

# Medication literacy status of outpatients in ambulatory care settings in Changsha, China

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## Abstract

**Objective:** To assess medication literacy status and to examine risk factors of inadequate medication literacy of outpatients in ambulatory care settings.

**Methods:** Study participants were recruited randomly from outpatient departments in four tertiary hospitals (Xiangya Hospital of Central South University, Second Xiangya Hospital of Central South University, Third Xiangya Hospital of Central South University, People's Hospital of Hunan Province) in Changsha, Hunan, China, between October 2014 and January 2015. Medication literacy was assessed using the Medication Literacy Scale, Chinese version. Demographic and clinical data were collected using structured interviews. Multiple logistic regression analysis was used to estimate the independent effects of demographic and clinical factors on medication literacy.

**Results:** Of 465 participants, 425 (91.4%) produced valid responses for analysis. The mean medication literacy score was 8.31 (standard deviation = 3.47). Medication literacy was adequate in 131 participants (30.8%), marginally adequate in 248 (58.4%), and inadequate in 46 (10.8%). The risk of inadequate medication literacy was greater for older and unmarried patients but lower for more educated patients.

**Conclusion:** Many Chinese outpatients in ambulatory care have inadequate medication literacy. Greater age, low education, and unmarried status are important risk factors of inadequate medication literacy.

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**Introduction**

Nearly half of global medication use is irrational.<sup>1</sup> According to the Institute of Medicine, 1.5 million adverse drug events are reported in the United States annually and half a million of these occur in non-hospitalized patients.<sup>2</sup> In China, between 12% and 30% of medication use in patients is irrational.<sup>3</sup> Moreover, about 25% of patients in China visit physicians because of adverse events; at least 2.5 million patients are admitted to hospital because of adverse drug events each year,<sup>4</sup> a trend that is increasing.<sup>5</sup> Previous studies have found that a lack of close compliance with doctor's orders after hospital discharge is caused, at least in part, by a lack of medication literacy.<sup>6-8</sup> Medication literacy has been defined as the ability of individuals to access, to appropriately understand, and to adequately act on basic medication information, and to make the right decisions accordingly.<sup>9,10</sup> It is an important predictor of correct medication use.<sup>9,10</sup> Research on the medication literacy status of non-hospitalized patients in China is sparse. Therefore, we conducted this study to assess medication literacy status and to examine risk factors of inadequate medication literacy in a cohort of outpatients in China.

**Patients and methods****Patients**

Outpatients from four tertiary hospitals (Xiangya Hospital of Central South University, Second Xiangya Hospital of Central South University, Third Xiangya Hospital of Central South University, and the People's Hospital of Hunan Province,

each with > 500 inpatient beds) in Changsha, Hunan, China, were invited to participate between October 2014 and January 2015. Participants' written informed consent was obtained. We obtained approval from the ethics board of each participating hospital before the study began. The eligibility criteria for participation were as follows the following: older than 18 years, competent language communication ability, mentally stable, and currently taking at least one medication. Exclusion criteria included the following: inpatients, engaged in health care-related work currently or before retirement, mentally unstable or major mental disorder, and cancer or other severe systemic diseases that affect participation.

**Data collection**

Demographic and clinical data were collected using structured interviews. Medication literacy was assessed using the Chinese version of the Medication Literacy Scale (MedLitRxSE). This scale was originally developed by Saucedo et al.<sup>9</sup> from the University of Texas at El Paso in the United States.<sup>10</sup> The scale consists of four case scenarios, with 14 items and a dichotomous scoring system (correct, 1; incorrect, 0). The maximum scale score is 14; higher scores indicate greater medication literacy.

According to the principle of calculation formula of the distinction degree, which is used in the educational statistics, the scores were classified into three groups: inadequate literacy (<4), marginal literacy (4-10), and adequate literacy (>10). We obtained permission from Saucedo et al.<sup>9</sup> to translate the scale into Chinese and modified it to suit the

Chinese culture. The validity and reliability of the Chinese version of the MedLitRxSE has been published elsewhere.<sup>11</sup> In brief, the Chinese version has validity and reliability equivalent to the original English version, with internal consistency reliability (the Kuder–Richardson Formula 20 = 0.81). The confirmatory factor analysis indicated overall good model fit: the root mean square error of approximation was 0.08,  $\chi^2/df$  was 3.06, Bentler's comparative fit index was 0.94, and the goodness of fit index was 0.91.<sup>11</sup>

### Data analyses

SPSS version 19.0 (2010, IBM Corp., Armonk, New York, United States) was used for all analyses. Descriptive statistical analyses were used to analyse demographic information. We used t-tests, analysis of variance, and the Kruskal–Wallis H test for the univariate analysis. Logistic regression analysis was used to analyse the independent effects of determinants of medication literacy.

