Home Medication Cabinets and Medication Taking Behavior of the Staffs in a University in China

To cite this article: Chengbin Xue et al 2018 IOP Conf. Ser.: Mater. Sci. Eng. 301 012107

View the article online for updates and enhancements.
Home Medication Cabinets and Medication Taking Behavior of the Staffs in a University in China

Chengbin Xue¹, Juan Ye¹, Yuzhen Dong² and Chunmei Xu¹*¹
1School hospital, Huazhong University of Science and Technology, Wuhan 430074, China
2Wuhan University, Wuhan 430074, China; Email: *xcb-2000@163.com

Abstract. Background: A growing sum of medicines is stored in home medication cabinets in China, with the behavior of self-medication increasing. Although responsible self-medication can help prevent and treat ailments that do not need professional consultation, it bears the risk of misuse of medicines issued on prescription due to inadequate prescription medicine administration. Objective: The objective of this study was to investigate the condition and safety of medication storage and intended self-medication in a University in China. Method: The study was conducted over 10 month period (May 2015–March 2016) and involved a random sample of households. The questionnaire survey and personal insight into household medicine supplies was performed by a team of trained pharmacy staffs. Interviewees (N = 398, aged 16–88 y) were visited door to door and the home medication cabinets were catalogued after the participants were interviewed. Results: The majority (89.71%) households have home medicine cabinets. The total number of medicine items in the 398 households was 5600, with a median of 14 per household. The most frequently encountered categories of registered medicines were cough and cold medicines (47.8%), antibacterials for systemic use (30.0%), topical products for joint and muscular pain(26.1%), vitamins (23.2%), medication for functional gastrointestinal disorders (23.2%), oral and external forms have not kept separately(55.1%). The most treatment related problems recorded were curative effect not ideal (57.9%). 68% of the sample population would choose doctors as medication consultation object about medicines purchased. Conclusion: Large sum of medicines were found per household, with a high prevalence of cough and cold medicines. Public services in China, mainly government and health organizations, need put more effort on educating people on how to store medicines, as well as finding a way to raise awareness of the public in promoting behavioral change about medication use.

1. Introduction
With the growing public awareness of health and health care products, the individual’s management of medicines and perspective of self-care should raise concern [1]. Different types of drugs are stored at home for future self-medication[2], when only manufacturers’ standard package sizes are used and drug repackaging to tailored amounts is not allowed[3-4], especially in the context of a growing elderly population. Home medication cabinets can prevent prescription drug abuse and drug overdose epidemic at some level. Inappropriate use of drugs might have serious adverse health consequence to individuals and society [6–8]. Medication errors can arise from human errors and/or systems failures. Such inevitable accident imposes health risks and economic loss both on individual and society. It is concluded by a Spanish study that the inappropriate storage of drugs in households is an important factor that increase the cost, reduce the efficiency and decrease the quality of medicinal treatment at
the community level [9]. Since 1997, both the number of death attributed to prescription drug misuse and the number of emergency room visit have quadrupled. It is argued by some author that the accident might related to the unreadability of the package insert [4], it could be lost or faded away as time goes by [10]. A similar study showed that in Russia, antibiotics were widely stocked among the population and used in an uncontrolled and imprudent way [11]. Some studies have found adolescents' nonmedical use of prescription medications to be associated with alcoholic use or illicit drug abuse [12]. Drug overdose have become the leading death cause by injury in the United States now [5]. Apart from drug abuse, the improper storage and disposal of medicine is another fact that might have serious public health consequence, including accidental poisoning and drug diversion caused prescription drug abuse. For example, in the United States, each day more than two thousand people are treated in emergency room as a result of unintentional medication poisoning [13]. Therefore, this study was to investigate the condition and safety of medication storage and intended self-medication in a university in China, which defined as taking medicines to treat illness without consultation of a health care professional, with an emphasis on self-medication with prescription-only medications (POM) in different types of households.

2. Ethical Approval
The objective of this study was to explore the nature and safety of medication storage and intended self-medication in a University in China.

