



Original Article

Photographs and medication imprint codes on medicine bags improve safety of medication use in a medical ambulatory clinic

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ABSTRACT

Objectives: This study evaluated the effectiveness of photographs of a medication and medication imprint codes printed on a medicine bag on safe drug use.

Materials and Methods: Surveys were developed for outpatients and pharmacists. The survey for outpatients was designed to investigate whether patients would use a picture and imprint code on the medication bag to verify their drug and whether they found the picture and imprint code helpful in improving the safety of drug use. The survey designed for pharmacists investigated the effects of a picture and imprint code on medication bags on the drug dispensing error rate of pharmacists and on their work satisfaction.

Results: The use of a medication photograph by the public increased from 66.7% to 80% ($p = 0.004$), while that of the medication imprint code increased from 51.5% to 74.5% ($p < 0.001$). The percentage of people who felt that medication photographs on a medicine bag were helpful for safety increased from 63.6% to 82% ($p < 0.001$), and of those who felt that medication imprint codes on the medicine bag were helpful increased from 52.5% to 77% ($p < 0.001$). All pharmacists thought that printing the photograph and imprint code of a medication was helpful in making medications safer to use. The monthly average medication dispensing error rate decreased from 0.042% to 0.034%.

Conclusion: Printing medication photographs and imprint codes on medicine bags may help patients and pharmacists use medications more safely.

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1. Introduction

Medication therapy is the most common form of medical treatment and it carries potential risks if used inappropriately [1]. A medication error is a failure in the treatment process that can, or has the potential to, harm the patient [2]. The majority of patients experience only mild side effects, although some may encounter severe or even fatal consequences. Adverse events have been caused by errors in prescribing, dispensing, administration, and monitoring of medications. Cooperation between the patient and a multidisciplinary healthcare team can prevent such errors.

One study demonstrated a wide range of medication errors in community pharmacies. On average, around 22 near misses and four dispensing errors were reported for every 10,000 items dispensed in the UK [3]. Another study in 2005 showed that dispensing errors occur in about 2% of all dispensed items, with about one in 100 missed by the final check [4]. Focusing on error reduction efforts by selecting the correct drug for the correct patient will likely yield the best results in reducing dispensing errors, because these errors accounted for 55 (67.1%) of the 82 reported errors in one study [5]. According to an American observational study of prescription dispensing accuracy and safety in 50 pharmacies, dispensing errors are a nationwide problem, occurring at a rate of about four errors per day in a pharmacy filling 250 prescriptions daily. An estimated 51.5 million errors occur during the filling of 3 billion prescriptions each year [6].

Large hospitals in Taiwan usually have busy outpatient pharmacies. Patients often wait for a long time to receive their

Conflict of interest: none.

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medication, especially during busy periods, and may leave without talking to a pharmacist about how to take the medication or confirming that the prescription has been filled correctly. Unless patients have taken the medications previously, they will not be able to tell whether the medicines are incorrect. If a wrong drug has been dispensed, the patient may suffer serious adverse events.

Given the importance of patients' active participation in the safe use of medicines, there is a need for a method to help patients ensure that they have the correct medications. As such, most medical institutions in Taiwan print a description of a medication's appearance on the medicine bag. However, according to data from the Department of Household Registration in Taiwan in 2012, more

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請仔細核對藥袋上的姓名、藥袋總數、藥品名稱、外觀及數量
 Please verify patient name, total bag number, drug name, appearance and quantity.

Fig. 1. Medication photograph and medication imprint code printed on the medicine bag.

than 15% of the population in a southern region (Yunlin and Chiayi Counties) were elderly and poorly educated (66% with an education level \leq elementary school; 11% illiterate), who might not be able to read the warnings on a medicine bag.

In Japan, an interesting study was conducted in 2007 to determine the rate of drug-dispensing errors with the use of medicine bags printed with photographs of prescribed medicines. Results showed that approximately 25% of errors were discovered at the providing stage as a result of photographs on the medicine bags. Error types such as using the wrong contents, dispensing the wrong drugs, and missing drugs were often discovered because of the printed photographs. Thus, photographs were assumed to contribute to the discovery of drug-dispensing errors [7].

Pharmacists have been experimenting with ways to reduce the rates of dispensing errors, although few studies have measured their impact. From the perspective of pharmacy quality assurance, pharmacists should also intensify checking of prescriptions to reduce prescription errors and should communicate with patients in a better way. Additional studies are still needed [8]. Therefore, the purpose of this study was to evaluate the effects of printing medication photographs and medication imprint codes on every medicine bag (Fig. 1) on the safe use of drugs. The effects on safe medicine use were assessed based on the following factors: (1) reduction in the error rate of pharmacists in dispensing

medications and (2) satisfaction of patients and pharmacists with the use of photographs.

