

# Mandarin multidimensional health literacy questionnaire for patient supporting groups

## A quality improvement article

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### Abstract

A patient support group (PSG) can serve the purposes of group therapy and education. However, how to evaluate outcome which can feedback to improve the PSG remains unclear. Health literacy, which is associated with patient outcome, has not been used in the evaluation of PSG.

Since 2017, we had conducted a working group dedicated to the creation and improvement of PSG. We applied a questionnaire (Mandarin Multidimensional Health Literacy Questionnaire, MMHLQ) for PSGs of all kinds of diseases (5 types, 8 diseases). The outcome was evaluated by the MMHLQ (5 dimensions, 20 variables). We determined factors (age, 1st-time/non-1st-time participation, and patient/family participation) that were associated with all 20 health literacy.

We finally obtained 458 questionnaires, with a response rate as high as 91.1% in 8 PSGs. Participants were  $55.30 \pm 16.39$  y/o. The highest score was with the dimension of understanding ( $12.25 \pm 1.85$ ) and the lowest score was with the dimension of appraisal ( $10.66 \pm 2.33$ ). Participating patients (compared to family) were associated with a higher score with “obey the instruction of medical personnel to care disease” but lower score with “find health information from the network”. Moreover, older participants (age  $\geq 65$  years) had lower scores for all questions in MMHLQ, within which the dimension of appraisal received the lowest scores ( $P < .001$ ).

We found that the highest score is with the dimension of understanding, and the lowest score with the dimension of appraisal. The elderly participants showed lower abilities in health literacy, especially with the dimension of the appraisal. Results from MMHLQ can be used to adjust the PSG curriculum to improve the health literacy of participants.

**Abbreviations:** ADPKD = autosomal dominant polycystic kidney disease, CKD = chronic kidney disease, COPD = chronic obstructive pulmonary disease, DM = diabetes mellitus, HNC = head and neck cancer, MMHLQ = Mandarin Multidimensional Health Literacy Questionnaire, PSG = patient support group, SLE = systemic lupus erythematosus.

**Keywords:** age, health literacy, Mandarin Multidimensional Health Literacy Questionnaire, patient support group

Editor: Wen-Wei Sung.

The institutional review board of the Taichung Veterans General Hospital approved the study (IRB TCVGH No.: CE20063A).

This study was approved by Ethics Committee of Taichung Veterans General Hospital, IRB number: CE20063A. All methods were carried out in accordance with relevant guidelines and regulations and all participants signed informed consents.

Consent to publish is not applicable

The individual patient-level data was not made publically available due to containing potentially identifying patient data; however, the study data may be made available from the authors upon reasonable request.

The authors have no conflicts of interest to disclose.

Supplemental Digital Content is available for this article.

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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How to cite this article: Wu CL, Liou CH, Liu SA, Sheu WH, Tsai SF. Mandarin multidimensional health literacy questionnaire for patient supporting groups: a quality improvement article. *Medicine* 2020;99:45(e23182).

Received: 21 May 2020 / Received in final form: 11 September 2020 / Accepted: 17 October 2020

<http://dx.doi.org/10.1097/MD.00000000000023182>

## 1. Introduction

According to the World Health Organization, patient care not only includes routine medical diagnosis, hospitalized care, and drug prescription but should also include supports from family members, peers, and fellow patients. Apart from their physical diseases, many patients also suffer from psychological stress, like depression, stress, and fear. Therefore, these patients need both health education and psychological support. The definition of a patient support group (PSG) is “a group of people with common experiences and concerns and they provide emotional and moral support for one another.” PSG can offer group therapy and education. Support sessions that are used for various diseases include chronic disease self-management and psychotherapy interventions for the purpose of psychotherapy, education, and group support.<sup>[1]</sup> Also, those PSGs with group education included are more efficient and cost-effective as reported in a study on patients of diabetes mellitus (DM).<sup>[2]</sup> In that study, diabetes education in a group setting was equally effective at providing equivalent or slightly greater improvements in glycemic control. PSG is also good for rare diseases, for example, Wilson disease.<sup>[3]</sup> PSG is beneficial for patients undergoing surgery. Studies on post-bariatric surgery,<sup>[4–6]</sup> those patients in PSG wanted a support group was more likely to be struggling in lowering their body weights. PSG, as an important part of postoperative care, helps to support patients in maintaining weight loss, body image, and their return to work. Especially, for cancer patients, as reported in a randomized outcome study of metastatic cancer, PSG offers a variety of functions:<sup>[7]</sup> educating patients/family, sharing the illness experience, providing strength to its members, raising public awareness, and fundraising. Group therapy can be also benefit for rescuing patients with cancer.<sup>[8]</sup> Learning about experiences from other patients can improve disease coping.<sup>[9]</sup> PSG can also reduce anxiety.<sup>[10]</sup> Despite so many benefits, the engagement in PSGs is surprisingly low. A study on 679 patients in the Netherlands showed that only a minority of the patients engaged in organized forms of peer support (9.6% participated in face-to-face support groups and 4.4% participated in peer exchange online).<sup>[11]</sup> The main reason is the lack of resources (time and money) and the heavy workload of medical personnel. Resource allocation depends on patient feedback and the evaluation of results. Therefore, how to evaluate the outcome of PSG matters. Currently, the only questionnaire is used for assessing the satisfaction of patients.

