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Older adult and family caregiver experiences with prescription medication labels and their suggestions for label improvement



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ABSTRACT

Background: Prescription medication labels (PMLs) are an important source of written medication information for patients. However, real-world PMLs do not entirely conform with available labelling best practices and guidelines. Given this disconnect, older adults remain particularly at risk of misinterpreting their PMLs. Past studies have commonly assessed hypothetical PMLs, warranting studies that explore the lived experiences of older adults with real-world PMLs. Furthermore, the perspective of family caregivers of older adults is yet to be studied.

Objective(s): This qualitative study documented the challenges faced by older adults and their family caregivers in using real-world PMLs, their strategies to cope with these challenges, and their suggestions to improve existing PMLs.

Methods: We conducted two focus group discussions ($n = 17$) and 30 in-depth interviews with older adults ($n = 20$; including those who can read in English and those with limited English proficiency) and caregivers ($n = 10$) in Singapore. The data were systematically assigned to codes that were continuously refined to accommodate emergent themes.

Results: Challenges, coping strategies and suggested improvements were related to the comprehensibility, availability, readability and consistency of medication information on PMLs.

Conclusions: Real-world PMLs continue to pose challenges for older adults and their caregivers, necessitating them to seek unique and personal coping strategies. The identified PML improvements, desired by older adults and their caregivers, urge healthcare systems to implement improved PMLs. Future research should explore system-level logistical, financial, and administrative barriers (or opportunities) that hinder (or facilitate) this implementation.

1. Introduction

Prescription medication labels (PMLs, pharmacy-generated sticker labels placed on medication packets/bottles at time of dispensing) are a common form of written medication information provided by the health system, yet they are not always understood by recipients.^{1–5} Inadequate understanding of PMLs is detrimental to patient safety⁶ and medication adherence.^{7,8} This can be attributed to individual-level factors and health system factors. On one hand, older adults (aged

60 years and above)⁹ and individuals with low literacy are at risk of misinterpreting PMLs.^{2,4,5,9,10} Furthermore, those with visual impairments are challenged to read PMLs.¹¹ On the other hand, PMLs provided by the health system may use complex or unfamiliar terms, unclear instructions, poorly organized information and have poor legibility, contributing to poor understanding.^{1,2,9,10,12,13} Older adults rely heavily on PMLs due to higher prevalence of chronic disease¹⁴ and medication intake.¹⁵ Therefore, PMLs should accommodate the needs of older adults.

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While published reviews on best practices for designing PMLs^{12,16–18} and international labelling guidelines^{19,20} are available, health systems have yet to incorporate many of these evidence-based improvements to their PMLs. Studies comparing actual PMLs' print characteristics against labelling guidelines have found non-conformity to format and content recommendations. A UK study reported that none of the 24 PMLs studied met the font size guidelines set by the National Patient Safety Agency.²¹ A Canadian study highlighted discrepancies in format characteristics, such as font size, choice of letter case, spacing, bolding and justification.²² In Singapore, less than half of evaluated PMLs complied with best practices recommendations, such as using sentence case and providing specific dosing intervals.²³ Moreover, one-third did not state medication indication, and about half did not state medication side effects or precautions.²³ The evidence suggests that till today, real-world PMLs conform poorly to labelling guidelines, and may continue to pose challenges for older adults.

Furthermore, studies included in the literature reviews, and elsewhere, are mostly randomized controlled trials, or structured and semi-structured interviews, often assessing hypothetical or prototype PMLs or warning labels.^{4,12,16,17,24,25} By contrast, studies exploring older adults' capabilities or lived experiences of using their own actual PMLs are few and lacking.^{26,27} Moreover, while the involvement of family caregivers in medication management for older adults is common and crucial,²⁸ their perspectives on PMLs have not been explored.

Documenting the challenges, coping strategies and suggested improvements for real-world PMLs, from the perspectives of older adults and family caregivers, is necessary to highlight the urgency in bridging the disconnect between research evidence and practice. Moreover, a rich description of older adults' and family caregivers' experiences could enable a nuanced understanding of the complexity in navigating PMLs in real life.

Singapore, a rapidly ageing nation,²⁹ is an excellent setting to study the lived experiences of older adults and their caregivers with PMLs. First, eight in ten Singaporean older adults have ≥ 1 chronic disease,³⁰ and the proportion reporting ≥ 3 chronic diseases nearly doubled from 2009 to 2017.³¹ Furthermore, a national survey found 14.5% of older Singaporeans have polypharmacy.³² This suggests that medication-taking and interaction with multiple PMLs is a daily routine for many older adults. Second, given the cultural importance of filial piety,³³ family caregivers commonly support older family members in their daily activities, including medication-taking. Third, while Singapore has four official languages (English, Chinese, Malay and Tamil), PMLs are largely dispensed only in English. However, 53% of Singaporeans aged ≥ 65 years cannot read in English,³⁴ highlighting a mismatch between their language proficiency and PMLs. Previous studies have reported that older Singaporeans with limited English proficiency (LEP) faced challenges in reading their PMLs,³⁵ and this was associated with medication non-adherence.⁸ While the language used on PMLs is clearly a problem for many older Singaporeans, it is worthwhile to assess what additional PML features challenge these at-risk individuals, allowing us to build an evidence-base for innovating PMLs in Singapore to suit its ageing population.

In response to the issues highlighted above, we conducted a health services research project, "Prescription Medication Label Improvement for Singaporean Elderly" (PROMISE), to provide the evidence-base for developing and implementing easily understood, context- and culturally-appropriate PMLs.³⁶ This paper presents findings from a qualitative research study, part of the PROMISE project, which documents a) the challenges faced by older Singaporeans and their family caregivers in using real-world PMLs from healthcare institutions in Singapore, b) strategies they adopt to cope with these challenges, and c) their suggestions for PML improvement.