### Results

A total of 465 outpatients were enrolled in the study; of these, 425 (91.4%) completed the questionnaires and were included in the final analysis. The basic characteristics of respondents who completed the study are shown in Table 1. Of the 425 participants, 62.8% were male and 16.2% were not married.

### Medication literacy of outpatients

Of the 425 participants, 248 (58.4%) had marginal medication literacy, 46 (10.8%) had inadequate medication literacy, and 131 (30.8%) had adequate medication literacy.

The assessment of medication literacy by case scenario is shown in Table 2. For Case Scenario 1, 27.7% of participants did not

**Table 1.** Characteristics of participants.

Variable name	No. of participants (N = 425)	Percentage (%)
<b>Gender</b>		
Male	267	63
Female	158	37
<b>Age (years)</b>		
≤25	11	3
26–35	30	7
36–45	31	7
46–55	43	10
56–65	142	33
>65	168	40
<b>Employment</b>		
Full-time	138	32
Unemployed/ Retired	287	68
<b>Education (years)</b>		
≤6	138	32
7–9	179	42
10–12	56	13
13–16	45	11
>16	7	2
<b>Marital status</b>		
Married	356	84
Unmarried	69	16
<b>Monthly income (¥)<sup>a</sup></b>		
<1000	47	11
1000–3000	147	35
>3000	231	54
<b>Number of health problems</b>		
1	192	45
2	150	35
≥3	83	20
<b>Number of medicines currently taken</b>		
1	69	16
2–3	91	21
4–5	118	28
≥6	147	35

¥1 = US\$0.1545.

know how many times their mother should inject the required medication and less than half (48.3%) knew where their mother should inject the medicine. For Case Scenario 2, 48.9% of the participants knew

**Table 2.** Medication literacy by case scenario for outpatients, Changsha, Hunan, China, October 2014 to January 2015 (n = 425).

Item	Percentage with correct answer
<b>Case Scenario 1</b>	
a1 According to the label, how many times per day should your mother inject the medicine?	72.3
a2 Please show me how much medicine you should put into the syringe in the morning, and mark it on the syringe.	62.0
a3 According to the instruction, please tell us or point out the three parts of the body into which your mother could inject the medicine.	48.3
a4 According to the instruction, please tell me what is the correct angle at which you should inject the medicine.	55.5
a5 Looking at the prescription, if your mother's medicine has run out, from whom should you get a new prescription?	63.6
<b>Case Scenario 2</b>	
a6 Looking at the instructions on this box, how much of the medicine should you give to your niece?	50.2
a7 If you know the dosage of medicine that your niece needs to take, please mark on the cup to which line you poured the medicine.	48.9
a8 According to the directions, what is the maximum dosage your niece should take?	49.8
<b>Case Scenario 3</b>	
a9 Looking at this prescription, what is the name of the medicine that you need to buy at the pharmacy?	70.4
a10 According to the prescription, how many pills should you take?	64.2
a11 Looking at this bottle, the medicine in the bottle has an action similar to the medicine on the prescription. If you need to take 30 pills to cure the infection, how many boxes should you buy to obtain the correct amount of antibiotic required by the original prescription?	63.9
<b>Case Scenario 4</b>	
a12 Looking at the box, when does the medicine go out of date?	59.8
a13 According to the directions, what is or what are the active ingredient(s) in each pill?	71.0
a14 Please look carefully at the box. For what reason should you stop taking the medicine?	54.2

how to use the cup to measure the dosage and 49.8% knew the maximum dosage of the medicine their niece should take in one day. For Case Scenario 3, 29.6% of the participants did not know the name of the medicine they needed to buy. For Case Scenario 4, 29.0% of the participants did not know the active ingredients of the medicine.

### *Determinants of outpatients' medication literacy*

The univariate analysis results are shown in Table 3. Eight determinants were significantly associated with medication literacy: higher literacy scores were found for participants who were male, younger, married, highly educated, employed, had

**Table 3.** Results of univariate analysis of determinants of medication literacy for outpatients, Changsha, Hunan, China, October 2014 to January 2015 (n = 425).