Health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services.<sup>[12]</sup> The issue was first studied 25 years ago and has attracted increasing interest in the form of hundreds of related studies published annually on the subject over the past few years.<sup>[13]</sup> A systemic review in 2011 reported that ~80 million Americans have limited health literacy.<sup>[14]</sup> Low health literacy is associated with poor health outcomes and poor use of health care services.<sup>[14]</sup> Therefore, professional organizations recommend, using universal health literacy precautions, to provide understandable and accessible information to all patients, regardless of their literacy or education levels.<sup>[15]</sup> A number of national-specific health literacy-related programs have been designed, such as Rapid Estimate of Adult Literacy in Medicine (REALM) and Test of Functional Health Literacy in Adult TOFHLA of America,<sup>[12]</sup> European Health Literacy Survey Questionnaire of Europe,<sup>[16]</sup> Health Literacy Questionnaire of Australia,<sup>[17]</sup> and All Aspects of Health Literacy Scale in United

Kingdom.<sup>[18]</sup> Mandarin Multidimensional Health Literacy Questionnaire (MMHLQ) was designed by M.H. Wei<sup>[19]</sup> to evaluate the health literacy for the mandarin-speaking population with good sensitivity and specificity. We made use of this self-reporting questionnaire on health literacy as the study outcome variable in our present study.

Given the known importance of PSG, the study on methods to improve PSG is rare. Our study here was designed to answer the question: what is the status of the health literacy (MMHLQ) of participants attending PSG activities? Results can be used to assess the gap of patients and to improve the design of PSG curricula.

## 2. Methods

### 2.1. Study design and population

In 2017, we started a special working group in Taichung Veterans General Hospital in Taichung city of Taiwan for the creation and improvement of PSG. Our institute is the biggest medical center in central Taiwan. Since then, activities for PSG have been managed in a coordinated fashion. We have a total of 45 PSGs in all 25 departments in the hospital. A training program had been established to teach personnel in each PSG to promote patient services, including creating new groups and improving activities. To evaluate health literacy of patients, we adopted a questionnaire with 5 subscale dimensions (MMHLQ) developed by Professor Mi-Hsiu Wei.<sup>[19]</sup> We aimed to determine if and how PGS could help patients to improve their health literacy. All questionnaires were sent to participants (including patients and their families), who had joined different diseases related PSGs. The diseases included: autoimmune disease (systemic lupus erythematosus (SLE) by rheumatology), malignancy (head and neck cancer (HNC) by otorhinolaryngology), chronic disease (diabetes mellitus (DM) by metabolism and endocrinology, chronic kidney disease (CKD) by nephrology, hemodialysis by nephrology and chronic obstructive pulmonary disease (COPD) by chest medicine), genetic disease (autosomal dominant polycystic kidney disease (ADPKD) by nephrology), and degenerative disease (osteoporosis by orthopedics). Reasons why we recruited the above diseases for analysis were as follows. First, we hypothesized that the background disease nature may matter in the healthy literacy. So we included all kinds of diseases for analysis. The above 8 diseases covered all 5 kinds of disease nature. Second, in each kind of PSG, we chose active PSGs for study in our institute in order to have better response rate and avoid selection bias. PSGs of SLE, HNC, DM, CKD, hemodialysis, COPD, ADPKD, and osteoporosis ranked best or better PSGs in their category of disease in our hospital. They had stakeholder map for their PSG, good participation by patients/family and staffs and good quality of curriculum. Finally, there were 5 types of disease (8 diseases and 8 PSGs). We recorded basic background data that included first time participation or not, patient or family, and age. Our study protocol was approved by the institute review board of Taichung Veterans General Hospital (approved number: TCVGH No.: CE20063A). Informed consents of patients and family were waived due to the pure data analysis nature of the study.