3. Methods
This study, lasted from May 2015 to March 2016, was conducted by clinical pharmacists enrolled in the clinical pharmacy in a university hospital in Wuhan, China. Before the initiation of the study, approval by the research ethics committee was acquired. At least 10% of the households in the university community were included as designed (about 30, 00 household). To reach different types of patients, all clinical pharmacists were participated. Each clinical pharmacist recruited 4 people entering the hospital outpatient hall starting at two different time points of the day; refusals were recorded anonymously and excluded. Recruitment criteria were age between 18 to 80 years, sufficient fluency in Chinese, and acceptance of being visited and interviewed. Participants were informed of the purpose of the study prior to their consent.

Demographic characteristics such as gender, age, household composition, education level were recorded by interview, while the condition of medicine supplies was recorded by inspecting the home medication cabinets and interviewing with a set of questionnaire. The conditions of medicines include storage condition (centralized location, appropriate storage temperature and humidity, accessibility by children or demented patients) and itemization (categories and quantity) of all drugs existed. Families without full cooperation, mostly refusal of showing all medicines at home or answering all questions were excluded from the interview. All medicines in the household were inspected and the questionnaire was completed with the presence of household member(s) during the interview. Besides home medication cabinets, medicines inspected were taken out from bathrooms, kitchens, and all other potential storage places. The questionnaire was developed based on existing literature [4, 15-17];

4. Data Analysis
Statistical data analysis was performed using SPSS 14.0 for Windows (SPSS Inc., Chicago, IL) software. Descriptive statistics on the distribution of number of packages in the surveyed households was performed. Variables identified as significant in univariate analysis were further tested in bivariate logistic regression analysis. p values ≤0.05 were considered significant.

5. Results
A total of 428 households were interviewed and surveyed, families lacking of full cooperation were excluded from the study. Detailed total numbers of households vary from each category for their cooperation willingness. As demographic features showed in table 1, average age of the interviewees were 51.8 ± 13.54 (mean ± SD) years. The percentage of male to female was 54.75% to 45.25 % (Table1). 44.0% of the interviewees answered the question had university education
background and 59% of the interviewees were retired. The majority (67.84%) of the interviewees who provided their information concerning their monthly income (n = 398) reported their monthly income higher than average (3000 RMB, equal to about 431 US dollars) (Table 1).

### Table 1. Demographic features of household members

| Parameter                                | Number | Percentage |
|------------------------------------------|--------|------------|
| Gender (N = 400)                         |        |            |
| Female                                   | 219    | 54.75      |
| Male                                     | 181    | 45.25      |
| Age (N = 396)a                           |        |            |
| 36–45                                    | 94     | 23.73      |
| >45                                      | 302    | 76.27      |
| Education level (N = 400)                |        |            |
| primary school                           | 22     | 5.50       |
| junior middle school                     | 45     | 11.25      |
| senior middle school                     | 157    | 39.25      |
| College and above                        | 176    | 44.00      |
| Working situation(N = 398)               |        |            |
| Working                                  | 131    | 32.92      |
| -retirement                              | 235    | 59.04      |
| Other                                    | 32     | 8.04       |
| Self-reported health(N = 394)            |        |            |
| Poor                                     | 158    | 40.10      |
| Fair                                     | 135    | 34.26      |
| Good                                     | 101    | 25.64      |
| Chronic morbidity(N = 395)               |        |            |
| No                                       | 105    | 26.58      |
| Yes                                      | 290    | 73.41      |
| Smoking (N = 400)                        |        |            |
| No                                       | 338    | 84.92      |
| Yes                                      | 60     | 15.08      |
| Income Ren Min Bi (RMB) (N = 398)        |        |            |
| <3000 RMB                                | 128    | 32.16      |
| >3000 RMB                                | 270    | 67.84      |

Regarding the general aspects of the home medicine cabinet, 89.71% of the interviewees kept their medicines in one specific cool and dry place as home pharmacy. However, in 14.6% of the households, at least one medicine requires hypothermal preservation was not stored in the refrigerator. In 51.41% of the households, the medicines were stored within the reach of children, while households with no children were excluded from this category. (Table 2). Surprisingly, 67.74% of the families have found expired medicines in the process of door survey (Table 2).