2. Materials and methods

2.1. Measures

Surveys were developed for pharmacists and patients in an ambulatory medical clinic, and included items on the usefulness of and satisfaction with a “medication photograph” and “medication imprint code” on the medicine bag for the public. The survey for patients was designed to investigate whether they would use the medication photograph and imprint code printed on the medicine bag to verify their medication and whether they found them helpful in using the medication more safely (Fig. 2). A survey designed for pharmacists investigated the effects of the photograph and imprint code printed on the medicine bag on their medication dispensing error rate and dispensing work satisfaction (Fig. 3).

The surveys for patients and pharmacists included two sections. Section 1 concerned personal characteristics of the study participants. Section 2 of the survey for patients comprised eight questions. Answers to the first three questions were yes or no, and the other four questions were graded on a five-point Likert scale. The last question was designed as an open-ended question. Section 2 of the survey for pharmacists comprised 10 questions. Answers to the



1.	Will you check the photographs of prescribed medications printed on the medicine bag? <input type="checkbox"/> Yes <input type="checkbox"/> No
2.	Will you read the medication imprint code marked on the medicine bags? <input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Will you introduce this practice to your relatives and friends? <input type="checkbox"/> Yes <input type="checkbox"/> No
4.	The medication photograph printed on each medicine bag can make medications safer to use. <input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
5.	Use of the medication imprint code is helpful in identifying the correct medication. <input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
6.	Degree of satisfaction with implementation of the medication photograph printed on each medicine bag <input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
7.	Degree of satisfaction with implementation of the medication imprint code marked on each medicine bag <input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
8.	Do you have any suggestions for the medication imprint code or medication photograph printed on the medicine bag?

Fig. 2. Survey for medical clinic ambulatory patients.

first five questions were yes or no, and the other four questions were graded on a five-point Likert scale. The last question was designed as an open-ended question.

The reliability of Surveys 1 and 2 was estimated using Cronbach α . Items in the survey were selected after cognitive interviews with five senior pharmacists who were not included in this study. Subsequently, a pilot study was conducted in a small group that included five pharmacists and five patients.

The survey was first distributed from July 22, 2008 to July 25, 2008. Participants were in a patient group ($n = 200$) sampled from a medical ambulatory clinic of the outpatient pharmacy between 10 AM and 12 noon (Survey 1). Pharmacists who were responsible for dispensing medication ($n = 34$) were selected. To make sure that the survey was complete and reliable, a trained research assistant was available to assist every patient who needed help completing the survey. A standard approach was used for all interviews in the patient group. The pharmacists completed the surveys themselves. The medication dispensing error rates prior to and after printing the medication photographs and imprint codes on the medicine bags were compared.

The first three questions of the survey for patients used “yes” or “no” questions to evaluate patients’ agreement with the following: (1) using photographs of prescribed medications marked on the medicine bag to check for correct medications; (2) reading the imprint code marked on the medicine bags; and (3) introducing this practice to their relatives and friends.

The fourth to seventh questions of the survey for patients used a five-point Likert scale, with ratings of 1 indicating “fully disagree/

dissatisfied” to 5 indicating “fully agree/satisfied”, to measure patients’ opinions regarding the following: (1) usefulness of the medication photograph printed on the medicine bag in improving medication safety; (2) effectiveness of the medication imprint code on the medicine bag in improving medication identification; (3) satisfaction with the medication photograph printed on the medicine bag; and (4) satisfaction with the medication imprint code printed on the medicine bag. The last question of the survey for patients used one open-ended question to elicit suggestions from patients.

Based on the findings of Survey 1, the medication imprint code on the medicine bag was printed in a larger font. In addition, promotional activities were implemented, and patients were told how to use the medication photograph. Survey 2 was distributed in February 2009 with the same contents as of Survey 1 for another 200 patients at an ambulatory medical clinic.

2.2. Implementation of promotional activities

Patients were provided with a “promotion card” and underwent a month-long training program on the use of the “medication photograph” and “medication imprint code” printed on medicine bags. After December 2008, posters were displayed in clinics and outpatient pharmacies. The slogan “Take a good look at your medications!” was released in the health education column of the clinic schedule in December 2008 and January 2009. In January 2009, a short play and quiz were held on the Pharmacist Day to educate the public on how to use the information provided on the medicine bag.



