BMJ Open

Exploring health literacy competencies toward patient education program for healthcare professionals: A Delphi study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2016-011772
Article Type:	Research
Date Submitted by the Author:	03-Mar-2016
Complete List of Authors:	Chang, Lichun; Chang Gung University of Science and Technology, Nursing
Primary Subject Heading:	Medical education and training
Secondary Subject Heading:	Public health
Keywords:	health literacy, competencies, Delphi method, health profession

Title: Exploring health literacy competencies toward patient education program for healthcare professionals: A Delphi study

Running Title: Competences in health literacy practice

Author (corresponding author)

Li-Chun Chang, EdD, RN

Associate Professor

School of Nursing, Chang Gung University of Science and Technology, Address：No. 261, Wen-Hua 1st Rd., Kwei-Shan, Tao-Yuan 33303 Taiwan, R.O.C.

Tel: 886-3-2118999 ext 3209

Fax:+886-3-2118866

E-mail: lichunc61@yahoo.com.tw

Objectives: To achieve consensus on a set of competencies in health literacy practice based on a literature review and expert consultation.

Setting: A two-stage modified Delphi study involving a literature review, followed by qualitative interviews and three rounds of email-based data collection over a three-month period in 2011.

Participants: 15 healthcare practitioners with more than six months' experience in patient education were interviewed to collect the health literacy practice. 24 experts (twelve who were academic scholars in health literacy and twelve professionals with training related to health literacy practice) were invited to participate in Delphi process.

Results: Qualitative data from interview was analyzed and summarized into 99 competency items for health literacy practice, which categorized into five domains of health literacy practice including those pertaining to knowledge and skills. Consensus was reached on 92 of 99 competencies, using a modified Delphi technique.

Conclusion: The 92 competencies in health literacy practice embraced core components of patient education in the healthcare profession.

Strengths and limitations of this study

- To the best of our knowledge, this is the first study to develop a competencies guide of health literacy practice for health professionals in Chinese societies.
- These competencies embraced core components of patient education in healthcare
- The limitation of this study is that only 24 experts were recruited in a panel, however, we adopted subjective and objectives methods to generate the

competencies in health literacy practice prior to achieving consensus of Delphi process.

- Competencies in health literacy practice may provide a starting point for increased integration of health literacy concepts and skills into professional and continuing education programs.

Introduction

Health literacy, as defined by the World Health Organization, represents cognitive and social skills that determine the individual's motivation and ability to access, understand, and use information in ways that promote and maintain good health [1]. To determine the contribution that health literacy makes to health disciplines, the rediscovery of health education should be explored in alliances between health and educational sectors in pursuing the goal of improved literacy levels in the population [2]. Accordingly, investment in sustainable health education requires competent healthcare professionals who contribute to the improvement of healthcare quality and reduce medical error [3].

Health literacy practice involved the use of a set of patient-centered protocols and strategies to mitigate the effects of limited health literacy [4 5], which should be considered in health education programs. Healthcare providers' competencies in health literacy practice are vital in ensuring significant health outcomes through the efficiency of appropriate care plans [6]. Healthcare professionals demonstrating assessment qualifications in their clinical practice could meet clients' care needs and design appropriate interventions to enhance self-care abilities at a level that clients understand [7]. However, previous studies have shown that healthcare providers overestimate patients' health literacy because of misunderstanding or limited cognition concerning health literacy [8-10].

Health literacy as an outcome of health education and its practices, which has been explored in previous studies, could be categorized into three groups: health literacy assessment [8], communication activities [11], and educational strategies for patients with low health literacy [12]. Although the importance of health literacy practice and use of a variety of health literacy techniques varied significantly across

health disciplines, such as nutritionists , nursing, and pharmacy [13], previous studies have demonstrated inadequate ability in health professionals, with respect to limited recognition and awareness of health literacy [9], confidence [11], and skills [13 14], in caring for those with low health literacy. It is important that health professionals possess adequate awareness, knowledge, skills, and attitudes when treating patients with low health literacy [5]. Accordingly, identifying key elements of competencies in health literacy practice is an essential step in promoting the quality of care provided for individuals with low health literacy [15]. In this study, we reviewed the literature to identify the core domains of health literacy practice and use it as a guideline in interviews designed to collect information regarding health professionals' competencies. The Delphi technique was used to establish consensus on the proposed competencies.