2. Methods

Fundamental qualitative description³⁷ was used to document the experiences of older adults and family caregivers with PMLs. Focus group discussions (FGDs) and in-depth interviews (IDIs) were conducted. While FGDs allow participants to exchange unique and shared experiences,

generating a variety of responses and highlighting areas of consensus and disagreement,³⁸ IDIs delve deeper into individuals' experiences.³⁹ Conducting both FGDs and IDIs can enable a broad and in-depth understanding of the phenomenon being studied.⁴⁰ The study was approved by the National University of Singapore Institutional Review Board (Reference Code: S-17-341). All participants provided written informed consent. The study complies with the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines (Supplementary Table 1).

2.1. Theoretical framework

We used the Communication-Human Information Processing (C-HIP) model^{41,42} to investigate the PML challenges faced by older adults and caregivers and their suggested improvements. The model describes a sequence of cognitive processes experienced by individuals when deciphering warning messages, such as those on PMLs. According to the model, a source delivers information through a channel to a receiver, which in the context of this study, is akin to a healthcare institution delivering medication information through a PML to an older adult or caregiver. When this happens, the recipient diverts attention to ("attention switching") and then maintains attention ("attention maintenance") on the information presented to comprehend it. The degree of alignment between the intended message and the user's attitudes and beliefs will influence the user's compliance with the intended action. Barriers encountered at any stage can block information flow to the subsequent stages. In the context of PMLs, after receiving a PML, the individual shifts attention to the PML to read and understand its intended message, which enables varying degrees of PML comprehension. If aligned with user's beliefs, the message may motivate an intended action, such as medication-taking. In particular, "attention switching" and "attention maintenance" are facilitated by factors including PML characteristics, content complexity and user characteristics. For instance, having graphics or coloured text can increase the salience of a PML, attracting user's attention to it. A PML with large font, appropriate language medium and reading difficulty will hold user's attention more effectively, although this is also influenced by the individual's visual acuity and literacy level. As we aimed to document challenges faced by PML users and their desired improvements, questions relating to PML format, PML content and patient factors were incorporated to the FGD and IDI guides. For instance, the question "why do you think you faced these problems?" was followed by probes such as "could it be related to the medicine label, such as size of the label, language used, font size or layout?", "are the instructions on the label difficult to understand? Why?" and "are the words difficult to see?".

2.2. Participants and data collection

We initially planned for six FGDs with older adults (equally split between those with or without LEP) and three FGDs with caregivers. Generally, six FGDs are recommended for data saturation.⁴³ However due to slow recruitment, only two FGDs were completed (one with older adults ($n = 10$) and one with caregivers ($n = 7$); both groups could read in English). IDIs generally require a sample size of 12 for data saturation.⁴⁴ We conducted ten IDIs *each* among older adults without LEP, older adults with LEP, and caregivers. As our study documents a common phenomenon from the perspectives of three subgroups, an overlap in PML experience was anticipated.

English PMLs are common in Singapore, thus it was important to gather perspectives of older adults with or without LEP. To assess older adults' LEP status, they were shown a prototype English PML, and then asked to read and answer a PML related question in English (Supplementary Fig. 1) – those who could not answer were considered as having LEP.

Older adult participants met all of the following eligibility criteria: (1) age ≥ 60 years, (2) Singapore citizen/permanent resident (PR), (3) taking prescription medications from public/private clinics, (4) no moderate/severe cognitive impairment (≥ 5 correct responses on the Abbreviated Mental Test),⁴⁵ (5) not deaf (self-report), (6) not blind (able to read logMAR

Table 1
Characteristics of focus group discussion and in-depth interview participants.

Characteristics	Mean \pm SD or n (%)	
	Older adults (n = 30)	Caregivers (n = 17)
Age, years		
Mean	70.7 \pm 8.2	52.0 \pm 16.0
21–59	–	11 (64.7)
60–69	14 (46.7)	5 (29.4)
70–79	11 (36.7)	–
80–89	5 (16.7)	1 (5.9)
Gender		
Female	19 (63.3)	13 (76.5)
Ethnicity		
Chinese	9 (30.0)	8 (47.1)
Malay	4 (13.3)	2 (11.8)
Indian	16 (53.3)	7 (41.2)
Other	1 (3.3)	–
English proficiency (self-reported) ^a		
Unable to read in English	9 (30.0) ^b	2 (11.8)
Highest education level		
No formal education	6 (20.0)	1 (5.9)
Primary	6 (20.0)	1 (5.9)
Secondary and above	18 (60.0)	15 (88.2)
Employment		
Working	8 (26.7)	12 (70.6)
Retired and/or not working	20 (66.7)	5 (29.4)
Never employed	2 (6.7)	–
Housing type		
1- and 2-room government-built flat	4 (13.3)	3 (17.7)
3-room government-built flat	7 (23.3)	4 (23.5)
4- and 5-room government-built flat and Private	19 (63.3)	10 (58.8)
Marital Status		
Never married	2 (6.8)	6 (35.3)
Married	18 (60.0)	11 (64.7)
Widowed or separated	10 (33.3)	–
Caregiver's relationship with their care recipient		
Spouse	–	3 (17.7)
Child	–	11 (64.7)
Child-in-law	–	1 (5.9)
Grandchild	–	2 (11.8)
Abbreviated Mental Test score ^c	9.2 \pm 1.0	–
Number of prescription medicines (of older adult or care recipient)	4.6 \pm 4.0	5.9 \pm 2.5
Polypharmacy (older adult or care recipient on \geq 5 prescription medicines)	13 (43.3)	10 (58.8)
Manages medicines by him/herself only	27 (90.0)	–
Healthcare institutions from where older adults or care recipients received medicines		
Public primary care clinics only	16 (53.3)	4 (23.5)
Hospitals only	4 (13.3)	6 (35.3)
Public primary care clinics and hospitals	7 (23.3)	5 (29.4)
Public and private primary care clinics	2 (3.3)	1 (5.9)
Public and private primary care clinics and hospitals	1 (3.3)	1 (5.9)
How often do you face problems in reading and understanding instructions on prescription medication labels?		
Always	8 (26.7)	–
Often	4 (13.3)	3 (17.7)
Sometimes	4 (13.3)	6 (35.3)
Occasionally	14 (46.7)	3 (17.7)
Never	–	5 (29.4)
How confident are you to follow instructions on prescription medication labels?		
Extremely confident	10 (33.3)	6 (35.3)
Quite confident	13 (43.3)	6 (35.3)
Somewhat confident	–	5 (29.4)
A little confident	–	–
Not at all confident	7 (23.3)	–
Near vision impairment ^d		
Yes (< 6/12)	23 (76.7)	–

