What do laypeople consider 'medication' and are they aware of modulators of a drug's effects?

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ABSTRACT

Objectives Healthcare providers expect patients to be responsible partners during drug treatment, who know potential risks impeding drug effects and are able to accurately report prescribed and non-prescribed medication. This presumes that they have the same understanding of the term 'medication' as healthcare providers. We assessed which products laypeople label as medication and which modulators of drug effects they know.

Methods People visiting the otorhinolaryngology outpatient clinic at a university hospital were invited to anonymously complete a questionnaire assessing which products out of 23 listed examples are medications and valuing 12 modulators potentially influencing drug effects.

Results Among 94 participants, 86 (91.5%) identified on average 14.4 ± 3.3 (62.6%) of the products and 79 (84.0%) identified 6.7 ± 2.0 (55.5%) of the modulators correctly. Women performed better than men ($p < 0.01$). Regular medication intake, education level and age did not influence the results.

Conclusions Laypeople are at risk of misclassifying medications and modulators of drug effects.

INTRODUCTION

Responsible and informed collaboration between patients and healthcare providers is critical for safe and efficient drug treatment. One way this partnership may fail is via incomplete medication histories following patient interviews.¹ Indeed, if asked, only 46% of patients tell their physicians which over-the-counter drugs they are taking and only 34% mention herbal products or vitamins.² Furthermore, two-thirds of patient drug histories contain one or more errors³ and about one in four in-hospital prescribing errors is attributed to erroneous or incomplete medication histories at hospital admission.^{4,5} Older age (>65 years) and polypharmacy (ie, taking more than four medications concurrently) can lead to an even higher incidence of medication history errors.⁶ This may also aggravate the risk of drug–drug interactions, particularly when a new drug is added to a drug regimen.

Best practices for how to obtain the most complete medication history can be found in the Standard Operating Protocol "Assuring Medication Accuracy at Transitions in Care" from the World Health Organization (WHO). This document recommends that healthcare providers ask patients explicitly about prescribed and non-prescribed (over-the-counter) drugs as well as herbal and

complementary products.⁷ However, in clinical routine, healthcare providers may commonly refer to over-the-counter, herbal and complementary drugs as 'medications' in the same way as prescription drugs. This leads to the important question of whether patients will understand this term in the same way and knowingly report all expected products.

AIM

The objectives of this study were to evaluate which types of drugs or products are considered as 'medication' by laypeople and to assess their knowledge of potential risk factors that may impede a drug's effect. This was done by conducting an anonymous survey among attendants of one outpatient clinic in a large teaching hospital.

ETHICAL APPROVAL

After consultation with the ethics committee of the Medical Faculty of the University of Heidelberg, ethical approval was waived due to the anonymity of the survey. After verbal invitation, attendants could voluntarily participate on an oral consent basis.

METHODS

Study site, study population and study design

During the 3-week survey period in May 2015, all people attending the otorhinolaryngology outpatient clinic at the University Hospital of Heidelberg who were cognitively able to participate were invited to take part in the study by a study member on site. After oral consent, participants received a questionnaire specifically developed for this survey. To ensure anonymity, the completed questionnaires were collected in blank envelopes and kept in a closed box until completion of the survey when the data were extracted and analysed.

Questionnaire

The questionnaire comprised two sections. The first section included a multiple-choice assessment of 23 common brands marketed in Germany that were considered to be easily misclassified as medication or non-medication by non-healthcare professionals. These included prescription drugs as well as drugs that are also available outside of pharmacies (eg, dietary supplements), herbal products and drugs with uncommon pharmaceutical formulations (eg, chewing gums). According to the WHO Standard Operating Protocol "Assuring Medication Accuracy at Transitions in Care",⁷ a best possible medication history should consist of "prescribed medication (ie, medication the patient is instructed to take by the prescriber), non-prescribed

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medication (ie, the prescriber did not advise the patient to take the medication), prescription medication, non-prescription medication (eg, over-the-counter (OTC)), complementary or herbal medication, recreational drugs, and 'prn' (ie, 'as needed') medication". When our research team assessed the 23 products according to this recommendation, we classified 20 of the 23 products as medications. These included prescribed and over-the-counter medications, herbal and complementary products and dietary supplements (figure 1). Three products that included toothpaste, dietetic food and a heat patch were not classified as medication (figure 1).

In the questionnaire, the 23 products were listed by name, ingredient and a colour photograph of each product in order to enhance participants' recognition of the product. Patients were asked to classify whether the illustrated product was a 'medication' or 'not a medication'. If unknown, participants could chose 'I do not know' as an answer. For each correct classification patients scored 1 point; the option 'I do not know', wrong allocations or no allocation at all scored 0 points. Thus the maximum score was 23. If participants skipped more than 10% of the questions, the entire multiple-choice section was not considered.