Methods

We began by reviewing the healthcare literature for information concerning key domains of health literacy practice in health professionals and used these domains as a guideline for interviews designed to explore experiences of health literacy practice in health professionals. We then considered the health literacy practice competency items in a Delphi consensus process. This study was approved by the Institutional Review Board at the institution with which the authors were affiliated.

Identifying the key domains of competencies in health literacy practice

We searched Medline, PsyclNFO, PubMed, and OVID nursing collections for original studies and expert review papers concerning health literacy practice between 2005 and 2015. We entered "health literacy" as the main keyword in the search to retrieve the relevant literature, and other related terms, such as training, teaching, practice, education, and profession, were added with the Boolean operator "AND" to

refine our search.

Qualitative interviews with healthcare professionals to generate competencies items in health literacy practice

We established the interview guidelines using four open questions: "describe the attributes of patients who were difficult to teach," "describe ways in which clients with low health literacy can be assisted," "describe the way that assessments are conducted," and "describe the communication techniques used in your practice." First, two experienced health educators were recruited via referrals from hospital managers. Snowball sampling, also known as accidental sampling, was used to identify other suitable interviewees, and additional participants were introduced by the interviewees. After agreeing to participate, they engaged in recorded one-to-one interviews conducted by trained investigators. At this stage, 15 healthcare practitioners with more than six months' experience in patient education, including five nurses working in clinical, internal, and surgical wards; four case managers; two health educators; three nutritionists; and a pharmacist, were interviewed between September 27 and November 12, 2011. Each interview took place at the participant's office, and lasted between 60 and 90 min. All interview details were typed as transcripts and reviewed carefully for content.

Delphi process

A Delphi process is defined as a multi-stage survey that ultimately attempts to achieve consensus on an important issue; its basic characteristics include anonymity, iteration, controlled feedback, and statistical aggregation to create a group response [16] [17]. Moreover, the method is highly recommended for issues for which knowledge and understanding have not been explored in depth, and it is based on the premise that pooled intelligence enhances individual judgment and captures through an anonymous

enquiry process [18]. The questionnaire for the second round of data collection feeds back the results of the first round, mainly in the form of median or arithmetic mean values and distribution parameters [19].

The first round of data collection was replaced by a literature review and face-to-face interviews to elicit the opinions of the expert panel. The second to fourth rounds involved questionnaires distributed via mail and followed the classic Delphi approach.

Expert recruitment

With respect to the sample size for the Delphi process, Parente and Anderson-Parente [20] recommended a lower limit of 10 participants after the deduction of potential dropouts. In Taiwan, health literacy research has attracted academic and practical experts since 2008, and the majority of the health literacy literature has focused on patient factors. Because the number of experts with experience in health literacy research or practice was limited, 24 experts (twelve who were academic scholars in health literacy and twelve professionals with training related to health literacy practice) were invited to participate in the second to fourth rounds of data collection.

Delphi procedure

The modified Delphi method used in this study consisted of three rounds of email-based data collection, each of which lasted for one month during a three-month period from January to April 2012. In each round, experts were invited to rate each proposed competency item with respect to its appropriateness and importance to health professionals, using a five-point Likert-type scale ranging from 1 (not important) to 5 (very important). Consensus was achieved if three criteria including a mean of at least 4.0, representing 80% agreement; a standard deviation of ≤1; and

quartile deviation ranging from 0.6 to 1.0 were met. The questionnaire contained space for an answer and feedback or further comments for each statement. Consensus was achieved if three predefined criteria were met: an mean item score of at least 4 and standard deviation of ≤1. In statements for which consensus was not achieved, feedback and comments were used to adjust the statement for the following round. The statements for all three rounds of the Delphi process were retained to ensure that they were all equally as likely to gain the highest importance rating and level of consensus [21]. Experts were provided with feedback and a summary of the results of the previous round, and their individual modified and amended items were color coded to prevent confusion during reading in the second and third rounds.