Variable name	Mean (SD) of total score	t/ H/ F	P
Gender			
Male	8.81 ± 3.36	3.19	<0.01
Female	8.64 ± 3.01		
Age (years)			
≤25	11.50 ± 1.51	123.44	<0.01
26–35	11.39 ± 1.67		
36–45	11.26 ± 2.16		
46–55	10.45 ± 1.80		
56–65	8.95 ± 2.69		
>65	5.97 ± 3.34		
Employment			
Full-time	10.50 ± 2.35	9.64	<0.01
Unemployed/ Retired	7.32 ± 3.45		
Education (years)			
≤6	5.10 ± 2.76	163.78	<0.01
7–9	9.11 ± 2.62		
10–12	10.95 ± 1.53		
13–16	11.79 ± 1.72		
>16	11.80 ± 3.54		
Marital status			
Married	8.62 ± 3.35	3.41	<0.01
Unmarried	6.84 ± 3.749		
Monthly income (¥) <sup>a</sup>			
<1000	6.75 ± 3.61	12.13	<0.01
1000–3000	7.56 ± 3.51		
>3000	9.15 ± 3.20		
Number of health problems			
1	9.03 ± 3.32	5.64	<0.01
2	7.89 ± 3.47		
≥3	7.52 ± 3.56		
Number of medicines currently taken			
1	9.38 ± 3.12	16.50	<0.01
2–3	9.28 ± 2.98		
4–5	7.85 ± 3.24		
≥6	7.63 ± 4.00		

¥1 = US\$0.1545; t, two-sample t-test; H, Kruskal–Wallis test; F, analysis of variance.

a higher income, took fewer medicines, and had fewer health problems.

Table 4 shows the results of the multiple logistic regression analysis. Three factors

showed an independent association with inadequate medication literacy. The risk of inadequate medication literacy was greater for older and unmarried patients, but lower for those with more education.

## Discussion

Our study of a cohort of outpatients in China showed that medication literacy was poor: only 30.8% of the study participants had adequate medication literacy. Analysis by case scenarios revealed some disturbing findings: about half the outpatients did not have detailed knowledge of some aspects of medication, such as dosage (50.2%), side effects (45.8%), and injection sites (51.7%).

We found that older age (>55 years) was independently associated with increased risk of inadequate medication literacy. This finding is consistent with results from studies of other populations.<sup>12–14</sup> As patients age, their cognition, learning, and memory abilities deteriorate.<sup>15,16</sup> Our findings indicate that greater education is associated with better literacy. This is inconsistent with findings from a report by Maniaci et al.<sup>7</sup> This may be because we had a greater percentage of participants with low education than Maniaci et al.<sup>7</sup> As a result, our study may have greater power to detect the effect of education on medication literacy. Our findings also showed that married patients had greater medication literacy. We could not identify any previous studies on the association between marital status and medication literacy. We suggest that married couples provide each other with support, which enhances their medication literacy.

Lack of medication literacy exposes outpatients to increased risk of re-hospitalization, emergency department visits, or serious consequences owing to adverse events related to unsafe medication.<sup>15,17</sup> Medication literacy could be improved by patient education. Adequate and effective communication about medication between

**Table 4.** Results of logistic regression analysis of determinants of medication literacy for outpatients, Changsha, Hunan, China, October 2014 to January 2015 (n = 425).

Effect	b	S <sub>b</sub>	P	$\hat{OR}$	OR (95% CI)
Age (years)	0.66	0.16	<0.01	1.94	(1.42, 2.64)
Education (years of schooling)	-0.93	0.17	<0.01	0.39	(0.28, 0.55)
Marital status (Unmarried)	0.85	0.34	0.01	2.34	(1.20, 4.58)

b, partial regression coefficient; S<sub>b</sub>, standard error; OR, odds ratio; 95% CI, 95% confidence intervals.

patients and health care professionals is a key factor in improving literacy.<sup>13,18</sup>

As patients sometimes cannot remember detailed medication information and guidance verbally communicated by physicians, the provision of comprehensible, written, educational material on medication might help. In addition, follow-up after discharge could remind patients to pay more attention to their medication.

Our study has several strengths. First, to our knowledge, this is the first study to examine outpatient medication literacy in mainland China. Second, we identified several risk factors of medication literacy, including unmarried status, which has not yet been identified as a risk factor in the literature. Third, we used a validated tool to assess medication literacy.

This study has some limitations. First, data were collected from four tertiary hospitals in Changsha. Further studies are needed to determine whether findings from this population can be generalized to populations in other parts of China. Second, the sample size was not sufficiently large, which prevented us from performing more refined analyses, such as item-specific analysis, or examining potential interactions among risk factors.

In conclusion, we found that the medication literacy in outpatients in China was generally low, and older age, lower education, and unmarried status were independent risk factors of inadequate medication literacy. Although prescription drugs are regulated in China, enforcement of these

regulations is often weak, and patients or their relatives can obtain prescription drugs such as antibiotics from local drug stores without a doctor's prescription. Therefore, patient education to improve medication literacy is an important issue in mainland China.

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### Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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