### 2.2. Outcome analysis with MMHLQ

The MMHLQ was designed by Wei et al. in 2017 for the evaluation of health literacy on mandarin-speaking population.<sup>[19]</sup> It consists of 5 dimensions:

- (1) accessing,
- (2) understanding,
- (3) appraising,
- (4) applying health information, and
- (5) communication.

It has 20 self-reported items (supplementary data, Table 1, <http://links.lww.com/MD/F179>). All items were scored according to a 4-points scale: 1 point for very easy, 2 points for easy, 3 points for difficult and 4 points for very difficult. The levels of health literacy are defined as the instruction of MMHLQ: inadequate if score  $\leq 2.5$ , limited/problematic if  $2.5 < \text{score} \leq 2.98$ , sufficient if  $2.98 < \text{score} \leq 3.52$ , and excellent if  $3.52 < \text{score} \leq 4$ . Psychometric analyses demonstrated that the scale has high internal consistency and test-retest reliability, as well as good construct, convergent, discriminant, criterion-related, and known group validity. Cross-validation analyses demonstrated the metric invariance of the scale across two samples. All questionnaires were sent to participants (both patients and their families) at the beginning of PSG activities. After collected the questionnaires as many as possible, we then analyzed the associations between all 20 questions of MMHLQ and some potential factors, including first-time participation, patient or family, and age ( $\geq 65$  or  $< 65$  y/o). Professor Wei et al had approved the use of MMHLQ in the present study on May 25, 2018 (supplementary data, Table 2, <http://links.lww.com/MD/F179>).

### 2.3. Statistical analyses

Quantitative data were expressed as mean  $\pm$  standard deviation. Nominal and categorical variables were compared using the *Chi-square* likelihood ratio or one-way ANOVA. Student *t* test was used to determine the associations between MMHLQ scores and first time participation or not, patient or family, and elderly or not. SPSS software (Statistical Package for the Social Science, version 20.0, Armonk, NY) was used for all the statistical analyses.

## 3. Results

We obtained 458 questionnaires returned from 8 PSGs (SLE, HNC, DM, ADPKD, hemodialysis, CKD, COPD, and osteoporosis) during their activities (Table 1). The overall response rate was 91.1% for the PSGs. The mean age of participants was  $55.30 \pm 16.39$  years old. Most participants (72.5%) took part in PSG for their first time. Many of these first-time participants had relatively mild and chronic diseases: 97.6% osteoporosis, 86.8% CKD, and 80.2% ADPKD. More than half of the participants (61.1%) were patients. Average age of participants was  $55.30 \pm 16.39$  years.

Results of all 20 questions of MMHLQ are shown with more details in Supplementary Table 1, <http://links.lww.com/MD/F179>. Table 1 shows the subtotal scores of each dimension:  $11.37 \pm 2.23$  for accessing,  $12.25 \pm 1.85$  for understanding,  $10.66 \pm 2.33$  for appraisal,  $11.16 \pm 2.04$  for application, and  $11.57 \pm 1.99$  for communication. The highest score was for dimension of understanding ( $12.25 \pm 1.85$ ) and the lowest score was for the dimension of appraisal ( $10.66 \pm 2.33$ ). For the dimension of understanding, all 4 questions had the highest 4 scores ( $3.02 \pm 0.56$ ,  $3.04 \pm 0.57$ ,  $3.07 \pm 0.51$ , and  $3.12 \pm 0.55$ ), which were  $> 2.98$  points, reflecting sufficiently good ability. On the contrary, the lowest 4 of the 20 questions were found with the dimension of appraisal ( $2.56 \pm 0.71$ ,  $2.66 \pm 0.67$ ,  $2.72 \pm 0.63$ ,