SD: Standard Deviation.

^a English proficiency (self-reported) was assessed through a yes/no question, “Are you able to read in English?”

^b The text reports that we interviewed 10 older adults with limited English proficiency (LEP). Older adults were classified as having LEP if they were unable to answer the English question that was based on an English PML (Supplementary Fig. 1). The number for English proficiency (self-reported) in the table is 9 (not 10) as one participant was classified as having LEP but still reported that s/he is able to read in English.

^c Higher score indicates better cognitive ability (Range: 5 to 10).

^d Near vision impairment defined based on the International Classification of Diseases used by the World Health Organization (<https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment> (2021, accessed 7 June 2021)).

Table 2

Challenges, coping strategies and suggested improvements in the context of medication information on prescription medication labels (PMLs) elicited from older adults and family caregivers during focus group discussions and in-depth interviews.

MAJOR THEMES (4)				
	Comprehensibility of medication information	Availability of medication information	Readability of medication information	Consistency of medication information
SUB-THEMES (23)				
Challenges	<ul style="list-style-type: none"> Unable to read medication information in English Complex and unclear medication instructions 	<ul style="list-style-type: none"> Lack of medication indication Lack of expiry date Lack of other medication information 	<ul style="list-style-type: none"> Small font size Poor font typography 	<ul style="list-style-type: none"> Inconsistency in PMLs across health-care institutions
Coping strategies	<ul style="list-style-type: none"> Learn and remember simple instructions Seek translation of medication information Sketch pictures on PMLs to depict medication information 	<ul style="list-style-type: none"> Write medication indication on PMLs Request for verbal information regarding the medication 	<ul style="list-style-type: none"> Use vision aids 	
Suggested improvements	<ul style="list-style-type: none"> Use a preferred language, in addition to English Use pharmaceutical pictograms Use numerals and plain language 	<ul style="list-style-type: none"> Supplement PMLs with additional materials Use technology 	<ul style="list-style-type: none"> Use large, clear font Use varying font typography Use tabular or bulleted format 	<ul style="list-style-type: none"> Standardize PMLs

1.0 on the tumbling E chart [Snellen equivalent 6/60] 2m away) and (7) able to speak ≥ 1 of the four official languages.

Family caregiver participants fulfilled all of the following eligibility criteria: (1) age ≥ 21 years, (2) able to speak ≥ 1 of the four official languages, and (3) family member involved in managing medications for a Singapore citizen/PR aged ≥ 60 years taking medications from public/private clinics.

A purposive sampling approach was applied. FGD participants were recruited from community-dwelling individuals listed in a survey research firm's database. The FGD moderator was fluent in English and Tamil. For the IDIs, older adults or family members of older adults who had participated in a national survey conducted by our medical school and had agreed to be contacted for future studies, were identified. Study team members (Y.W.T. and S.D.S.) and a research intern (H.N.), fluent in English and one other language – Mandarin Chinese, Tamil and Malay, respectively – contacted potential participants to check their interest and eligibility, and then conducted the IDIs in the interviewee's preferred language.

The FGDs were conducted from 5th to 20th March 2018, and the IDIs from 17th May to 16th July 2018. The FGDs (duration: 108–123 min) and IDIs (26–97 min) were audio-recorded. The FGD and IDI guides (Supplementary Table 2) focused on three key topics – challenges faced in using PMLs, strategies used to cope with the challenges, and suggestions to improve PMLs.

2.3. Data analysis

All audio recordings were transcribed verbatim, and if needed, translated to English. Each transcript was analyzed independently by two investigators (Y.W.T. and S.D.S.) using thematic content analysis. A combination of deductive and inductive approaches was used.^{46–48} The pre-identified topics outlined in the guides, informed by the C-HIP model, facilitated the categorization of codes. Emergent themes were also identified and disagreements in codes were resolved by discussion. A codebook containing the topic categories, themes, and codes was derived from the first few transcripts. Subsequently, the codes were systematically applied to the remaining transcripts. The coding process was iterative, whereby the codebook was updated to accommodate emergent themes and codes from later transcripts, until no new codes were identified. NVivo12 was used to store and analyze the data. Descriptive analysis of the participants' socio-demographic data was done using Stata14.

3. Results

The mean age of the older adult participants was 70.7 ± 8.2 years. The majority were female (63.3%) and 40% had no formal education or

primary education. As for caregiver participants, their mean age was 52.0 ± 16.0 years, majority were female (76.5%) and 11.8% had no formal education or primary education. Detailed participant characteristics are presented in Table 1.

Four major themes and 23 sub-themes, summarized in Table 2, were derived from the fundamental qualitative description of the FGDs and IDIs. Considerable repetition of codes was observed for the last few IDIs, supporting data saturation. The major themes, all pertaining to medication information on PMLs, were (1) comprehensibility, (2) availability, (3) readability and (4) consistency. Challenges, coping strategies and suggested improvements were observed for themes (1), (2) and (3), and challenges and suggested improvements for theme (4). Next, we elaborate on the sub-themes under each major theme, organizing them under the headers of *challenges*, *coping strategies* or *suggested improvements*.

