> 80	50 (25.3)
Live alone or not	
Yes	103 (52.0)
No	95 (48.0)
Regular general practitioner	
Yes	171 (86.4)
No	27 (13.6)
Regular dispensing pharmacy	
Yes	168 (84.8)
No	30 (15.2)
Number of different medications taken/day	
1–4	48 (24.2)
5–9	67 (33.8)
> 10	68 (34.3)
Unsure	15 (7.6)
Number of doses per day	
1–4	36 (18.2)
5–9	50 (25.3)
> 10	92 (46.5)
Unsure	20 (10.1)
Assistance with medications	
Self	154 (77.8)
Spouse	26 (13.1)
Son or daughter	10 (5.1)
Healthcare worker	4 (2.0)
Other family member	4 (2.0)
Received Medcheck, Diabetes Medcheck and/or HMR	
Yes	6 (3.0)
No	192 (97.6)
Reasons why participants did not have Medcheck and diabetes check	
I did not see any leaflets or advertisement	24 (12.1)
My Pharmacist or Pharmacy staff have not informed or offered me	10 (5.1)
My GP has not informed me	3 (1.5)
No one I know has heard of these services	5 (5)
None of my family members or neighbour has heard of these services	146 (73.7)
Benefits of medicine use review services in assisting with self-management at home	
Yes, it would be of benefit	137 (69.2)
No, it would not be of benefit	20 (10.1)
Unsure	41 (20.7)
Acceptance of Hospital Pharmacists' referral to community pharmacist for Medication Use Review Service(s) upon discharge	
Yes	187 (94.4)
No	11 (5.6)

Assistance with medication taking at home

A hundred and fifty-four (78%) participants did not require any assistance with managing their medications at home, 18% had assistance from their spouse or adult children, and 2% of participants received assistance from a healthcare worker or other family member (not spouse or daughter/son).

Awareness, understanding and use of medication use review services

Most of the participants (99%) had never heard of Meds-Check and Diabetes MedsCheck prior to hospital admission (Table 2). Only 15% of participants were aware of the HMR and 5% of participants understood MedsCheck, Diabetes MedsCheck or HMR services. A total of 189 (95.5%) participants had no understanding of MedsCheck, Diabetes MedsCheck or the HMR program. These include ten patients that were referred by their GP for HMR prior to hospital admission.

When asked why they were not aware of MMS, 94% of participants responded 'all of the above reasons' which include: 'I did not see any leaflets/advertisement in relation to these services', 'my pharmacist/local pharmacy staff have not informed me of the availability of these services', 'my GP has not informed/referred me of these services', 'no one I know has heard of these services, none of my family members/friends/neighbours has heard of these services'.

Only 3% of participants, who were referred by their GP, had HMR prior to hospital admission. Overall, 192 (97%) participants had not used MedsCheck, Diabetes MedsCheck or HMR (Table 1). Reasons given for not using the MMS include: none of my family members or friends or neighbours had heard of these services (74%), they did not see any leaflets or advertisement (12%), their pharmacists or pharmacy staff had not informed or offered the service (5%). Only three participants stated that they have not used the service because their GP did not inform them about it.

Many of the participants (69%) thought that the MMS would be of benefit with medication management at home and 94% would accept hospital pharmacists' referrals to community pharmacists for MMS upon discharge to enhance medication adherence (Table 1). Older adults were more willing to accept a medicines management service compared to younger adults (Table 2).

Participants' perceptions of their type 2 diabetes management and access to diabetes educator/management services

Fifty-three participants reported a diagnosis of type 2 Diabetes Mellitus in the last 12 months prior to hospital admission (Table 3). Only 36% of these thought that their diabetes treatment was adequate in the last 12 months. Many of those with type 2 diabetes (64%) did not think that their diabetes was adequately controlled in the last 12 months with diabetes treatment. Almost all type 2 Diabetes participants (98%) reported that they had no access to a diabetes educator in the last 12 months. Only 1 participant has had access to a diabetes educator or a community health service in the time frame.

Although most of the participants did not have access to MMS prior to hospital admissions, 77% of participants with type 2 diabetes agreed that their community pharmacists had provided them with sufficient and useful information on how to monitor and manage blood sugar levels at home.

Responses to medication adherence questions

Participants were asked ten questions relating to medication adherence. The majority of participants (76%) noted that they had issues with brand substitution and only 23% stated that they have good understanding of drug–drug interactions, and what medications (complementary/supplementary/OTC/non-prescribed) to avoid with their currently prescribed medicines. Most of the participants (90%) claimed that they had never self-ceased their medications; they always consulted their doctor or pharmacist to determine what medication to cease. However, 66% of participants highlighted that they had forgotten to take their medication and only 34% of respondents reported that they have never forgotten or missed taking doses of their medication.