Results

Literature review

Literature searches using the keywords "training," "teaching," "competence," and "profession" in combination with "health literacy" produced 35, 35, 5, and 55 articles, respectively. After excluding duplicates, anonymous authors, and non-English articles, 62 articles were relevant to the topic. Of these, 43 were discussion articles, and 19 were empirical studies, of which two were excluded, as the full text was not available. In the 17 complete articles, communication strategies (n=9, 52.94%) and understanding health literacy knowledge (n=8, 47.05%) were the most frequently mentioned health literacy practices. Assessment methods for low health literacy and appropriately written education materials or resources for patients were also crucial to health literacy practice. None of these studies or discussion articles were Chinese (see Table 1).

Table 1 The results of literature review for health literacy practice among health professionals between 2005-1015

Themes in literatures	N(%)	Source
Assessment methods for low health literacy	5(29.4%)	15 22-25
Appropriate written patient education materials or resource	5(29.4%)	15 22 23 26 27
Communication strategies	9(52.94%)	3 15 22 24-26 28-30
Understanding or knowledge of health literacy	8(47.05%)	3 9 15 23 24 28 29 31
Association between literacy or health literacy and patient outcomes	1(5.8%)	28
Evaluating the health literacy education	1(5.8%)	32
Teaching of information and methods;	1(5.8%)	33
Implementing a health literacy program for patients	2(11.7%)	9 27

Qualitative interview for health professionals

The deductive content analysis described by Elo and Kyngas [34] was used to confirm four domains of health literacy practice, based on a review of related literature. In total, 648 meaningful statements were extracted from the interviews. Interview results were summarized as health literacy practices and used to compare categorization results from the literature review for further classification. Thereafter, 99 meaning units were identified and classified into two domains with six subdomains including those pertaining to knowledge (i.e., knowledge of health literacy and recognition of the characteristics of patients with low health literacy) and skills (i.e., designing a patient education plan for patients with low health literacy, assessing health literacy assessment, adopting low-literacy health education strategies, and evaluating of an educational plan for patients with low health literacy attributes).

The consensus results of the Delphi process

In the second round, 10 of 99 items did not reach consensus which eight items reached 70–79% agreement with a standard deviation of >1 and two items had mean

scores between 3.0 and 3.5 (60–70% agreement). In the third round, none of the 99 items had a mean score of <3.0, while 92 reached consensus, four had mean scores between 3.5 and 3.9, and three had scores of 4.0 with a standard deviation of >1. Ultimately, in the final questionnaire, which was used in the fourth round and created according to experts' opinions, healthcare professionals' competencies in health literacy practice consisted of 92 consensus items, with seven items deleted (see table 2).

Discussion

In Taiwan and the rest of the world, most health literacy studies have focused on the patient's perspective; only a few have explored health professionals' competencies in promoting patients' health literacy. The manner in which health professionals help to promote health literacy in the public is crucial to the expansion of health literacy. The first step to understanding health professionals' ability in health literacy practice is to establish practice-based competencies. The results of the preliminary study were consistent with Coleman [15], who achieved consensus regarding healthcare professionals' competencies, using a modified Delphi method. These results could be used as a reference to increase professionals' awareness of their health literacy skills.

A search using the keywords, "training," "education," "competence," and "health profession," in combination with "health literacy," returned primarily discussion articles and only 19 empirical studies. Teaching materials, teaching resources, and communication skills were mentioned most frequently in the studies included in the analysis.