4. Theme 1: Comprehensibility of information on PMLs

4.1. Challenges

4.1.1. Unable to read medication information in English

Older adults with illiteracy or LEP were unable to read their PMLs.

“It is difficult... to tell you the truth, it is very difficult (to read the PML)... My family, we can speak rudimentary English but we can't read it.” (OA-16, older adult, 64 years, limited English proficiency).

“When (the) doctor gives (a) new medicine, (my elderly mother would ask) ‘eat how many tablets?’ (and) ‘what is this?’ She doesn't know how to read... didn't study.” (CG-03, caregiver, 41 years, can read in English).

Some older adults and their caregivers with LEP mentioned that they could only read simple, key medication instructions.

“There are difficulties... just not really sure. I don't know English words. (As for) how many times to eat per day... (I) still can understand a bit.” (OA-07, older adult, 70 years, limited English proficiency).

In addition, older adults with LEP reported not paying attention to precautionary statements on PMLs as they were unable to read them.

“(The) doctor has told me some details about this medication, although I will not usually read those (precautionary statements). I will only read those (instructions) that give specific instructions about food.” (OA-12, older adult, 67 years, limited English proficiency).

4.1.2. Complex and unclear medication instructions

A few participants raised concerns about complex, unclear and wordy instructions in English on PMLs, as they caused confusion about medication use. Common dosing instructions on PMLs, such as “twice daily” or “two times a day”, were perceived to be difficult to interpret.

“Let’s say we eat 3 times in (a) day – morning, afternoon, night... so it is easier for us to know. If they write... only 3 (times a day), we don’t understand. What is 3? (Instead) Put morning one, afternoon one, then night.” (OA-20, older adult, 88 years, limited English proficiency).

Furthermore, the phrasing of food instructions, such as “may be taken with or without food”, were perceived to be complex, even for those who could read in English.

“This is high level language. Grammatically, everything correct. Do you really need ‘(may be taken) with or without food?’ You just put ‘food, yes or no’ only.” (OA-11, older adult, 66 years, can read in English).

Caregivers also commented that wordy instructions posed a barrier for understanding PMLs.

“(Instead of) ‘instil’, we (should) just put, ‘one drop only’. ‘Inhale two puffs’, so inhale is also a refined word. (An) ordinary person will say, oh, two puffs, four times a day. Much easier. No need ‘may be taken’. Just with or without, simple... If you write too much, too complicated, people also cannot read.” (CG-02, caregiver, 66 years, can read in English).

4.2. Coping strategies

4.2.1. Learn and remember simple instructions

Older adults tried to overcome their difficulties in reading PMLs by learning and remembering simple instructions for medication taking. For instance, those who were illiterate initially depended on verbal instructions from family members, and gradually became accustomed to their medication-taking routines.

“He (elderly father) remembers it himself. Because this one is just drip, so he can administer the eye drop himself. Through time, he gets the rhythm (and) come to a routine.” (CG-06, caregiver, 51 years, can read in English).

Similarly, most older adults or caregivers with LEP became familiarized with their chronic medications over time. They learnt to read key medication instructions, such as the number of pills to take and how frequently to take them.

“Because we only went to Malay school right? This label is in English, so it is a bit difficult. But when we see it daily, we (can) understand (and) remember. There is no change of medicines, so it is ok.” (CG-07, caregiver, 81 years, limited English proficiency).

4.2.2. Seek translation of medication information

Older adults commonly sought help from their caregivers or pharmacy staff, who translated medication information verbally and/or handwrote translations on older adults’ PMLs in a preferred language.

“So she (elderly mother) asks (me) those questions, which (medicine) is for this problem? How many pills, how many times, before or after food?” (CG-10, caregiver, 50 years, can read in English).

Caregivers, who preferred to read in another language other than English, also reported receiving help from pharmacy staff.

“Usually they (pharmacy staff) know I speak Mandarin... so straight away (they) write, ‘morning’, ‘night’ (or) ‘breakfast’ in Chinese.” (CG-08, caregiver, 66 years, can read in English).

4.2.3. Sketch pictures on PMLs to depict medication information

Caregivers also sketched pictures to convey dosing instructions, such as a “sun” or “moon” to depict the time of the day to take medications.

“I will (write) for her in Chinese. I put ‘2 times’ (in Chinese). The best thing (to do)... this one ‘morning’ (in Chinese) is the sun. Then ‘night’ (in Chinese). I (draw) a moon for her.” (CG-08, caregiver, 66 years, can read in English).

Even though older adults and caregivers were generally able to obtain help, simplification of written information on the PMLs were frequently limited to dosing instructions. It was uncommon for caregivers to provide simplified, written information, or sketches on precautionary statements.

One older participant shared how barriers to understanding the PML and relying only on verbal explanation may potentially affect medication safety.

“Yes, (an) elderly (friend). (The pharmacy staff) told him to take half a pill every morning, but he ate eight pills instead. [The pronunciations for ‘half’ and ‘eight’ sound similar in Mandarin, and the elderly friend misheard the verbal information.] As a result, he thought, oh no, why does he keep feeling light-headed, he felt very awful. On the second day, he ate the same number of pills. So he felt very awful. On the third day, he couldn’t take it anymore and the ambulance came. He said that he almost died and told us he ate eight pills when he was supposed to eat half a pill.” (OA-01, older adult, 75 years, limited English proficiency).

4.3. Suggested improvements

4.3.1. Use another preferred language, in addition to English

Almost all participants favoured the idea of providing an additional official language (Chinese, Malay or Tamil) to PMLs in order to improve comprehension. They have also voiced that keeping the English text alongside is important as younger, English-literate caregivers may be helping to interpret PMLs.