About 80% of participants responded that they have a good understanding of their medication and what conditions their medications were for, 88% stated that they have confidence in managing their own medications at home without assistance from anyone and, 93.4% of participants stated that they understood the appropriate time to take their medication in relation to food and timing of their doses (Table 4). Majority of the patients (96%) knew the best place to store their medications, that is, not in the kitchen/bathroom or anywhere with temperature fluctuations. Further, 86% of participants understood that if they require assistance with managing their medications at home, they can request their local pharmacies to pack them into dose administration aids. Many of the participants (58%) reported a good understanding of the side effects of their medication(s) and knew what adverse effects to watch out for. However, they responded differently when the questions were more refined, with more participants acknowledging that they had issues with different generics/brand of medication, 42.2% highlighted that they did not have good understanding of the side effects of their medication and 76.8% identified that they did not have good understanding of drug–drug interactions. Overall 66% of participants responded that they either forget to take their medications or may miss some doses.

Table 2 Participants awareness, medicine management and usage of medication review services stratified by age

	< 50	51–60	61–70	71–80	> 80
Age group (years)					
Number of individuals that agreed to participate (%)	8 (4.0)	27 (13.6)	37 (18.7)	76 (38.4)	50 (25.3)
Sex					
Number of female participants (%)	4 (2)	14 (7)	23 (11.6)	40 (20.2)	27 (13.6)
Number of male participants (%)	4 (2)	13 (6.5)	14(7.0)	36 (18.2)	23 (11.6)
Living condition					
Number of participants that live alone (%)	5 (2.5)	11 (5.6)	13 (6.7)	35 (17.7)	39 (19.7)
Number of participants that do not live alone (%)	3 (1.5)	16 (8.1)	24 (12.1)	41 (20.7)	11 (5.6)
Primary healthcare provider					
Number of participants with a regular GP (%)	7 (3.5)	16 (8.1)	34 (17.2)	70 (35.4)	44 (22.2)
Number of participants with a regular pharmacy (%)	3 (3.0)	12 (6.1)	37 (18.7)	68 (34.8)	45 (22.7)
Medication adherence prior to hospital admission					
Number of medications used daily (%)					
1–4	1 (0.5)	15 (7.6)	13 (6.7)	13 (6.7)	6 (3)
5–9	5 (2.5)	8 (4.0)	14 (7.0)	19 (9.9)	21 (10.6)
> 10	2 (1.0)	4 (2.0)	5 (2.5)	35 (17.7)	22 (10.6)
Unsure	0 (0.0)	0 (0.0)	5 (2.5)	9 (4.5)	1 (0.5)
Number of doses used daily (%)					
1-4	1 (0.5)	13 (6.7)	4 (2.0)	12 (6.1)	6 (3.0)
5-9	2 (1.0)	9 (4.5)	17 (8.6)	11 (5.6)	11 (5.6)
> 10	5 (2.5)	5 (2.5)	10 (5.0)	42 (21.2)	30 (15.2)
Unsure	0 (0.0)	0 (0.0)	6 (3.0)	11 (5.6)	3 (1.5)
Assistance with medications at home n (%)					
No assistance required	5 (2.5)	22(11.1)	28 (14.1)	52 (26.7)	47 (23.7)
Assistance from spouse	0 (0.0)	3 (1.5)	7 (3.5)	16 (8.1)	0 (0.0)
Assistance from child	1 (0.5)	1 (0.5)	0 (0.0)	1 (0.5)	0 (0.0)
Assistance from other family members	0 (0.0)	0 (0.0)	1 (1.5)	2 (1.0)	1 (0.5)
Assistance from healthcare worker	2 (1.0)	1 (0.5)	0 (0.0)	1 (0.5)	0 (0.0)
Medication management at home n (%)					
Medications in original packaging labelled by community pharmacist	6 (3.0)	20 (10.1)	30 (15.2)	48 (24.2)	27 (13.6)
Uses dosage aid packed with direction by community pharmacist	2 (1.0)	3 (1.5)	4 (2.0)	21 (10.6)	21 (10.6)
Used dosette box, self-packed, no direction	0 (0.0)	30 (15.2)	3 (1.5)	6 (3.0)	1 (0.5)
Uses dosette box, packed by someone else other than self or pharmacist	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	1 (0.5)
Aware of Medcheck n (%)					
Yes	0 (0.0)	1 (0.5)	1 (0.5)	0 (0.0)	0 (0.0)
No	8 (4.0)	26 (13.1)	36 (18.2)	76 (38.4)	50 (25.2)
Aware of Diabetes Medcheck n (%)					
Yes	0 (0.0)	1 (0.5)	1 (0.5)	0 (0.0)	0 (0.0)
No	8 (4.0)	26 (13.1)	36 (18.2)	76 (38.4)	50 (25.2)
Aware of Home Medication Review n (%)					
Yes	0 (0.0)	2 (1.0)	2 (1.0)	4 (2.0)	2 (1.0)
No	8 (4.0)	25 (12.6)	35 (17.7)	72 (36.4)	48 (24.2)
Has received Medcheck, and/or Diaebtes Medcheck and/or HMR services n (%)					
Yes	0 (0.0)	0 (0.0)	1 (0.5)	4 (2.0)	2 (1.0)
No	8 (4.0)	27 (13.6)	36 (18.2)	72 (36.4)	49 (24.7)