In section 2 of the questionnaire, participants had to select substances or circumstances from a list that they believed could directly interact with a drug and influence drug effects. This list consisted of items that were considered potentially interacting agents (eg, dietary supplements, herbal substances, vitamins, grapefruit juice, apple juice, milk, alcohol, vegetables and

smoking) and items that were considered to be devoid of such potential (eg, tap water, homeopathic medicines and weather). Each correct allocation was scored with 1 point whereas a wrong selection or no selection was scored with 0 points, resulting in a maximum possible score of 12 points.

Lastly, participants could voluntarily specify whether they were regularly taking medications and provide information on their age, sex and educational status on the questionnaire.

Statistical analysis

Basic descriptive statistical analyses were conducted with Microsoft Excel 2010 V.14 (Microsoft Corporation, Redmond, USA) and data are expressed as mean $\pm$ SD, percentages and ranges unless stated otherwise. IBM SPSS Statistics V.22 (IBM SPSS Statistics, Ehningen, Germany) was used for all subsequent analyses. Differences due to participants' characteristics (ie, age, gender, education and medication intake) were analysed with t-tests, ANOVA or linear regression. A two-tailed p value <0.05 was considered significant.

RESULTS

Overall, 94 visitors participated in the survey with 86 participants (91.5%) completing section 1 and 79 participants (84.0%) completing section 2 (table 1).

Participants scored on average 14.4 $\pm$ 3.3 points in section 1 (62.6%, range 7–20 points) and 6.7 $\pm$ 2.0 points in section 2 (55.5%, range 1–12 points) (figure 1). While regular drug intake (p=0.95/p=0.48), age (p=0.75/p=0.20) and education

Figure 1 Percentage of correct answers in section 1 (medication understanding) and section 2 (potential interaction). Non-medication (section 1) and non-interacting substances and circumstances (section 2) are shaded in grey.

Table 1 Characteristics of the respondents

	All participants
N	94
Age, years	
Mean±SD	47.4±17.2
Range, years	16–87
Not specified	17 (18.1%)
Sex	
Men	29 (30.9%*)
Women	51 (54.3%*)
Not specified	14 (14.9%*)
Regular medication use	
Yes	46 (48.9%)
No	34 (36.2%)
Not specified	14 (14.9%)
Level of education	
Less than high school	57 (60.6%)
High school	11 (11.7%)
College	12 (12.8%)
Not specified	14 (14.9%)

*Deviation from 100.0% due to rounding.

($p=0.94/p=0.88$) did not influence the scores, women performed better than men (section 1: 15.3 ± 3.1 vs 12.8 ± 3.2 points; section 2: 7.1 ± 1.7 vs 5.9 ± 2.1 points; both $p<0.01$). There was a statistically significant but weak positive correlation between performance in section 1 and section 2 ($r=0.279$, $p=0.02$, $N=76$).

DISCUSSION

To support safe drug treatment, patients should know their current medications and reliably communicate them to their healthcare professionals. Healthcare providers and patients should therefore have the same understanding of which products are actually perceived as medications. In our assessment, the participants labelled only two-thirds of the selected products correctly. Indeed, many of the drugs erroneously not recognised as medications could be involved in drug–drug interactions. For instance, only 30% of the participants identified St John's wort tablets, which is a typical perpetrator drug, as medication (see figure 1). Moreover, 40% of the participants did not classify oral contraceptives as medication although they are drugs frequently affected by drug–drug interactions.

Participants also lacked understanding of specific risk factors modulating a drug effect and identified only half of the potential drug interaction perpetrators correctly. In particular, ingredients generally considered healthy, such as vitamins, vegetables or fruit juices, were not recognised as potentially interacting perpetrators. In fact, more than half of the participants did not know that grapefruit has the potential to modulate a drug's effect, although this effect is well known in the literature.⁸ Furthermore, only one in five participants considered herbal substances generally as a potential risk of interactions. Interestingly, while only about 9% of participants believed that vegetables could influence drug effects, 10 times more participants believed that the weather could do so. The reason for this remains unclear and might need to be assessed in further studies.

Only one-quarter of participants classified nicotine chewing gums and caffeine tablets as drugs. This suggests that the remaining three-quarters of our sample could be careless about the handling of these products, which emphasises the risk for potential medication errors. It is also likely that patients do not

disclose those drugs to healthcare providers taking their medication history if the healthcare provider does not particularly ask about specific dosage forms or active ingredients.⁹ How much these patient misbeliefs and knowledge deficits might impair the medication process and interfere with decision-making by healthcare professionals or with correct drug handling by patients is currently unknown, but should be considered as a potentially influential source of variability and error. Knowledge deficits of patients have also been reported with regard to other domains of drug treatment such as a drug's indication.¹⁰ Furthermore, even if a patient would in theory correctly identify a product as a medication, it is uncertain whether he/she would actually report it during drug history taking or rather forget^{11 12} or deliberately choose not to mention it.¹³

The fact that women performed better than men in our survey is in good agreement with earlier studies.¹⁴ However, because 14 individuals did not indicate their sex in this anonymous survey, we do not know whether and how this may have influenced the analysis with respect to sex. It appears, however, rather unlikely that they all belonged to the same sex, and even if they were all men, the difference would still be significant.