**Table 1**

**Background characteristics of participants and score of MMHLQ in all PSGs (N=458).**

	Total
Case (n.) and response rate (%)	458 (91.1%)
1st time participation (n, %)	332 (72.5%)
Patient (n, %), not family	280 (61.1%)
Age (yr/o)	$55.30 \pm 16.39$
MMHLQ: 5 subscales	
Subscale 1: Accessing	
1. Searching information about disease	$2.79 \pm 0.66$
2. Get information about health protection	$2.90 \pm 0.60$
3. Find health information from network	$2.87 \pm 0.71$
4. Get information about report of health examination report	$2.81 \pm 0.62$
Total of subscale	$11.37 \pm 2.23$
Subscale 2: Understanding	
5. Understand the instruction of medication bag	<b><math>3.02 \pm 0.56</math></b>
6. Obey the instruction of medical personnel to care disease	<b><math>3.04 \pm 0.57</math></b>
7. Understand the introduction of medical personnel	<b><math>3.07 \pm 0.51</math></b>
8. Follow the instruction of medical bag to take medication	<b><math>3.12 \pm 0.55</math></b>
Total of subscale	<b><math>12.25 \pm 1.85</math></b>
Subscale 3: Appraisal	
9. Evaluate whether the health information can be used to solve medical problems	<b><math>2.72 \pm 0.63</math></b>
10. Evaluate the health information suitable for himself/herself or not	<b><math>2.73 \pm 0.63</math></b>
11. Evaluate the difference or consistence of health information	<b><math>2.66 \pm 0.67</math></b>
12. Evaluate the reliability of medical information from network	<b><math>2.56 \pm 0.71</math></b>
Total of subscale	<b><math>10.66 \pm 2.33</math></b>
Subscale 4: Application	
13. Apply health information to know the progress of disease	$2.74 \pm 0.61$
14. Apply health information to prevent disease	$2.81 \pm 0.57$
15. Apply health information to understand the report of health examination	$2.86 \pm 0.56$
16. Apply health information to decided how treat disease	$2.76 \pm 0.59$
Total of subscale	$11.16 \pm 2.04$
Subscale 5: Communication	
17. Talk to doctors the chosen examination and treatment	$2.83 \pm 0.60$
18. Make sure with medical personnel about accuracy of orders	$2.89 \pm 0.56$
19. Discuss with doctor about the choice of treatment	$2.92 \pm 0.57$
20. Ask medical personnel if you are not sure	$2.93 \pm 0.55$
Total of subscale	$11.57 \pm 1.99$

MMHLQ = Mandarin Multidimensional Health Literacy Questionnaire, PSG = patient support group.

and  $2.73 \pm 0.63$ ). Of all scores, the lowest was “evaluate the reliability of medical information from network” ( $2.56 \pm 0.71$ ) and the highest was “follow the instruction of medical bag to take medication” ( $3.12 \pm 0.55$ ).

The association between first-time participation and all MMHLQ scores are listed in Table 2. No statistical significance was found in all 20 questions. However, there was a trend that the first time participant had high score of “Find health information from network” ( $2.91 \pm 0.70$  vs  $2.77 \pm 0.72$ ,  $P = .059$ ). There is an also a trend that non-1st time participant had higher score of “Discuss with doctor about the choice of treatment” ( $2.99 \pm 0.51$  vs  $2.89 \pm 0.59$ ,  $P = .075$ ).

The association between the role or participation (patients themselves or family) and MMHLQ is shown in Table 3. Patients (compared to family) were associated with higher score on “obey the instruction of medical personnel to care disease” ( $3.09 \pm 0.57$  vs  $2.97 \pm 0.56$ ,  $P = .021$ ). However, Patients (compared to family) had lower score on “find health information from network” ( $2.82 \pm 0.77$  vs  $2.95 \pm 0.58$ ,  $P = .045$ ).