1.	Will you check the medication photograph printed on the medicine bag while dispensing?
	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.	Will you read the medication imprint code printed on the medicine bag while dispensing?
	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Will you check the medication photograph printed on the medicine bag while checking?
	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.	Will you read the medication imprint code printed on the medicine bag while checking?
	<input type="checkbox"/> Yes <input type="checkbox"/> No
5.	Will you introduce this practice to relatives and friends?
	<input type="checkbox"/> Yes <input type="checkbox"/> No
6.	The medication photograph printed on each medicine bag can make medications safer to use.
	<input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
7.	Use of the medication imprint code is helpful in identifying the correct medication.
	<input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
8.	Degree of satisfaction with implementation of medication photographs printed on each medicine bag
	<input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
9.	Degree of satisfaction with implementation of medication imprint codes marked on each medicine bag
	<input type="checkbox"/> 5 (fully agree/satisfied) <input type="checkbox"/> 4 (agree/satisfied) <input type="checkbox"/> 3 (not sure) <input type="checkbox"/> 2 (disagree/dissatisfied) <input type="checkbox"/> 1 (fully disagree/dissatisfied)
10.	Do you have any suggestions for the medication imprint code or medication photograph printed on the medicine bag?

Fig. 3. Survey for the pharmacists.

2.3. Statistical analysis

We calculated the reliability to evaluate the quality of the survey. Evaluation of the internal consistency (Cronbach $\alpha \geq 0.70$) for newly developed scales was recommended. Statistical analyses were performed using SPSS version 15.0 statistics software (SPSS Inc., Chicago, IL, USA). The Wilcoxon rank sum test was used to find the significance of study parameters between the two groups of patients. Significance was assessed at the 5% level.

3. Results

Completion rates of Surveys 1 and 2 for outpatients were 99% and 100%, respectively (198 and 200 copies). Internal consistencies of Surveys 1 and 2 were comparatively satisfactory (Cronbach $\alpha = 0.84$ vs. 0.86). No differences in personal characteristics were reported between the two patient groups in terms of sex, age, education, occupation, and residential area. Most of the patients were females, aged 40 years or older, and from Chiayi County or Chiayi City. The patients included retirees, soldiers, students, and service personnel (Table 1). The response rate of pharmacists was 84% (34/36); 32% were men and 68% were women. Most pharmacists had a college education (88%), and 12% had a master degree. In addition, they were between 26 years old and 39 years old (Table 2).

In Survey 1, 66.7% (132/198) of patients reported comparing the medication with the photograph on the medicine bag, 51.5% (102/198) compared the medication imprint code with the imprint code on the medicine bag, and 61.6% (122/198) told friends and relatives that the hospital provided a photograph and imprint code on the medicine bag (Table 3).

After promotional and improvement measures, the results of Survey 2 showed that 160 patients (80%) checked whether the appearance of the medication received was identical to the photograph on the medicine bag, 149 (74.5%) checked whether the medication imprint code was consistent with the code on the medicine bag, and 155 (77.5%) helped promote the use of the medication photograph and medication imprint code on the medicine bag to relatives and friends. The use of the medication photograph by the public increased from 66.7% to 80% ($p = 0.004$), whereas that of the medication imprint code increased from 51.5% to 74.5% ($p < 0.001$). The rate of introduction of this measure to family and friends increased from 61.6% to 77.5% ($p < 0.01$; Table 3).

Table 1
Demographic characteristics of the two questionnaire groups.

Categories	Basic information	Survey 1 N (%)	Survey 2 N (%)	p
Sex	Male	95 (48)	78 (39)	0.088
	Female	103 (52)	122 (61)	
Age (y)	25	22 (11)	19 (10)	0.229
	26–39	41 (21)	42 (21)	
	40–64	98 (49)	85 (43)	
	65	37 (19)	54 (27)	
Education	≤Junior high	83 (42)	83 (42)	0.987
	>Junior high	115 (58)	117 (58)	
Occupation	Homemakers	54 (27)	53 (27)	0.095
	Farmers	15 (8)	32 (16)	
	Laborers	14 (7)	18 (9)	
	Merchants	21 (11)	22 (11)	
	Public officials	8 (4)	9 (5)	
	Others	86 (43)	66 (33)	
Residential area	Chiayi	79 (40)	94 (47)	0.358
	Yunlin	71 (36)	64 (32)	
	Others	48 (24)	42 (21)	

Table 2
Demographic data of the pharmacists.