Table 2. Results of consensus-group ratings for healthcare professionals' competencies in health literacy practice (n = 24)

Competency item	Round accepted	Final round Mean	Mode	SD	QD
Knowledge domain					
Knowledge of health literacy					
K1. Health literacy refers only to a person's ability to read.	2	4.0	4	1.0	0.5
K2. Adequate health literacy is the ability to read, understand, and process health information.	2	4.3	4	0.7	0.5
K3. Those with low health literacy have poorer health outcomes relative to those with sufficient health literacy	2	4.6	5	0.7	0.5
K4. Age is a risk factor that decreases health literacy.	3	4.0	4	0.7	0.5
K5. Patients with high educational levels may present with low health literacy.	2	4.7	5	0.7	0.3
K6. Those with low health literacy have poorer health outcomes relative to those with sufficient health literacy	2	4.7	5	0.7	0.3
K7. Using an appropriate tool is the best way to assess health literacy and identify patients with low health literacy.	2	4.2	5	1.0	0.8
K8. Individuals with high educational levels also need an easy method of learning complicated health information.	2	4.3	5	1.0	0.8
K9. The average education level of those who can understand letters of consent is the first grade of junior high school.	2	4.0	4	1.0	1.0
K10. Suitable educational materials designed for people with low literacy should be understandable at levels below the sixth grade in elementary school.	Delete	3.8	3	1.1	1.0
K11. People with low health literacy need extra medical support, and therefore have higher healthcare	2	4.4	5	0.9	0.8

costs.					
K12. Health education materials should be written at or below a seventh-grade reading level.	2	4.0	4	1.0	1.0
K13. Health literacy could affect physician-patient communication.	2	4.7	5	0.7	0.3
K14. Persons with low health literacy experience limited comprehension health information, leading to care problems.	Delete	3.4	4	1.3	1.0
Recognition for attributes of patients with low health literacy					
Patients with low health literacy …					
A1. may pretend to understand the health educator and ask for help at home.	Delete	3.8	3	0.8	0.8
A2. will say "I can do this, no there is need to teach me" to cover up for their lack of understanding.	2	4.6	5	0.7	0.5
A3. will repeat the same questions.	2	4.4	5	1.0	0.5
A4. will tell you if they cannot read.	3	4.0	4	1.3	1.0
A5. are more likely to misinterpret medication instructions provided on prescription labels.	2	4.1	4	0.8	0.8
A6. will easily misunderstand prescription instructions.	2	4.4	5	1.0	0.5
A7. cannot understand medication indications.	2	4.6	5	1.0	0.3
A8. will often bring family members along when talking to healthcare professionals.	2	4.4	5	1.0	0.5
A9. will make excuses to avoid reading health information materials when given material to read.	2	4.4	5	0.7	0.5
A10. often complain about their medicine.	2	4.4	5	0.7	0.5
A11. only seek assistance when symptoms worsen.	2	4.7	5	0.7	0.3
A12. cannot understand medical forms and are therefore unable to complete them accurately.	2	4.7	5	0.7	0.3
A13. are likely to put a lot of folded paper in their pockets or wallets.	3	4.0	4	0.8	0.8
A14. do not make necessary appointments or attend for follow up.	2	4.3	4	0.7	0.5
A15. may be likely to pose few questions to professionals.	2	4.4	5	0.9	0.8
A16. cannot talk about how to take medicine.	2	4.1	4	0.8	0.8

Skill domain					
Designing health education plan for patients with low health literacy					
D1. I can handle the psychical barriers to conducting health behaviors for clients	2	4.6	5	0.7	0.5
D2. I can cooperate with other professionals to design health education plans	2	4.7	5	0.7	0.3
D3. I can design audio-visual teaching materials	2	4.7	5	0.7	0.3
D4. I have the language ability to handle different patients	2	4.6	5	0.7	0.5
D5. I can provide group health education	Delete	4.0	5	1.1	0.5
D6. I can implement behavior modification counseling	2	4.4	5	1.0	0.5
D7. I can design computer-based teaching aids	2	4.6	5	1.0	0.3
D8. I can design health education flyers with less than 20% text	2	4.4	5	1.0	0.5
D9. I can apply appropriate education theories in the curriculum	2	4.7	5	1.0	0.0
D10.I can establish a personal profile of teaching materials	2	4.7	5	0.7	0.3
D11.I can design a teaching plan for multicultural populations	2	4.6	5	0.7	0.5
D12.I can design education materials for the illiterate	2	4.4	5	1.0	0.5
Assessing health literacy for low health literate patients					
As1.Determine the right teaching time for various clients	2	4.7	5	0.7	0.3
As2.Determine potential education barriers based on patient characteristics	2	4.7	5	1.0	0.0
As3.Apply appropriate tools to assess patient health literacy levels	2	4.7	5	1.0	0.0
As4.Can conduct health assessments by collecting personal, organizational, and community data	2	4.8	5	0.7	0.0
As5.Identify the classical attributes of low health literacy prior to teaching	2	4.8	5	0.7	0.0
Adopting low-literacy health education strategies					
S1.Use plain language instead of medical jargon	2	4.8	5	0.7	0.0
S2.Use storytelling to make clients understand	2	4.7	5	0.7	0.3