**Table 2****The association between first time participation and all scores of MMHLQ in all PSGs.**

	Total		P value
	1st time	Not 1st time	
Subscale 1: Accessing			
1. Searching information about disease	2.78 ± 0.68	2.82 ± 0.64	.592
2. Get information about health protection	2.88 ± 0.62	2.94 ± 0.53	.356
3. Find health information from network	2.91 ± 0.70	2.77 ± 0.72	.059
4. Get information about report of health examination report	2.82 ± 0.65	2.79 ± 0.56	.661
Total of subscale	11.39 ± 2.32	11.32 ± 2.01	.742
Subscale 2: Understanding			
5. Understand the instruction of medication bag	3.01 ± 0.58	3.02 ± 0.50	.840
6. Obey the instruction of medical personnel to care disease	3.05 ± 0.57	3.02 ± 0.57	.522
7. Understand the introduction of medical personnel	3.06 ± 0.54	3.08 ± 0.43	.763
8. Follow the instruction of medical bag to take medication	3.10 ± 0.56	3.14 ± 0.49	.477
Total of subscale	12.24 ± 1.92	12.26 ± 1.67	.914
Subscale 3: Appraisal			
9. Evaluate whether the health information can be used to solve medical problems	2.71 ± 0.66	2.74 ± 0.55	.621
10. Evaluate the health information suitable for himself/herself or not	2.73 ± 0.64	2.74 ± 0.60	.889
11. Evaluate the difference or consistence of health information	2.64 ± 0.69	2.69 ± 0.60	.484
12. Evaluate the reliability of medical information from network	2.53 ± 0.73	2.63 ± 0.67	.195
Total of subscale	10.61 ± 2.41	10.79 ± 2.11	.456
Subscale 4: Application			
13. Apply health information to know the progress of disease	2.74 ± 0.63	2.75 ± 0.55	.933
14. Apply health information to prevent disease	2.81 ± 0.60	2.82 ± 0.51	.865
15. Apply health information to understand the report of health examination	2.86 ± 0.57	2.84 ± 0.53	.730
16. Apply health information to decided how treat disease	2.75 ± 0.60	2.76 ± 0.56	.885
Total of subscale	11.16 ± 2.12	11.17 ± 1.84	.985
Subscale 5: Communication			
17. Talk to doctors the chosen examination and treatment	2.82 ± 0.62	2.85 ± 0.55	.669
18. Make sure with medical personnel about accuracy of orders	2.91 ± 0.57	2.86 ± 0.52	.396
19. Discuss with doctor about the choice of treatment	2.89 ± 0.59	2.99 ± 0.51	.075
20. Ask medical personnel if you are not sure	2.91 ± 0.56	2.98 ± 0.51	.157
Total of subscale	11.53 ± 2.06	11.68 ± 1.81	.457

T test. \* $P < .05$ ; \*\* $P < .01$ .

MMHLQ = Mandarin Multidimensional Health Literacy Questionnaire, PSG = patient support group.

Moreover, older participants (age  $\geq 65$ ) had much lower scores of all 20 questions of MMHLQ (Table 4). Of these lower scores, greater significance ( $P < .001$ ) was found in the dimensions of accessing ( $11.76 \pm 2.08$  vs  $10.56 \pm 2.35$ ) (“searching information about disease,” “get information about health protection, and “find health information from network”), applications ( $10.91 \pm 2.32$  vs  $10.14 \pm 2.28$ ) (“apply health information to know the progress of disease,” “apply health information to prevent disease,” and “apply health information to understand the report of health examination”), and communication ( $11.82 \pm 1.91$  vs  $11.03 \pm 2.06$ ) (“ask medical personnel if you are not sure”).

#### 4. Discussion

All participants believed that they have sufficient ability to understand the information given by the medical personnel, including instruction on the medical bag, instruction of how to care disease, instruction of disease, and follow the instruction on the medical bag. This supported the positive effects regarding the medical bag, and the well-received face-to-face recommendations. Moreover, the health literacy has the highest impact. Information on education and communication can be provided in the drug bags, while patients can study it at each time medication is taken. Drug bags not only serve the purpose of drug packaging but also convey medical information. With a well-designed drug bag, it can improve the drug adherence.<sup>[20]</sup> In 2002, the Taiwan