### Table 2. General aspects of the home medication cabinets

| Variable                                                      | Number of households | % of total (%) |
|---------------------------------------------------------------|----------------------|----------------|
| Locations in which medications were maintained               |                      |                |
| Specific place as home pharmacy                              | 349/389              | 89.71          |
| At several places around the house                           | 40/389               | 10.28          |
| Internal and external medicine storage separately             | 214/389              | 55.01          |
| Availability of medications to children(yes)                 | 200/389              | 51.41          |
| Regularly organize family medicine cabinet                    | 197/389              | 50.64          |
| know how to clean up                                         | 141/389              | 36.24          |
| Medications past expiry date                                 | 42/62                | 67.74          |
In the aspect of major constituents of the home medication cabinet, there was a total number of 5600 medicine items in the 389 households with an average of 14 per household. Detailed categories of medicines encountered frequently are listed in Table 3. The most encountered medication was related to cough and cold medicines (47.8%), such as expectorants, cough suppressants and nasal decongestants (topical or systemic). Antibiotics (30%) and topical products for joint and muscular pain (26.1%) were also found to be commonly stored in the households. As for systemic antibiotics, most common ones were amoxicillin, cefalexin and cefradine. Other categories of medicines included drugs for functional gastrointestinal disorders (23.2%), vitamin and calcium (23.2%), antiinflammatory and antirheumatic products (18.8%), ophthalmic remedy(16.0%), hypertension, diabetes mellitus(16.0%), antiallergic drugs(7.0%).

Table 3. Major constituents of the home medication cabinet

| Category Description                                      | Number of households | % of total (%) |
|-----------------------------------------------------------|----------------------|----------------|
| Cough and cold medicines                                  | 191/400              | 47.8           |
| Antibiotics                                               | 120/400              | 30.0           |
| Drugs for functional gastrointestinal disorders            | 93/400               | 23.2           |
| Antidiarrheal agent                                       | 87/400               | 21.7           |
| Antinflammatory and antirheumatic products                | 75/400               | 18.8           |
| Topical products for joint and muscular pain              | 104/400              | 26.1           |
| Antiallergic drugs                                        | 28/400               | 7.0            |
| Vitamin, calcium                                          | 93/400               | 23.2           |
| Ophthalmic remedy                                         | 64/400               | 16.0           |
| Hypertension, diabetes mellitus                           | 64/400               | 16.0           |
| Medical equipment such as blood pressure meter, blood glucose meter, thermometers | 17/400               | 4.3            |
| Other drugs                                               | 12/400               | 3.0            |

When interviewed about the bases of drug purchase, a total number of 515 responses were given by 395 participants (Table 4). The most common basis was according to the doctor's prescription and guidance (68.1%). Other bases include their own experience and medical knowledge (36.2%), pharmacy staff recommendation (11.6%), recommending by friends and family (10.1%) and advertising (4.3%).

Table 4. Bases of citizen’s drug purchase

| Bases of citizen’s drug purchase                        | Number of households | % of total |
|---------------------------------------------------------|----------------------|------------|
| Doctor's prescription and guidance                      | 269/395              | 68.1       |
| Advertising                                              | 17/395               | 4.3        |
| Recommending by friends and family                      | 40/395               | 10.1       |
| Own experience and medical knowledge                     | 143/395              | 36.2       |
| pharmacy staff recommendation                            | 46/395               | 11.6       |

This study collected 398 results of the treatment related problems (TRPs). Almost all interviewees reported to have at least one TRP (Table 5). The most common problem cited by participants was curative effect not ideal (57.9%). Other problems included untoward effect (24.6%), instructions reading problems (14.4%), administration method uncertainty (5.7%) and others (15.9%).