S3. Use metaphors to explain the disease to clients	2	4.7	5	0.7	0.3
S4. Using life-oriented examples to explain the care that patients need	2	4.4	5	1.0	0.5
S5. Teaching using language the student understands	2	4.7	5	1.0	0.0
S6. Explaining health education using materials available to the patient	2	4.7	5	1.0	0.0
S7. Connect new learning with previous experience	2	4.7	5	1.0	0.0
S8. Limiting curricula to two or three new topics	2	4.7	5	1.0	0.0
S9. Use the teach-back technique	2	4.6	5	1.0	0.3
S10. Teach repeatedly when clients cannot understand the teaching content	2	4.7	5	1.0	0.0
S11. Teach repeatedly for the difficult materials	Delete	3.4	4	1.1	0.5
S12. Use the demonstrate-do technique	2	4.7	5	1.0	0.0
S13. Provide health education materials and encourage clients to discuss them with their families	2	4.8	5	0.7	0.0
S14. Provide health education materials with “Questions & Answers”	2	4.7	5	1.0	0.0
S15. Use simple words to explain care plans and related treatment	2	4.8	5	0.7	0.0
S16. Base decisions regarding teaching focus on treatment progress	2	4.6	5	1.0	0.3
S17. Summarize the key points of teaching at the end of the interview	2	4.8	5	0.7	0.0
S18. Instruct others regarding how to create a care plan rather than explaining the disease or condition	2	4.8	5	0.4	0.3
S19. Use pictorial methods, rather than words, to emphasize importance of issues for clients	2	4.7	5	1.0	0.0
S20. Provide self-designed sticks to allow clients to mark their records	2	4.8	5	0.7	0.0
S21. Use the one-by-one method and pictorial image material	2	4.8	5	0.7	0.0
S22. Use media to benefit teaching outcomes	2	4.7	5	1.0	0.0
S23. Design teaching materials as teaching aids in health education	2	4.4	5	1.0	0.5
S24. Use online or internet teaching	2	4.7	5	1.0	0.0
S25. Consider disobedient behavior to be temperate coping behavior	2	4.2	5	1.3	0.8

S26. Offer more encouragement to patients and illiterate clients	2	4.7	5	1.0	0.0
S27. Understand clients' disobedient behaviors	2	4.6	5	0.7	0.5
S28. Invite caregivers to participate in the teaching plan	2	4.6	5	0.9	0.5
S29. Encourage clients and their families and clarify unclear parts of teaching via telephone	2	4.8	5	0.7	0.0
S30. Present oneself to clients as a resource	2	4.7	5	0.7	0.3
S31. Create an environment of mutual trust	2	4.8	5	0.7	0.0
S32. Encourage sharing between clients	2	4.8	5	0.7	0.0
S33. Create an embarrassment-free environment	2	4.6	5	0.9	0.5
S34. Ensure clients' confidentiality	Delete	4.0	5	1.1	0.0
S35. Encourage clients to take note during interviews	2	4.8	5	0.7	0.0
S36. Teach clients to ask, "What is my main problem?"	2	4.8	5	0.7	0.0
S37. Teach clients to ask, "What do I need to do?"	2	4.8	5	0.7	0.0
S38. Teach clients to ask, "What can I do to help my body?"	2	4.7	5	0.7	0.3
S39. Encourage clients to use the question-posing method	2	4.8	5	0.7	0.0
S40. Encourage clients to talk about what doctors say to them	2	4.8	5	0.7	0.0
S41. Encourage clients to demonstrate learned skills to determine their understanding	2	4.8	5	0.7	0.0
S42. Ask clients to provide evidence of their health behavior	2	4.8	5	0.7	0.0
S43. Make eye contact with patients to ensure concentration	2	4.6	5	0.9	0.5
S44. Ask clients to restate the key points that they have learned	2	4.8	5	0.7	0.0
S45. Pay attention to questions that patients ask repeatedly	2	4.8	5	0.7	0.0
S46. Pay attention to nonverbal (e.g., facial) expressions to determine whether the patient has understood	2	4.8	5	0.7	0.0
Evaluating of educational plan for patients with low health literacy					
E1. Can build up the right evaluation criteria for health literacy practice	2	4.7	5	1.0	0.0