Healthcare Reform Foundation conducted two surveys regarding quality of drug bags at 16 major local medical centers and hospitals. Results showed that most drug bags were substandard. Raising public awareness of this issue, the Department of Health released new regulations in May, 2002. Under new regulations, 13 mandatory labels were required to appear on every drug bag. These mandatory items included “name of the pharmacists, expiration date, and the name of pharmaceutical company”. Such information was previously commonly ignored. Since June 2006, the Taiwan Drug Relief Foundation consistently promoted all national medical care institutions (including our institute) and pharmacies in putting drug relief information as visible as possible on drug packages. Afterwards, the design of drug bag is good for all participants who have therefore better health literacy. In our institute, we designed drug bags as follows. The information was grouped, classified, and merged in accordance with the needs of the target users, and arranged on the label, from upper-left to lower-right, according to importance. The font size was  $>12$  point, and line spacing, 1.2. In addition, the English drug name was printed in prefixed and in uppercase. The text of words and background colors in the drug bag were presented with sufficiently high contrast, adding a visual element to better readability. Besides, bar code, photograph of the drug, and the registration information were incorporated to enhance the accuracy and efficiency of using the drug bag. A drug bag design is also good for the issue of polypharmacy, especially in

**Table 3**  
**The association between participation (patient or family) and all scores of MMHLQ in all PSGs.**

	Total		P value
	patient	family	
Subscale 1: Accessing			
1. Searching information about disease	2.78 ± 0.70	2.81 ± 0.61	.521
2. Get information about health protection	2.88 ± 0.62	2.93 ± 0.55	.300
3. Find health information from network	2.82 ± 0.77	2.95 ± 0.58	<b>.045*</b>
4. Get information about report of health examination report	2.80 ± 0.63	2.83 ± 0.61	.641
Total of subscale	11.28 ± 2.34	11.53 ± 2.06	.225
Subscale 2: Understanding			
5. Understand the instruction of medication bag	3.05 ± 0.55	2.96 ± 0.56	.064
6. Obey the instruction of medical personnel to care disease	3.09 ± 0.57	2.97 ± 0.56	<b>.021*</b>
7. Understand the introduction of medical personnel	3.08 ± 0.53	3.04 ± 0.47	.447
8. Follow the instruction of medical bag to take medication	3.15 ± 0.55	3.06 ± 0.51	.065
Total of subscale	12.38 ± 1.88	12.04 ± 1.80	.056
Subscale 3: Appraisal			
9. Evaluate whether the health information can be used to solve medical problems	2.73 ± 0.62	2.69 ± 0.64	.496
10. Evaluate the health information suitable for himself/herself or not	2.76 ± 0.63	2.69 ± 0.62	.272
11. Evaluate the difference or consistence of health information	2.66 ± 0.68	2.65 ± 0.64	.776
12. Evaluate the reliability of medical information from network	2.52 ± 0.72	2.61 ± 0.70	.184
Total of subscale	10.68 ± 2.34	10.64 ± 2.33	.877
Subscale 4: Application			
13. Apply health information to know the progress of disease	2.75 ± 0.61	2.72 ± 0.61	.622
14. Apply health information to prevent disease	2.81 ± 0.60	2.81 ± 0.54	.975
15. Apply health information to understand the report of health examination	2.86 ± 0.56	2.84 ± 0.55	.687
16. Apply health information to decided how treat disease	2.78 ± 0.58	2.71 ± 0.60	.224
Total of subscale	11.21 ± 2.06	11.09 ± 2.02	.538
Subscale 5: Communication			
17. Talk to doctors the chosen examination and treatment	2.84 ± 0.60	2.82 ± 0.60	.788
18. Make sure with medical personnel about accuracy of orders	2.89 ± 0.56	2.89 ± 0.56	.994
19. Discuss with doctor about the choice of treatment	2.93 ± 0.58	2.90 ± 0.56	.662
20. Ask medical personnel if you are not sure	2.95 ± 0.54	2.90 ± 0.55	.365
Total of subscale	11.60 ± 1.97	11.52 ± 2.03	.650

T test. \* $P < .05$ ; \*\* $P < .01$ .

MMHLQ = Mandarin Multidimensional Health Literacy Questionnaire, PSG = patient support group.

type 2 DM and other internal medicine department.<sup>[21,22]</sup> In this study, we also highlighted the importance of professionalism in drug bags and during face-to-face interactions with patients.