The investigation results of self-medication errors show that when taking medications, university staff pay attention to the instruction on the drug product to ensure it’s proper use, only 1% of the interviewees do not see the drug product description before use. 14.5% of the participants can’t take the medicine on time and 2% of the participants take medicine with tea or milk. What is particularly striking about these findings are the common use of antibiotics when having cold or fever (46.3%, Table 6).
Table 5. Description of treatment related problems (TRPs) in study population

| TRPs                          | Number of households | % of total |
|-------------------------------|----------------------|------------|
| Instructions reading problems | 57/398               | 14.4       |
| Administration method uncertainty | 23/398            | 5.7        |
| Curative effect not ideal     | 230/398              | 57.9       |
| untoward effect               | 98/398               | 24.6       |
| Others                        | 63/398               | 15.9       |

Table 6. Common medication errors of the participants in self-medication

| Type of medication errors                          | Number of households | % of total |
|----------------------------------------------------|----------------------|------------|
| Don't read the instructions before using the drug  | 4/399                | 1.0        |
| Not according to the doctor's medication course    | 29/399               | 7.2        |
| Use of multiple medications                        | 120/399              | 30.0       |
| Take medicine with tea or milk                     | 8/399                | 2.0        |
| Can't take the medicine on time                    | 58/399               | 14.5       |
| use antibiotics when have cold or fever            | 185/399              | 46.3       |

Table 7 summarizes the results of the tendency of the participants' medication counseling. 68.1% of the participants reported that they would counsel their doctors about the medications purchased, although it appeared that some participants only confirmed the indication of the medicine with the community doctors (10.1%) before taking it.

Table 7. Objects of citizens' medication counseling

| Medication consultation object | Number of households | % of total |
|--------------------------------|----------------------|------------|
| Doctors                        | 270/397              | 68.1       |
| Community doctors              | 40/397               | 10.1       |
| Pharmacist                      | 23/397               | 5.80       |
| Friends or relatives           | 23/397               | 5.80       |
| Surf the Internet              | 92/397               | 23.2       |

6. Discussion
The purpose of the study was to investigate the storage and maintenance condition of medicines in a sample of university households. Our study showed that a large majority (89.71%) of the participants have home medication cabinets with a median of 14 drugs per household. The number of medications stored was correlated with household composition, education level and the age of elderly family member in the household. Bigger household consume more medicines as expected. The association between medicines and education level might suggest that educated people have deeper understanding of their health conditions and medications they required and are more inclined to self-medicate and store medications for a rainy day. There is association between the number of medicine stored and the age of people over 65. Apart from the fact that elder people is liable to illness, it could suggest their lack of compliance: treatment courses not completed leads to medication leftover accumulation. The medicine storage conditions were satisfactory in the majority of the households. In one-third of the households, drug storage condition could be considered unstable, especially when hypothermal or dark preservation medicine existed. But whether this unstable storage condition actually threat life and health is not within the scope of the study. Furthermore, 3 in 5 medications found expired during the door survey, especially over-the-counter (OTC) products. Yet, except for tetracycline, expired medicines causing harmful effects (other than reduced activity) are scarcely reported. Topically applied medicines such as dermatologic corticosteroids and nasal decongestants were often found to be misunderstood and overused. Although severe outcomes rarely result from misuse of these kinds of
medicines, the occurrence of their adverse effects may be underestimated, especially after prolonged use [17-18]. The most frequently encountered categories of medicine found during the survey were cough and cold medicines, as these medicines are available OTC that widely used and favored by medical professionals and patients alike. Finally, 30% of the households visited had stored systemic antibiotics, although most of the participants stated that consulting a doctor first is necessary, especially when having a cold and fever, which suggests that the awareness among the China about the risks of an uncontrolled use of antimicrobial drugs is reasonably high [19-20]. It is proved and propagated that inappropriate use of antibiotics could have grave adverse outcomes for individuals and society [8, 21-23]. Storing antibiotics at home for future self-medications is still a common phenomenon among citizens [24]. Nevertheless, in this matter, socially desirable responses should be aware of, and more efforts should be made to reduce leftover or reserved antibiotics by controlling prescribing quantities. In this regard, pharmacists are in key position to insure the implementation of pharmacy regulations and citizen education of rational self-medications with antibiotics. The main TRPs collected in this study were “Curative effect not ideal”, “untoward effect”, “instructions reading problems”, and “administration method uncertainty”. In study from USA [25], “inappropriate drugs” is the most frequent TRP, while in other studies from Australia and Taiwan, “a need for laboratory tests” and “need for additional drug therapy” were the most frequent DRPs respectively[26,27]. Roughead et al[28] found that ‘additional monitoring’, ‘additional medication’, and ‘inappropriate medication’ were the main DRPs in the Minnesota while in the South Australian sample included ‘non-compliance’, ‘additional drug therapy’, and ‘ineffective drug therapy’. Rao et al[29] found that ‘additional drug therapy’, ‘dosage too low’ and ‘non-compliance’ were the most frequent DRPs. In a recent study from Nigeria, the main DRPs among outpatients were ‘non-adherence’, ‘problems associated with self-medication’ and ‘adverse drug reactions’[30]. The results of the similarities and differences so widely from different countries may be due to the patient’s age, lifestyle, disease prevalence, type and number of medications. The differences in methods and settings also make comparisons between the studies very difficult. The finding about medication counseling objects indicates that doctors’ opinion are superior to the patients’, this is obvious as doctors has the knowledge and credential. However, a large part of the interviewees tend to get medication information through the internet. Patients must have confidence in the competence of their doctors and must feel that they can confide in him or her.