Discussion

This study shows that majority of participants were unaware that their local pharmacies provided a range of services that will improve their knowledge of medicines and their ability to better manage their medications at home. This may be because patients rely mainly on, and follow their doctors' recommendations [21]. A study that examined doctors

Table 3 Type 2 Diabetes participants' responses to question questions related to management of diabetes (n = 53)

	Yes Number (%)	No Number (%)
Have you been recently diagnosed with type 2 Diabetes in the last 12 months?	53 (26.8)	n/a
Do you think that your treatment for diabetes has been adequate in the last 12 months?	19 (35.9)	34 (64.1)
Have you had access to a diabetes educator/health service in the community in the last 12 months about your diabetes	1 (1.9)	52 (98.1)
Do you agree that your pharmacists have provided you with sufficient and useful information on how to monitor and manage you sugar levels at home?	41 (77.4)	12 (22.6)

Table 4 Participants' responses to medication adherence questions

	Yes Number (%)	No Number (%)
I have good understanding of my medication and what conditions the medications are used for	160 (80	38 (19.2)
I have confidence in managing my own medication at home without assistance from anyone	175 (88.4)	23 (11.6)
I have issues with different generic/brands of medications	151 (76.3)	47 (23.7)
I have good understanding of the side effects of my medication and what to watch out for	114 (57.6)	84 (42.4)
I understand when is the best time to take my medication in relation to food and timing of dose	185 (93.4)	13 (6.6)
I have good understanding of drug–drug interactions and which complementary/supplementary/OTC/non-prescribed medication they should avoid taking with their current prescribed medication	46 (23.2)	152 (76.8)
I know where is the best place my medication, i.e. not in the kitchen/bathroom or anywhere with fluctuations of temperature	189 (95.5)	9 (4.5)
I understand that if I need assistance with managing my medication at home, I can ask my pharmacist to either pack them into a dose administration aid	170 (85.9)	28 (14.1)
I have never forgotten or miss taking my medication	67 (33.8)	131 (66.2)
I have never stopped taking my medication without first consulting my doctor or pharmacist	178 (89.8)	20 (10.1)

uptake of HMR shows that more doctors are utilising this service [22], a recent systematic review however shows that the uptake of MMS by patients continues to be low [23]. In our study, only about 3% of those surveyed had a referral for any of these services.

The increased likelihood of ADRs post-discharge in older adults is characterised by an abrupt shift in responsibility for medication management from hospital care to the patient and community based services [11]. Hospital pharmacists can therefore play a major role in advising patients being discharged of the availability of these MMS. This is pertinent since majority of patients in this study are willing to accept a hospital pharmacist referral for MMS post-hospital discharge.

Furthermore, the number of medications and number of doses of medications used by patients per day increased with age. From the age of 60 years, participants were more likely to take at least five different medications per day. This increased to more than 10 medications per day for those who above the age of 70 years. Although older persons are known to require more medications to treat more disease states, they are also at increased risk of ADRs due to age associated metabolic changes and decreased drug clearance [24].

Increased pill-burden has been associated with increased risk of non-adherence to medications and increased hospitalisation from the age of 60 years [25] and, consuming more than four medications increases the risk of falls among adult patients with diabetes [26]. In addition, a review by Sorenson and associates identified many additional ADR risk factors including: a strong relationship between the number of medications taken and the incidence of ADRs; and the storage of medication in multiple locations [27]. Hence, access to MMS may assist in reducing patients' risk of ADRs and inappropriate storage of medications.

Participants expressed confidence in their own ability to self-manage medications but reported that brand substitution affects their capacity to effectively manage their own medications, and they may forget to take their medication as prescribed. This is in line with studies showing that changes to packaging and pill colour may result in decreased medication adherence due to confusion [28, 29]. Therefore, community pharmacists can be vital in improving medication adherence by providing the required education to patients whenever a brand substitution occurs.

The strength of this study is that it attempts to sample all eligible patients that presented within the study period

and the characteristics of those who declined was analysed. Furthermore, the population that responded reflects the age-group that is associated with medication related problems in the community. Limitations of this study include its reliance on patient self-reporting which is susceptible to bias. Importantly, our data were collected in 2014, a more recent data may reveal a different result. Furthermore, because this was a study on patients' awareness and use of MMS, no blood glucose monitoring information was obtained to confirm adequacy of diabetes treatment. This could be a basis for further research. Finally, while there were 189 participants the study was carried out in one hospital, limiting generalisability.

Conclusion

Hospitalised patients are unaware of MMS which are known to improve their understanding, ability to better manage their medications, and reduce their frequency of hospital presentation. These individuals get confused with brand changes and do not have an adequate understanding of adverse effects or interactions associated with their medications. Adherence is affected as patients either forget to take their medications or may miss some doses. Given that medication adherence is central to the effective management of several medical conditions, increased patient education regarding the availability and benefit of these services is essential. Adequate counselling with respect to brand substitutions and increasing patients' awareness of MMS could potentially decrease the rate of medication-related hospital admissions.

Conflicts of interest Authors K.P.L. and A.D.A declare that they have no conflict of interest.

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