“If possible, put in Malay language, so it is easy for us to read... We can ask our children to read for us. So two languages (English and Malay). Easy to explain.” (OA-20, older adult, 88 years, limited English proficiency).

“But for those who only (read) Tamil, (having the PML in Tamil) will be helpful. Because (if) they (older adults) can’t read English, maybe their family member can read it to them in English, then it will definitely be (helpful). But the translation, must make sure it’s the correct Tamil.” (FGD, Caregiver, can read in English).

4.3.2. Use pharmaceutical pictograms

Use of pictograms to depict medication information was suggested as pictograms were generally perceived to be more easily understood. However, some participants voiced concerns that pictograms may not always be interpreted as intended.

“Draw it (the dose). For instance, if it is one tablet, then write ‘1 per day’ and draw one tablet. It will be clearer this way. For two tablets, draw a circle, then use colour, and indicate ‘2 tablets’. Isn’t it easier to identify?” (OA-01, older adult, 75 years, limited English proficiency).

“Draw a heart if it’s a heart condition, if it’s a bone (condition), draw a bone. Not all old folks are fortunate enough to have somebody to give (or) arrange the medicine. How would you understand from this label? You will not know. To a certain extent (pictures) will help, may not benefit everyone, but maybe (a) minority that cannot benefit... You can’t have (a) label that can benefit 100%.” (CG-09, caregiver, 62 years, can read in English).

4.3.3. Use numerals and plain language

Participants provided suggestions to simplify PML instructions for optimal understanding of PMLs, particularly among those with LEP. For instance, using numerals to depict quantitative values may be helpful for some older adults or caregivers.

“For more people to understand, you (have to) use the numeric number, will be easier. Old people can see... 2 or 3 or 4. Put number.” (CG-08, caregiver, 66 years, can read in English).

The use of plain language on PMLs was also highlighted. For instance, dosing instructions such as “twice daily” or “two times a day” could be worded clearer by specifying the time of the day.

“More detail, ‘one in the morning, one at night’. That is the best.” (OA-20, older adult, 88 years, limited English proficiency).

Participants reported that they found some medication instructions to be non-specific and recommended that they be re-worded to improve clarity. Another related suggestion was to phrase medication instructions in a concise and straightforward manner. Removing unnecessary words and providing a clear directive for patients could make PML instructions more comprehensible.

“Maybe the letter should be bigger and less wording. Straight to the point. And if it's too much wording... As you grow older, you can't be bothered to read too many things, too many sentences. Oh, simplified... very direct.” (OA-02, older adult, 77 years, can read in English).

5. Theme 2: Availability of information on PMLs

5.1. Challenges

5.1.1. Lack of medication indication

The medication indication was not always available on PMLs, and this was perceived to be a challenge for numerous reasons. First, older adults faced problems in identifying their medications when the PMLs did not state the medication indication.

“If I haven't taken it for some time... I forget what (is) this (medication's indication). So I go to the clinic, I ask, what is this for? That's my problem sometimes.” (OA-18, older adult, 76 years, can read in English).

Second, older adults expressed that not knowing *why* they were taking each medication made them feel less in control of their treatment. Related, it could also increase the risk of unintentional medication misuse.

“When I take medication, I want to know what it is for. Especially now, society is better educated, and everybody want to know. They don't take it blindly like olden days, you know, doctor said take this, you just take blindly.” (OA-02, older adult, 77 years, can read in English).

Third, participants voiced that it contributed towards medication wastage, particularly for medications prescribed for treatment of acute conditions.

“If they specify there... this is for cough, nausea. Then it... would be (of) help. I have (had) to throw away good pills, because I don't know what (they were) for. I don't want to keep (them) around, because (they are) no use for me. If my grandchildren or somebody comes (to my home) and they take it. (That) might be dangerous.” (OA-10, older adult, 71 years, can read in English).

5.1.2. Lack of expiry date

The lack of expiry date on PMLs was commonly cited as a challenge. When the expiry dates are not printed on the PML, participants would

become unaware of the medications' validity and might inadvertently consume expired medications.

“If they don't put (the expiry date), people will just continue after a while. Even the milk and all that, they have expiry dates. Why doesn't medication have?” (OA-13, older adult, 80 years, can read in English).

5.1.3. Lack of other medication information

Older adults and caregivers stated that other medication information, such as precautionary statements, side effects, specific food instructions and medication or food interactions, were not always printed on PMLs.

“Of course it is important. Sometimes when you eat, there will be side effects. Gastric pains, vomiting. It is better if you state it. If it's written here, then (we) won't be so scared.” (OA-01, older adult, 75 years, limited English proficiency).

They opined that absence of precautionary statements or side effects may result in patients being unaware of adverse drug reactions or not seeking timely medical help.

“Sometimes people are having side effect. They may think, it is normal, it is not due to the medicine. They will apply their own medicine, and to cure it. And when the situation gets worse, then they go and see a doctor. So, by saying (on the PML), ‘if you have weakness or swelling, immediately see the doctor’. When they have that symptom, they will see the doctor.” (OA-05, older adult, 70 years, can read in English).

One participant, who had diabetes, shared his experience about taking his anti-diabetic medication incorrectly in relation to his meals as his PML did not state the specific duration required between medication intake and mealtime. His sharing highlighted the importance of knowing specific food instructions through the PML.

“This (anti-diabetic medication), I (went to) ask the doctor and nurse, ‘How long before eating a meal do I eat the medicine?’ ... Sometimes I (didn't) eat (correctly); (after) I eat (the medicine) then I eat my meal right away. (Pharmacy staff) said, ‘oh... cannot... you must eat it 15 minutes before eating a meal.’ After eating for a few years, I didn't even know. The medicine for diabetes.” (OA-03, older adult, 74 years, limited English proficiency).