Generally speaking, the lowest score of MMHLQ was with the dimension of appraisal (10.66 ± 2.33 of subscale). How to deal with ever-increasing volume of information about medicine is not only important for patients but also for medical professionals. Professionals were taught how to deal with the data deluge.<sup>[23]</sup> On the other hand, little attention has been paid to teach patients how to appraise medical information. As health information becomes more accessible and transferable, several issues arise, including information filtering, context-sensitive decision support, ethical and legal guidelines, and accuracy of information.<sup>[24]</sup> Health care consumers increasingly obtain health information from the Internet to inform their health care but noteworthy considerations exist including information appraisal skills.<sup>[25]</sup> Awareness and education are warranted to assist the health care consumers in achieving proficiency when they turn to the Internet for health information. Moreover, without improved appraisal skills, despite good ability of accessing and application, patients likely obtain inaccurate knowledge and they might readily apply them for medical care. They might experience worse outcomes. Therefore, the dimension of appraisal is most problematic especially in current era of information explosion. The impression of “The doctors as the second opinion and the internet as the first” was reported by Lisa et al in 2009 in an unpublished study. Lacking the ability of

appraisal should not be underestimated in the current era. We suggested that professionals can offer clarification on the differences between symptoms and diagnoses, as well as suggesting credible sources of online health information. For all PSGs, we should make a point for improvement along this direction, and provide best practices to ensure the health care consumers can better understand how to seek and obtain credible health information on the Internet.

Whether the participation is first-time or not had no effect on all dimensions of MMHLQ. This finding is reasonable because patients can access health information from all kinds of media in the current era of information explosion. The participation of PSG is self-reported and is just one way for patients to access health information. Also those participants with more than one time-PSG did not indicate they had better health literacy. Result suggested that no differences existed between new and old participants of PSG.

Compared to family’s participation, patients’ participation was associated with “obey the instruction of medical personnel to care disease” ( $P = .021$ ). In our institute, participants were always invited by medical personnel. Therefore, those participants likely had high adherence to professionals, including invitation of PSG and to the instruction of disease care. For the family, we did not have enough rapport and they really had fewer adherences to professionals. That is also consistent with the result that family was more willing to search for more medical information from

**Table 4**  
**The association between age (Age $\geq$ 65 or < 65yr/o) and all scores of MMHLQ in all PSGs.**

	Total		P value
	Age < 65	Age $\geq$ 65	
Subscale 1: Accessing			
1. Searching information about disease	2.88 $\pm$ 0.63	2.60 $\pm$ 0.69	<.001**
2. Get information about health protection	2.97 $\pm$ 0.56	2.75 $\pm$ 0.65	<.001**
3. Find health information from network	3.03 $\pm$ 0.62	2.54 $\pm$ 0.78	<.001**
4. Get information about report of health examination report	2.88 $\pm$ 0.60	2.67 $\pm$ 0.65	.001**
Total of subscale	11.76 $\pm$ 2.08	10.56 $\pm$ 2.35	<.001**
Subscale 2: Understanding			
5. Understand the instruction of medication bag	3.06 $\pm$ 0.55	2.92 $\pm$ 0.56	.010*
6. Obey the instruction of medical personnel to care disease	3.08 $\pm$ 0.56	2.97 $\pm$ 0.58	.068
7. Understand the introduction of medical personnel	3.13 $\pm$ 0.48	2.94 $\pm$ 0.54	<.001**
8. Follow the instruction of medical bag to take medication	3.15 $\pm$ 0.53	3.03 $\pm$ 0.55	.029*
Total of subscale	12.43 $\pm$ 1.80	11.86 $\pm$ 1.91	.002**
Subscale 3: Appraisal			
9. Evaluate whether the health information can be used to solve medical problems	2.78 $\pm$ 0.62	2.59 $\pm$ 0.63	.002**
10. Evaluate the health information suitable for himself/herself or not	2.78 $\pm$ 0.62	2.62 $\pm$ 0.62	.008**
11. Evaluate the difference or consistence of health information	2.71 $\pm$ 0.66	2.54 $\pm$ 0.68	.008**
12. Evaluate the reliability of medical information from network	2.63 $\pm$ 0.72	2.39 $\pm$ 0.68	.001**
Total of subscale	10.91 $\pm$ 2.32	10.14 $\pm$ 2.28	.001**
Subscale 4: Application			
13. Apply health information to know the progress of disease	2.82 $\pm$ 0.59	2.58 $\pm$ 0.62	<.001**
14. Apply health information to prevent disease	2.88 $\pm$ 0.53	2.65 $\pm$ 0.64	<.001**
15. Apply health information to understand the report of health examination	2.94 $\pm$ 0.53	2.68 $\pm$ 0.57	<.001**
16. Apply health information to decided how treat disease	2.81 $\pm$ 0.59	2.65 $\pm$ 0.58	.006**
Total of subscale	11.45 $\pm$ 1.94	10.56 $\pm$ 2.13	<.001**
Subscale 5: Communication			
17. Talk to doctors the chosen examination and treatment	2.89 $\pm$ 0.59	2.70 $\pm$ 0.60	.002**
18. Make sure with medical personnel about accuracy of orders	2.95 $\pm$ 0.55	2.77 $\pm$ 0.55	.001**
19. Discuss with doctor about the choice of treatment	2.98 $\pm$ 0.56	2.79 $\pm$ 0.58	.001**
20. Ask medical personnel if you are not sure	3.00 $\pm$ 0.51	2.78 $\pm$ 0.58	<.001**
Total of subscale	11.82 $\pm$ 1.91	11.03 $\pm$ 2.06	<.001**