E2.	Can conduct appropriate evaluations to demonstrate the effectiveness of health literacy practice	2	4.1	5	1.6	1.0
E3.	Modify education plans to fit patients' problems	2	4.7	5	0.7	0.3
E4.	Illustrate the appropriate effectiveness of teaching based on health literacy	2	4.6	5	0.7	0.5
E5.	Encourage clients with low health literacy to share the successful action outcome	Delete	4.0	5	0.9	0.5
E6.	Design various evaluation approaches according to clients' health literacy levels	2	4.8	5	0.7	0.0

The reason for this could be that the study subjects were physicians in three of the 17 studies and believed that health literacy was a communication skill. However, from the perspective of non- physician professionals, such as nursing, social work, and health education, patient education was an essential component of care plan to help patients achieve self-care. Coleman used the same five crucial points to examine competencies in health literacy practice but divided the competencies into educational and practice domains[15]. However, the present study incorporated a literature review and interviews into an educational process which supported the World Health Organization goals of promoting health literacy to the general public by educational system [5]. For healthcare professionals, the results of this study will be helpful in operating the concept of health literacy into patient education practice while serving patients in clinical settings.

The expert group failed to reach consensus on seven items, three of which, "suitable educational materials designed for people with low literacy should be understandable at levels below the sixth grade in elementary school," "persons with low health literacy experience limited comprehension health information, leading to care problems," and "may pretend to understand the health educator and ask for help at home," belonged to the knowledge domain. With respect to the importance of signs and attributes of low health literacy [35 36], Coleman et al. (2013) labeled them as red

flags and listed the characteristics of patients with low health literacy. However, the low-consensus items represented inadequate identification and recognition of clients with attributes of low health literacy in clinical practice. Chinese health literacy studies still focus primarily on health impact. However, a study conducted in Taiwan showed that patients with low health literacy require professionals to use additional techniques to ensure effective health education, which involves teaching and communication techniques [37]. However, it did not include formal training or courses related to health literacy and did not mention health literacy practice in health professionals; therefore, the expert group failed to reach consensus on some of the knowledge items related to health literacy. For most Chinese-speaking health professionals, understanding health literacy competencies is necessary, and crucial to enhancing public health literacy. Furthermore, consensus was not reached for the three items in the skill domain, "group health education," "ensure clients' confidentiality," and "encourage clients with low health literacy to share the successful action outcome." These items were related to health education and captured via interview but have not been mentioned specifically in the health literacy literature; therefore, the experts could not reach consensus.

Conclusion

The health literacy competencies identified in this study constitute an important and necessary first step in the systematic design and evaluation of curricula required to produce a healthcare workforce that both accounts for and addresses the issues surrounding low health literacy. Most studies have suggested that health literacy and health education or communication skills are closely related. The present study applied these education principles in a holistic and continuous process to construct an index for assessing practice competencies.