5.2. Coping strategies

5.2.1. Add medication indication on PMLs

When the PML lacked information on medication indication, older adults or caregivers would request pharmacy staff to write the medication indication on their PMLs. Otherwise, participants would write it themselves, in the older adults' preferred language, for future reference.

“(Pharmacy staff) will write what it (the medication) is for, He will write ‘heart’, ‘high blood pressure’, ‘lungs’, and so on. I said, ‘it is easier for me if you write it. If you don't write for me, which is it? Which (medication) to inject?’” (CG-01, caregiver, 68 years, limited English proficiency).

5.2.2. Request for verbal information regarding the medication

For other medication information that were sometimes absent on the PMLs, such as side effects, participants would request for the pharmacy staff to convey this information verbally to them during medication counselling. In other cases, older adults would seek the help of family caregivers to explain their medications.

“Some medicine... change of colour (of) urine, stools all that. I will ask again as I have to make sure. Sometimes, they don't put on the label there (as to) what are the side effects.” (CG-04, caregiver, 64 years, can read in English).

5.3. Suggested improvements

5.3.1. Supplement PMLs with additional materials

Participants wanted more medication information on their PMLs, as knowing more would enable them to understand, use and manage medications better. However, they acknowledged that there is limited space on the PMLs. A few participants raised the possibility of provision of additional printed materials for giving them access to desired medication information.

“They (the clinic) can give an extra print... on a paper, on the instructions. (Regarding) what you're supposed to do. Because, say, you are taking the normal Panadol. (Only) after four hours then you can take the Ibuprofen.” (FGD, Caregiver, can read in English).

5.3.2. Use technology

Participants also suggested utilising technological platforms to make medication information readily available to older adults and their family caregivers. This would mitigate concerns surrounding the limited space on PMLs.

“Recently there (is) Healthhub [an online portal for Singaporeans to manage their health]. (For) our parents or who we are caregiving (for), we can check (and) change their appointments, and (check) the medications they are giving. All these you can see from Healthhub nowadays. When we google, we need information. Maybe they can put the information on medications (on Healthhub). So, when we go (to the app) we can see it.” (FGD, caregiver, can read in English).

6. Theme 3: Readability of information on PMLs.

6.1. Challenges

6.1.1. Small font size

The most common readability challenge was small font size. It posed as a strong barrier for obtaining medication information, especially for those suffering from visual impairments, such as presbyopia.

“(Having bigger font) should help. Because everyone is lazy. I have presbyopia. If you didn't ask me to wear my spectacles, I wouldn't be bothered to wear it. It'll be easier if (the font) is bigger, you can see it once you pick it up.” (OA-01, older adult, 75 years, limited English proficiency).

“You know, caregiver like us (are) all old people; I'm old also. Sometimes (we) need wear spectacles and see (the label). It is a bit difficult.” (CG-04, caregiver, 64 years, can read in English).

6.1.2. Poor font typography

A few participants voiced concerns about font typography, such as condensed spacing and faint print, which could impact the PML's readability.

“Yes, look here [pointing to a PML]... it looks good here... (the spacing) is slightly bigger. But here [pointing to another PML], it is so cramped... I can't even see the number here clearly. You see, here also... they make (the words) very near, very difficult to see.” (E-16, older adult, 64 years, limited English proficiency).

6.2. Coping strategies

6.2.1. Use vision aids

Participants shared that they wore spectacles or used a magnifying glass to facilitate reading of the small font on PMLs.

“Sometimes I can't see... I'll put on my glasses, and magnifying glass because it enlarges... the writing. The writing is so small, (but) then I'm curious, I want to know, did they add anything on it? I take the magnifying glass to ensure

that I read correctly and take the... correct medication.” (OA-02, older adult, 77 years, can read in English).

6.3. Suggested improvements

6.3.1. Use large, clear font

Participants opined that having a larger, clearly printed font would make PMLs much easier to read and understand.

“Keep it standard font for all clinics. Make it bigger for the elderly to see. Make it big, and standard, easy to read fonts. (Font) can be darker, maybe.” (FGD, caregiver, can read in English).

6.3.2. Use varying font typography

Some participants highlighted that improving the font's typography would enhance readability and allow readers to pay more attention to the PML. Use of colour and bolding of dosing instructions and precautionary statements was also suggested.

“Seek the doctor's...'. These are very important... Ah, red colour, like, danger. Then people will really notice. Otherwise, normally people don't go and read.” (CG-04, caregiver, 64 years, can read in English).

6.3.3. Use tabular or bulleted format

It was suggested that information on PMLs could be organized differently for optimal readability. Older adults and caregivers supported using a tabular format to present dosing instructions, instead of a sentence format. Some caregivers opined that a bulleted format for dosing instructions and/or precautionary statements would also enhance PML readability.

“It is good in point form. Very easy to understand and whether young or old... Sentences take time to read.” (CG-08, caregiver, 66 years, can read in English).

7. Theme 4: Consistency of PML information

7.1. Challenges

7.1.1. Inconsistency in PMLs across healthcare institutions

Inconsistency in the formatting and content of PMLs across healthcare institutions was a concern. Participants perceived such variability to be confusing.

“My mum... can actually read the font. But sometimes she finds it... you know, when there's a discrepancy... let's say, now she's taking it from clinic X. And then she takes (another medication from) clinic Y. Two different fonts you know? It confuses her.” (FGD, caregiver, can read in English).

PMLs for the same medication but from different institutions could show inconsistent precautions, leading to confusion.

“The funny thing about Simvastatin (label) is that mine is labelled with 'avoid grapefruit'. A contemporary of mine took the same medication, without this (precautionary statement). So we're talking a bit, and (I) said, 'funny thing is that we cannot take grapefruit', you know? He said, 'no, nonsense. Why (does) yours (state) need to avoid grapefruit?' I said, 'mine is labelled there. You better check, you shouldn't take grapefruits.' So the person... went back, he check, (his label) doesn't have.” (OA-11, older adult, 66 years, can read in English).