T test.

MMHLQ = Mandarin Multidimensional Health Literacy Questionnaire, PSG = patient support group.

\*  $P < .05$ .

\*\*  $P < .01$ .

other media (such as network) than from medical personnel ( $P = .045$ ). Therefore, for patients in PSG, we could make more efforts in giving them than families accurate instructions.

Elderly people (aged 65 and above) are currently the fastest growing population worldwide. Many changes during aging could lead to lower health literacy.<sup>[26]</sup> In this study, aging is also a major threat to health literacy in all 20 variables and all 5 dimensions. The lower health literacy is important for older people, including poorer self-rated health, limited use of preventive health services, more hospital visits and higher mortality as well as inferior physical and mental health.<sup>[27]</sup> An European study showed that 58.1% of the elderly report limited health literacy.<sup>[28]</sup> Physical impairments, including hearing and vision losses, may contribute lower ability of the dimension of accessing. Psychosocial factors may lead to poorer ability to understand things. Patients most certainly rely on cognitive functions to recall and process health information. The elderly have poorer ability to comprehend and recall new events.<sup>[26]</sup> The decline of cognitive function is a cause of showing the lowest scores with the dimension of appraisal (11.45  $\pm$  1.94 vs 10.56  $\pm$  2.13,  $P < .001$ ). Of all participants, the elderly had the lowest ability of "evaluate the reliability of medical information from network" (2.39  $\pm$  0.68), which was also within the dimension of appraisal. This result further echoes the impact of information explosion. The elderly could access more information

in current era, but they did not necessarily evaluate the reliability of medical information found from the network. To our knowledge, ours is the first study to compare all detail variables of health literacy in the elderly and non-elderly populations. Our study is the first to point out that the most severely reduced health literacy is with the dimension of literacy. This information can help us to adjust curriculum of PSG for the older participants.

There are some limitations of this study. First, we did not obtain questionnaires for all 45 PSGs in our hospital. The sample size is still too small and that may impact the output interpretation. But the 458 questionnaires returned had covered nearly all types of diseases, including autoimmune disease (SLE), malignancy (HNC), chronic disease (DM, CKD, hemodialysis and COPD), genetic disease (ADPKD), and degenerative disease (osteoporosis). We believe that results of this study can be applied to other PSGs. Second, we did not have results of MMHLQ for the comparison of before and after attending PSGs. However, the aim of this study was to use MMHLQ for PSG first. Because the result is useful for the improving PSG, we will use MMHLQ as an outcome analysis for participants before and after PSGs in our future study. Finally, we did not have the data of sociodemographic characteristics, such as sex and educational level. That is because of the issue of privacy. In the future, we will try to investigate the role of sociodemographic characteristics on health literacy.

## 5. Conclusion

In addition to standard medical care, PSG is also crucial. The highest score we found is with the dimension of understanding and the lowest score is with the dimension of appraisal. For the elderly, they had poorer ability of health literacy, especially with the dimension of appraisal. The results of MMHLQ in PSG can be used to improve curriculum on health literacy of participants.

## Acknowledgments

We thank the Biostatistics Task Force of Taichung Veterans General Hospital and Mr. Chen, Jun-Peng for help in statistics. We also thank Professor Wei et al. had approved the use of MMHLQ in the present study on May 25, 2018.

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