7. Conclusion
In conclusion, our study showed that the average quantity of medicines stored in households in China is considerably high, with a high prevalence of cough and cold medicines and NSAIDs. The absence of safety storage condition and the occurrence of medicine expiration should raise concern. Although it is acceptable regarding the intention of self-treatment against common ailments in terms of indication and dosage, more effort is necessary to raise public awareness and promoting behavioural change to insure the safety of medicine storage and self-medications.

8. Acknowledgments
We would like to thank all study participants involved in this research for their contribution in the study. Funding: is work was supported by Health and Family Planning Commission of Hubei Province (WJ2017M054); Wuhan middle-aged and youngbackbone personnel training project of medicine; Fundamental Research Funds for the Central Universities (NO.2015QN041, 2015MS140, 2016YXMS178). Conflict of interest: The authors of this manuscript have no conflicts of interest to declare.

9. References
[1] Milica PK, Zdenko T, Zoran B, Ljiljana N, Ana T, Nebojsa S, Ana S. Home pharmacies in Serbia: an insight into self-medications practice. Int J Clin Pharm. 2015; 37(2):373–8.
[2] Sawalha AF. Self-medications with antibiotics: a study in Palestine. Int J Risk Saf Med. 2008; 20(4):213–22.
[3] Leen D B. Self-medications a potential health threat in Belgium. PharmacoEconomics Outcomes
News. 2008; 552(1):8-8.

[4] Leen D B, Mehuys E, Adriaens E, Remon J P, Borrelt LV, Christiaens T. Home Medication Cabinets and Self-Medication: A Source of Potential Health Threats? The Annals of Pharmacotherapy, 2008; 42(4):572-9.

[5] Stergachis A. Promoting proper disposal of unused, unwanted, or expired medications. Journal of the American Pharmacists Association. 2014; 54(3):226.

[6] Ansam S. Extent of storage and wastage of antibacterial agents in Palestinian households. Pharm World Sci. 2010; 32(4):530–5.

[7] Bronzwaer S L, Cars O, Buchholz U, Mo¨ lstad S, Goettsch W, Veldhuijzen I K, Kool J L, Sprenger M J, Degener J E. European Antimicrobial Resistance Surveillance System. A European study on the relationship between antimicrobial use and antimicrobial resistance. Emerg Infect Dis. 2002; 8(3):278–82.

[8] Goossens H, Ferech M, Vander Stichele R, Elseviers M. Outpatient, antibiotic use in Europe and association with resistance: cross-national database study. Lancet. 2005; 365(9459):579–87.

[9] Orero A, Gonzalez J, Prieto J. Antibiotics in Spanish households, medical and socioeconomic implications. URANO Study Group. Med Clin (Barc). 1997; 109(20):782–5.

[10] Cheng T C, Lo C C. Nonmedical use of prescription medications: A longitudinal analysis with adolescents involved in child welfare. Children and Youth Services Review. 2012; 34(4):859–64.