7.2. Suggested improvements

7.2.1. Standardize PMLs

Both older adults and caregivers felt that standardizing PML format and content across all healthcare institutions in Singapore would enable them to navigate PMLs more effectively.

“Problem is that... (for) the educated (person), it's easier to handle (a) different format and everything. But come to (an) uneducated person, they need to have it (in) pictorial, (which) will be clearer. Then, you find that the polyclinic (label) is different from a private clinic (label). So this can add confusion... Even the format. So if you standardise the format and the written instructions throughout, it become a universal language for us everybody.” (FGD, older adult, can read in English).

8. Discussion

Our study provided a multi-faceted and novel understanding of the lived experiences, in term of challenges, coping strategies and suggested improvements, of older adults and family caregivers with real-world PMLs in Singapore. They were summarized into four main themes – comprehensibility, availability, readability and consistency. Some challenges echoed those reported previously in the context of older, low literate individuals.^{2,9,49} The unique coping strategies add to the literature on how challenges with PML might be dealt with on an individual level. Interestingly, many suggested PML improvements aligned with recommendations from studies conducted in other countries, mainly the US.^{3,10,13,50,51} Additional considerations for PMLs in Singapore were also found.

8.1. Comprehensibility

English-language PMLs commonly dispensed by Singapore healthcare institutions challenge older adults and family caregivers, particularly those with LEP. While such older adults received help from caregivers or pharmacy staff to read out or interpret their PML instructions, the findings highlight gaps in pharmaceutical care delivery. First, older adults are unlikely to always have immediate access to human assistance with interpreting PMLs. Second, pharmacy staff commonly provided handwritten instructions or drawings on PMLs as an ad-hoc measure to improve communication with patients during medication counselling. This alludes to barriers posed by PMLs during medication counselling, and strongly suggest that system-level improvements to PMLs will help to ease the workload of pharmacy staff. Third, it was uncommon for pharmacy staff to write or draw on the PML to simplify precautionary instructions. Patients sometimes relied only on verbal counselling. However, as older patients only have partial recall of information conveyed verbally during clinical encounters,⁵² having relevant, written medication information in a patient-preferred language on PMLs is crucial for medication safety.

Participants suggested addition of a preferred language alongside English to PMLs, which should be strongly considered for implementation. Bilingual PMLs can address the needs of those with LEP but who can read another official language. This can ease the translation-related workload of and reduce potential errors in translation by caregivers and pharmacy staff. A previous Singapore study has demonstrated that the inclusion of bilingual text on PMLs improves older adults' understanding of PMLs.⁵³ Nevertheless, given space limitation on PMLs, printing medication information in another preferred language on a separate label upon request may be more feasible.

Another suggested improvement was incorporating pharmaceutical pictograms in PMLs, which can improve medication understanding,⁵⁴ adherence and recall.⁵⁵ One Malaysian study reported that older adults with a high number of co-morbidities showed a greater preference for PMLs with pictograms, compared to font-enlarged PMLs.⁵⁶ Nonetheless, pictograms should be developed or tested in the local context prior to use, as verifying their contextual comprehensibility is recommended.^{57,58} We have recently validated a set of pharmaceutical pictograms among older adults in Singapore³⁶ that could potentially be used on PMLs. At the same time, lower educational level and poorer cognitive ability are associated with a lower comprehension of pharmaceutical pictograms among older adults,³⁶ thus medication counselling remains important to facilitate pictogram understanding among them.

For those who can read English, PML comprehensibility can be enhanced by improving the phrasing of medication instructions. Instead of stating the number of times to take a medication per day, specifying the time periods (morning, afternoon, evening, night) was perceived to be clearer to convey dosing instructions. Aligned with our findings, studies in the US and Ireland echoed that using the Universal Medication Schedule enabled better patient comprehension.^{10,50,59} Another challenge reported by patients was difficulty in understanding complex words on PMLs. The term “instil”, commonly used for eye preparations, was quoted as an example. Previous studies investigating PMLs and warning labels also highlighted that patients had trouble understanding instructions that utilized medical terminology (e.g. antibiotics), uncommon vocabulary, or contained multiple steps.^{1,9} Furthermore, our participants found instructions such as “to be taken with or without food” confusing. While non-specific instructions allow flexibility in medication taking, our findings show that older adults and caregivers prefer specific instructions. Thus, re-evaluating PML instruction wording, with consideration of patient preferences, is needed to improve comprehensibility.

8.2. Availability

Participants voiced that PMLs sometimes lacked their desired medication information, and they wanted more details to facilitate understanding of their medical conditions or medications. Medication indication, expiry date, side effects, precautions and food instructions were cited by our participants as some examples. Previous studies in Singapore and the US have also reported that precautions, adverse effects, drug-drug/drug-food interactions, medication indication, dosing, pharmacological effects, and duration of use were ranked highly by patients as important medication information.^{60–62}

As space on PMLs is limited, participants suggested that Patient Information Leaflets (PILs) could supplement PMLs. However, existing PILs would need to be reviewed and improved for them to complement PMLs effectively. For instance, a study from Singapore reported PILs to have small font size, poor layout, and contain inaccurate information.⁶³

Another suggestion was to leverage technology to communicate medication information. Internet use among older adults in Singapore has been increasing; in 2019, 58% reported internet use in the past 3 months versus 42% in 2017.⁶⁴ At the same time, digital platforms, such as “HealthHub” (<https://www.healthhub.sg/>), exist to help Singaporeans view their medications online. Nonetheless, as 2 in 5 older adults are non-internet users, sustained efforts will be required to familiarize older adults with such platforms for accessing their medication information. A multi-pronged approach, consisting written materials and digital channels, for medication information delivery may be most suitable to meet the needs of both older adults and their younger, more digitally connected caregivers.