Demographics		<i>N</i>	%
Sex	Male	13	38
	Female	21	62
Age (y)	<25	10	29
	26–39	22	65
	40–64	2	6
Education level	College	30	88
	Graduate	4	12
Seniority (y)	<0.5	9	26
	0.5–1	5	15
	1–2	6	18
	2–3	4	12
	3–4	1	3
	4–5	0	0
	>5	9	26
Service unit	Outpatient	20	59
	Inpatient	8	24
	Others	6	18

The percentage of patients who considered the medication photograph on the medicine bag helpful for improving medication safety increased from 63.6% (126/198) to 82.0% (164/200; $p < 0.001$), whereas those who thought that the medication imprint code on the medicine bag was helpful for safety increased from 52.5% (104/198) to 77% (154/200; $p < 0.001$). The percentage of those satisfied with the medication photograph increased from 42.9% (85/198) to 75.5% (151/200; $p < 0.001$), whereas that for the medication imprint code increased from 37.9% (75/198) to 74.5% (149/200; $p < 0.001$; Table 4). Ten patients suggested the use of color prints, which unfortunately was too costly for the study hospital.

Through the promotion of medication safety conducted by pharmacists, $\geq 70\%$ of patients held a positive attitude toward printing medication photographs on the medicine bag, and 80% used it to verify the correctness of medications received.

While dispensing the medicine, approximately 85.3% (29/34) of pharmacists reported that they compared the appearance of the medication with the photograph on the pouch and 76.5% (26/34) compared the medication imprint code with that on the medicine bag. Similarly, for verification of the medicine, 88% (30/34) of the pharmacists examined whether the medication appearance matched the photograph on the medicine bag and 82.4% (28/34) examined whether the medication imprint code matched that on the medicine bag (Table 5). All of them thought that printing the medication photograph and imprint code was helpful or very helpful in improving the safe use of drugs, and 82.4% and 94.1%, respectively, were “satisfied or very satisfied” with having the photograph and imprint code printed on the medicine bag (Table 6).

Comparing medication dispensing error rates from the 630,852 outpatient prescriptions in 2008 showed that the monthly average

Table 3
Comparison of the use of medication photograph and medication imprint code printed on the medicine bag prior to and after promotion.

Contents of survey	Survey 1 N (%)	Survey 2 N (%)	p ^a
1. Will you check the photographs of prescribed medications marked on the medicine bag? (Yes)	132 (66.7)	160 (80.0)	0.004
2. Will you read the imprint code marked on the medicine bags? (Yes)	102 (51.5)	149 (74.5)	<0.001
3. Will you introduce this practice to your relatives and friends? (Yes)	122 (61.6)	155 (77.5)	<0.01

^a Wilcoxon rank sum test.

Table 4Satisfied with the medication photograph and medication imprint code prior to and after promotion ($n = 198$ vs. $n = 200$).

Contents of the questionnaire		Total	Opinion N (%)					p^a
			1	2	3	4	5	
Q1. Medication photographs printed on each medicine bag will make medications safer to use	Survey 1	198 (100)	4 (2)	17 (8.6)	51 (25.8)	117 (59.1)	9 (4.5)	<0.001
	Survey 2	200 (100)	0 (0)	12 (6.0)	24 (12)	127 (63.5)	37 (18.5)	
Q2. Medication imprint code printed on each medicine bag is helpful to identify the correct medication	Survey 1	198 (100)	4 (2)	23 (11.6)	67 (33.9)	98 (49.5)	6 (3)	<0.001
	Survey 2	200 (100)	0 (0)	9 (4.5)	37 (18.5)	114 (57)	40 (20)	
Q3. Degree of satisfaction with the photographs printed on the medicine bag	Survey 1	198 (100)	2 (1)	12 (6.1)	99 (50)	62 (31.3)	23 (11.6)	<0.001
	Survey 2	200 (100)	0 (0.0)	1 (0.5)	48 (24)	120 (60.0)	31 (15.5)	
Q4. Degree of satisfaction with the medication imprint code	Survey 1	198 (100)	3 (1.5)	15 (7.6)	105 (53)	56 (28.3)	19 (9.6)	<0.001
	Survey 2	200 (100)	0 (0)	1 (0.5)	50 (25)	117 (58.5)	32 (16)	

^a Wilcoxon rank sum test.

rate prior to printing the photograph of the medication on the medicine bag was 0.042%. After the photograph was included, this decreased to 0.034%. Moreover, because the photographs were available on each medicine bag, the time needed for pharmacists to check the medication decreased. Therefore, the overall average waiting time of the patients at the pharmacy also decreased, from 12.6 minutes to 11.5 minutes.