[11] Stretchouski LS, Andreeva IV, Ratchina SA, Galkin DV, Petrotchenkova NA, Demin AA, Kuzin VB, Kusnetsova ST, Likhatcheva RY, Nedogoda SV, Ortenberg AS, Toropova IA. The inventory of antibiotics in Russian home medicine cabinets. Clin Infect Dis. 2003; 37(4):498–505.

[12] McCabe S E., West B T., Cranford J A., Ross-Durow P., Young A., Teter C J. Medical misuse of controlled medications among adolescents. Archives of Pediatrics & Adolescent Medicine. 2011; 165(8):729–735.

[13] Stergachis A. Promoting proper disposal of unused, unwanted, or expired medications. Journal of the American Pharmacists Association. 2014; 54(3):226

[14] Abrons J, Vadala T, Miller S, Cerulli J. Encouraging safe medication disposal through student pharmacist intervention. J Am Pharm Assoc. 2010; 50(2):169–73.

[15] Persson M, Sabelstro¨m E, Gunnarsson B. Handling of unused prescription drugs knowledge, behaviour and attitude among Swedish people. Environ Int. 2009; 35(5):771–4.

[16] Chattopadhyay D, Bisoi S, Biswas B, Chattopadhyay S. Study of attitude regarding health care waste management among health care providers of a tertiary care hospital in Kolkata. Indian J Public Health. 2010; 54(2):104–5.

[17] Hengge UR, Ruzicka T, Schwartz RA, Cork MJ. Adverse effects of topical glucocorticosteroids. J Am Acad Dermatol 2006; 54(1):1-15.

[18] Grigoryan L, Haaijer-Rysjamp FM, Burgerhof JG, et al. Self-medication with antimicrobial drugs in Europe. Emerg Infect Dis 2006; 12(3):452-9.

[19] McNulty CA, Boyle P, Nichols T, Clappison DP, Davey P. Antimicrobial drugs in the home, United Kingdom. Emerg Infect Dis 2006; 12(10):1523-6.

[20] Bojalil R, Calva J J. Antibiotic misuse in diarrhea. A household survey in a Mexican community. J Clin Epidemiol. 1994; 47(2):147–56.

[21] Bronzwaer SL, Cars O, Buchholz U, Mo¨ lstad S, Goettsch W, Veldhuijzen I K, Kool JL, Sprenger MJ, Degener JE. European Antimicrobial Resistance Surveillance System. A European study on the relationship between antimicrobial use and antimicrobial resistance. Emerg Infect Dis. 2002; 8(3):278–82.

[22] Okumura J, Wakai S, Umenai T. Drug utilisation and self-medication in rural communities in Vietnam. Soc Sci Med. 2002; 54(12):1875–86.

[23] Thomas J K, Forrest A, Bhavnani S M, Hyatt J M, Cheng A, Ballow C H, Schentag J J. Pharmacodynamic evaluation of factors associated with the development of bacterial resistance...
in acutely ill patients during therapy. Antimicrob Agents Chemother. 1998;42(42):521–7.

[25] Gurwitz JH, Rochon P. Improving the quality of medication use in elderly patients: a not-so-simple prescription. Arch Intern Med. 2002;162(15):1670–2.

[26] Gilbert AL, Roughhead EE, Beilby J, Mott K, Barratt JD. Collaborative medication management services: improving patient care. Med J Aust. 2002;177 (4):189–92.

[27] Chan DC, Chen JH, Kuo HK, We CJ, Lu IS, Chiu LS. Drug-related problems (DRPs) identified from geriatric medication safety review clinics. Arch Gerontol Geriatr. 2012; 54(1):168–74.

[28] Roughhead EE, Barratt JD, Gilbert AL. Medication-related problems commonly occurring in an Australian community setting. Pharmacoepidemiol Drug Saf. 2004; 13(2):83–7.

[29] Rao D, Gilbert A, Strand LM, Cipolle RJ. Drug therapy problems found in ambulatory patient populations in Minnesota and South Australia. Pharm World Sci. 2007; 29(6):647–54.

[30] Basheti IA, Qunaibi EA, Bulatova NR, Samara S, Aburuz S. Treatment related problems for outpatients with chronic diseases in Jordan: the value of home medication reviews. International Journal of Clinical Pharmacy. 2013; 35(1):92-100.