8.3. Readability

Participants opined that a larger and clearer font size, varying font typography to emphasize information and an optimal layout would facilitate extraction of medication information. Among our older adult participants, visual impairment or deterioration were common concerns. Previous studies also recommend larger font sizes on printed materials.^{11,13,51,65,66} An additional challenge brought up by our participants, not often described in the PML literature, was the lack of spacing between English letters and words. Spacing between characters should be considered for all languages. For instance, the strokes for Chinese or Tamil characters may appear too cramped together for older adults to read comfortably.

Our participants also supported the use of varying typography, as it provides visual cues for patients to pay attention to certain information. Likewise, US labelling guidelines for drug labels recommend highlighting, bolding and other typographic cues to enhance patient-centred information and thus optimize readability.³

Our study affirms that older adults and caregivers support alternative ways to organize medication information, such as using tabular formats

for dosing instructions and bulleted points for listing precautionary statements, versus sentence formats. Despite so, previous studies showed mixed results. For instance, while one study received positive feedback on providing 4-time-of-day dosing instructions in a table form,⁵¹ another study noted that the provision of a table graphic alongside explicit dosing instructions reduced comprehension rates, compared to explicit dosing instructions alone.⁵⁹ As for other medication instructions, those presented in a list are quicker to read for older adults, than in a paragraph.⁶⁷ Overall, evidence supporting an optimal PML format is limited. Many interventions on PMLs tend to assess multiple design principles simultaneously, leading to challenges in separating their individual findings.¹⁸ Nonetheless, there is scope to improve existing PMLs' font and organization in Singapore for better readability.

8.4. Consistency

Participants preferred PMLs to be standardized across healthcare institutions to minimize confusion. A review highlighted that a consistent format improves patients' ability to navigate PMLs and extract relevant information.⁶⁸ Moreover, standardized PML content can reduce variability in medication error rates across healthcare institutions.⁶⁸ In Singapore, each public healthcare institution, such as a polyclinic, hospital or specialist medical centre, operates its own pharmacy. Private institutions, such as general practitioner clinics, also practise in-house dispensing. Thus, patients who visit multiple healthcare providers receive PMLs that vary in content and format, even for the same medication. In future, plans to further consolidate Singapore's public pharmacies into a single dispensing system through the implementation of National Harmonised Integrated Pharmacy System (NHIPS)⁶⁹ could support patients' preference for more consistent PMLs, especially across public healthcare institutions.

8.5. Research, policy and practice relevance

Findings from this study on the current challenges and coping strategies, of both older adults and family caregivers, highlight the urgency for health systems to implement improvements to their real-world PMLs. Moreover, the suggested PML improvements provide an evidence-base for informing policy and future research.

First, implementation of bilingual PMLs should be strongly considered in Singapore. Second, given the potential of pharmaceutical pictograms,⁵⁷ the ones recently validated among older adults in Singapore should be considered for use on PMLs.³⁶ Third, PML instructions should be simplified and standardized for better clarity. For instance, cognitive interviews can be conducted with patients for rewording and simplifying PML instructions. Taking a patient-centred approach towards improvising PMLs has been shown to produce better outcomes.¹⁸ Fourth, future research should explore which medication information, besides those legally mandated, should be primarily available on PMLs. While our study participants desired many types of medication information on PMLs, a potential research direction, given the PMLs' space constraints, is the use of preference elicitation methods to prioritize these information types. For instance, best–worst scaling, an increasingly popular method to elicit preferences in healthcare, could be considered.⁷⁰ A modified Delphi approach, where an expert panel (comprising patients and healthcare professionals) iteratively discusses the relative importance of information types on PMLs to arrive at a consensus-based ranked list might also be appropriate.⁷¹ Fifth, participant suggestions for improving PML readability, especially the use of larger font size, should be considered. Furthermore, our study highlighted several suggestions to improve PML format, which could be incorporated into an experimental design to test for an optimal format that appeals to patients' preferences or impacts understanding. Upon consolidating all necessary

improvements, they should be applied systematically across healthcare institutions in Singapore to enhance the utility of PMLs from a user perspective.

8.6. Strengths

The qualitative methodology enabled a thorough investigation of older adults' and caregivers' real-world experiences with PMLs, which has remained understudied in Singapore and elsewhere. This is the first qualitative study to capture perspectives of both older adults and family caregivers on PMLs. Finally, participant selection was based on a mix of those with and without LEP, enabling us to glean insights into the perspectives of those with poorer English literacy, which is particularly relevant in the context of older adults in multi-lingual Singapore.

8.7. Limitations

A validated English proficiency test was not used to classify participants as having LEP or not, which may have resulted in a misclassification of some participants. However, all 10 older participants classified as having LEP had no formal/primary education, suggesting that our classifier question to identify LEP was accurate. Second, the experiences of older adults' and caregivers' with PMLs may not be fully generalizable to other countries and contexts. However, several of our user preferences, such as using pictograms, plain language and precise dosing instructions on PMLs, do corroborate with labelling best practices,^{3,12,17} showing some consistency across populations. Nevertheless, our findings provide useful reference for developing geriatric-specific PML guidelines.

Although the broad findings are somewhat similar to previously published studies,^{1,11,12,16–18} the recurring themes of PML challenges and desired improvements suggest that the gap between research and real-world practice has not been filled. There could be logistical, financial and administrative barriers preventing the implementation of evidence-based PMLs. As it is crucial for healthcare systems to be responsive to evidence-based research, further investigation and action on these possible system-level barriers is warranted.

9. Conclusion

The comprehensibility, availability, readability and consistency of medication information on real-world PMLs continue to pose challenges for older adults and family caregivers, leading them to adopt unique strategies to cope with those challenges. The study also documented several suggestions to improve PMLs, urging healthcare systems to consider system-level changes to existing PMLs.

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Declaration of Competing Interest

None

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.rscop.2021.100087>.

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