This study has the following limitations. First, the participants' experience with drugs was not evaluated in detail. Hence, we did not know whether participants knew any of the shown products or had already experienced a drug interaction in the past. This might influence participants' responses regarding product classification and estimation of the drug interaction potential. However, in this study participants' ratings were independent of whether they regularly used medications, indicating that at least previous drug experience in general was irrelevant for their performance. Second, only participants visiting the otorhinolaryngology outpatient clinic were included in this survey and their medical history was not recorded because of the anonymous nature of the survey. Furthermore, we neither assessed whether participants had previous training or job experience in a medical field nor evaluated their health literacy and health numeracy. All these factors can modulate a patient's understanding of provided drug information¹⁵ and thus probably also influence how patients perceive benefits and risks of their medication. It is therefore unknown how generalisable the results are to other populations. Third, while we approached all people waiting in the outpatient clinic and invited them to participate, we did not document the number of people initially approached, thus precluding the calculation of a response rate or the potential assessment of a selection bias.

CONCLUSION

Participants did not recognise important products as medication and misclassified more than one-third of the selected products. When taking a medication history, healthcare providers should be aware of this fact and follow the protocols for taking the best possible medication history, principally asking for specific dosage forms or active ingredients. Moreover, healthcare providers should be aware that the influence of modulators of drug effects might be misunderstood by patients and, hence, should be explicitly highlighted for patients when relevant.

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Contributors All authors were involved in developing the research question and/or planning the study conduct. AFJS and HMS developed the questionnaire. AFJS and JAB collected the data. AFJS, JAB, WEH and HMS analysed and interpreted the data. AFJS wrote the first draft of the manuscript. All authors critically revised the manuscript and approved the final version.

Competing interests None declared.

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REFERENCES

- 1 Tam VC, Knowles SR, Cornish PL, *et al.* Frequency, type and clinical importance of medication history errors at admission to hospital: a systematic review. *CMAJ* 2005;173:510–15.
- 2 Serper M, McCarthy DM, Patzer RE, *et al.* What patients think doctors know: beliefs about provider knowledge as barriers to safe medication use. *Patient Educ Couns* 2013;93:306–11.
- 3 Sullivan C, Gleason KM, Rooney D, *et al.* Medication reconciliation in the acute care setting: opportunity and challenge for nursing. *J Nurs Care Qual* 2005;20:95–8.
- 4 Dobranzki S, Hammond I, Khan G, *et al.* The nature of hospital prescribing errors. *Br J Clin Govern* 2002;7:187–93.
- 5 Santell JP. Reconciliation failures lead to medication errors. *Jt Comm J Qual Patient Saf* 2006;32:225–9.
- 6 Gleason KM, McDaniel MR, Feinglass J, *et al.* Results of the Medications at Transitions and Clinical Handoffs (MATCH) study: an analysis of medication reconciliation errors and risk factors at hospital admission. *J Gen Intern Med* 2010;25:441–7.
- 7 World Health Organization. *High 5s project: action on patient safety. Assuring medication accuracy at transitions of care: medication reconciliation.* World Health Organization. <http://www.who.int/entity/patientsafety/implementation/solutions/high5s/h5s-sop.pdf> (accessed 28 Jun 2016).
- 8 Rodríguez-Fragoso L, Martínez-Arismendi JL, Orozco-Bustos D, *et al.* Potential risks resulting from fruit/vegetable-drug interactions: effects on drug-metabolizing enzymes and drug transporters. *J Food Sci* 2011;76:R112–24.
- 9 Martin-Facklam M, Rieger K, Riedel KD, *et al.* Undeclared exposure to St. John's Wort in hospitalized patients. *Br J Clin Pharmacol* 2004;58:437–41.
- 10 Bosch-Lenders D, Maessen DW, Stoffers HE, *et al.* Factors associated with appropriate knowledge of the indications for prescribed drugs among community-dwelling older patients with polypharmacy. *Age Ageing* 2016;45:402–8.
- 11 Frey J, Greißing C, Buchal P, *et al.* [Discharge medication—what do patients know about their medication on discharge?] *Dtsch Med Wochenschr* 2016;141:e150–6.
- 12 Gardiner P, Sadikova E, Filippelli AC, *et al.* Medical reconciliation of dietary supplements: don't ask, don't tell. *Patient Educ Couns* 2015;98:512–17.
- 13 Granas AG, Bates I. Patients' understanding and management of their illnesses and prescribed medicines—a descriptive study. *Pharm World Sci* 2005;27:321–8.
- 14 Beier ME, Ackerman PL. Determinants of health knowledge: an investigation of age, gender, abilities, personality, and interests. *J Pers Soc Psychol* 2003;84:439.
- 15 Davis TC, Federman AD, Bass PF, *et al.* Improving patient understanding of prescription drug label instructions. *J Gen Intern Med* 2009;24:57–62.