4. Discussion

Hospital pharmacies in Taiwan usually have high volumes of prescriptions for both in- and outpatients. Limited time for dispensing, enormous amount of drugs stored, and continuous marketing of new drugs that stretch the pharmacists' basic drug knowledge all these factors increase the chances of drug-dispensing errors [9]. For patients with low literacy, combining easy-to-read written patient education materials with verbal directions and culturally sensitive illustrations may improve compliance with therapy [10]. However, many patients, irrespective of literacy skills, receive inadequate verbal or written instructions on the use of their medications [11–13]. Many high-volume clinic physicians are busy and may not track their patients to ensure that these patients understand the instructions and use medications accurately [14].

Patients with low literacy are often embarrassed to ask health-care staff for help with understanding directions [15]. Without such help, they are likely to misinterpret written instructions, leading to medical errors and noncompliance. Thus, providing essential drug information that is available readily in a useful form to encourage patients to participate actively in their own medication safety is crucial.

Survey results and statistics show that printing a photograph and medication code on the medicine bag makes medicines safer to use and the pharmacy more efficient. However, photographs are in black and white because a color laser printer is too costly. As a

result, patients or pharmacists may have difficulty identifying the medications if the drugs have similar shapes. Some patients and pharmacists recommended the use of color photographs.

Patients are not informed about the use and purpose of the medication photograph and imprint code on the medicine bag in advance. By contrast, pharmacists understand the value of such details. This disparity may have caused significantly lower satisfaction ratings by patients than that by pharmacists. Less than 70% of patients answered “yes” on the first three questions in Survey 1. After promotional activities, patient satisfaction of the products increased significantly.

This is the first study that describes the effects of medication photograph printed on each medicine bag in English literature. Significant reductions were reported in dispensing error rates and dispensing time for pharmacists. Photographs and imprint codes on medicine bags can improve the safety of medication use in several ways. First, pharmacists can compare the appearance of the medication with the photograph and match the medication imprint code with that described on the pouch when they dispense the drug. Second, patients can be included as active partners in safe medication use by checking the photograph and imprint code to make sure that they have received correct medications. Third, satisfaction of both pharmacists and patients increases as the dispensing error rate and waiting time of patients at the pharmacy decrease.

In the future, the use of color photographs is recommended to overcome difficulties in identifying the medications with similar shapes when black and white photographs are used.

Although the study includes 398 patients and 34 pharmacists, the results should be interpreted with caution because of the following limitations. First, the external validity of the study results

Table 5Results of pharmacists' survey ($n = 34$).

Contents of survey	Results (total 34)	
	Yes N (%)	No N (%)
1. Will you check the medication photographs printed on the medicine bag while dispensing?	29 (85.3)	5 (14.7)
2. Will you read the medication imprint code printed on the medicine bag while dispensing?	26 (76.5)	8 (23.5)
3. Will you check the medication photographs printed on the medicine bag while checking?	30 (88.2)	4 (11.8)
4. Will you read the medication imprint code printed on the medicine bag while checking?	28 (82.4)	6 (17.6)

Table 6

Result distributions of the five-point scale survey in the group of pharmacists.

Contents of the survey	Opinion				
	1 Point N (%)	2 Points N (%)	3 Points N (%)	4 Points N (%)	5 Points No. (%)
1. Medication photographs printed on each medicine bag will make medications safer to use	0 (0)	0 (0)	0 (0)	15 (44.1)	19 (55.9)
2. Medication imprint code printed on each medicine bag is helpful to identify the correct medication	0 (0)	0 (0)	0 (0)	13 (38.2)	21 (61.8)
3. Degree of satisfaction with the photographs printed on the medicine bag	0 (0)	0 (0)	6 (17.6)	16 (47.1)	12 (35.3)
4. Degree of satisfaction with the medication imprint code	0 (0)	0 (0)	2 (5.9)	18 (52.9)	14 (41.2)

was limited by the study design and participants. This study adopted a convenience sampling method, with all the participants being from a single teaching hospital. It violates assumptions of statistical hypothesis testing, and future research should use true random samples. Second, the survey results were not connected to medication safety indicators for patients. That is, the study does not assess differences in improving the safety of medication use in patients prior to and after promotional activities for the same patient group. If further studies support a correlation between the satisfactory use of medication photographs and medication safety parameters, the survey can be developed into a more predictive indicator for patients' medication safety than the existing complicated tools investigating adverse drug events. Last, the content validity of the surveys was assessed only by a pilot study.

In conclusion, printing medication photographs on medicine bags may help patients identify medicines and use them more safely. These photographs also help pharmacists verify drugs quickly during the dispensing process and decrease the incidence of errors. In the future, by using color photographs of medications on medicine bags the actual medicine can be represented more accurately, thereby increasing its safe use.

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