A modified Delphi technique was used to achieve consensus on competencies in health literacy practice in healthcare professionals. Further empirical studies are required to verify whether the 92 items identified can be classified into the six domains of competencies in health literacy practice. Moreover, further work is required to prioritize these 92 items, and educational research is required to validate the competencies in health literacy practice and determine which should be taught, which healthcare professionals should receive training, which settings should be used, and which teaching methods should be adopted to improve patient-centered outcomes.

The potential biases in traditional Delphi studies include the imposition of preconceptions on respondents and the use of poor techniques to summarize and present group responses [38]. To avoid the drawbacks involving the imposition of preconceptions on respondents, a thorough review of the literature concerning the modified Delphi method was performed to collect information regarding competencies in health literacy practice, and qualitative interviews were conducted to confirm those generated by healthcare professionals in their own settings.

Contributor

Chang Li Chun completed the study and wrote the manuscript.

Acknowledgements

The authors would like to thank the experts and interviewees involved in the study. We also appreciate the helpful comments received from the anonymous reviewers from BMJ Open.

Funding

This project was funded by the Ministry of Science and Technology, Taiwan (NSC 100-2511-S-255-001-MY2) and received financial assistance from Chang Gung Memorial Hospital (BMRP 978).

Competing interests

None declared.

Ethics approval

Chang Gung Memorial Hospital

Data sharing statement

No additional data are available.

References

1. Nutbeam D. health promotion glossary. Health Promotion 1998;**1**(1):113-27.

2. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International 2000;**15**(3):259-67.

3. Coleman CA, Fromer A. A health literacy training intervention for physicians and other health professionals. Fam Med 2015;**47**(5):388-92.

4. Estacio EV, Comings J. Health literacy: Exploring future directions and potential

contributions from health psychology. Journal of health psychology 2013;**18**(8):997-1003.

5. Institute of Medicine. *Health literacy: A prescription to end confusion.* Washington, DC: National Academic Press, 2004.

6. Atcherson S, Zraick R, Hadden K. A need for health literacy curriculum: Knowledge of health literacy among us audiologists and speech-language pathologists in Arkansas. Education Health 2013;**26**(2):85-88.

7. Smith DL, Gutman SA. Health literacy in occupational therapy practice and research. American Journal of Occupational Therapy 2011;**65**(4):367-9.

8. Dickens C, Lambert BL, Cromwell T, et al. Nurse overestimation of patients' health literacy. Journal of Health Communication 2013;**18**(sup1):62-69.

9. Macabasco-O'Connell A, Fry-Bowers EK. Knowledge and perceptions of health literacy among nursing professionals. Journal of Health Communication 2011;**16**(Suppl 3):295-307.

10. Zanchetta MS, Maheu C, Fontaine C, et al. Awakening professionals' critical awareness of health literacy issues within a francophone linguistic-minority population in Ontario. Chronic Diseases & Injuries in Canada 2014;**34**(4):236.

11. Nadia KA, Robert PF, Sharmin M, et al. Do medical trainees feel confident communicating with low health literacy patients? Journal of community

hospital internal medicine perspectives 2014;**4**.

12. Cafiero M. Nurse practitioners' knowledge, experience, and intention to use health literacy strategies in clinical practice. Journal of Health Communication 2013;**18**(sup1):70-81.

13. Schwartzberg JG, Cowett A, VanGeest J, et al. Communication techniques for patients with low health literacy: A survey of physicians, nurses, and pharmacists. American Journal of Health Behavior 2007;**31**(suppl 1):S96-S104.

14. Seligman HK, Wang FF, Palacios JL, et al. Physician notification of their diabetes patients' limited health literacy. A randomized, controlled trial. Journal of General Internal Medicine 2005;**20**(11):1001-07.

15. Coleman CA, Hudson S, Maine LL. Health literacy practices and educational competencies for health professionals: a consensus study. Journal of Health Communication 2013;**18**(Suppl 1):82-102.

16. Linstone H, Turoff M. *The Delphi method: Techniques and applications.* Addison-Wesley: Reading, PA, 1975.

17. Keeney S, Hasson F, McKenna H. Conducting the Research Using the Delphi Technique. The Delphi Technique in Nursing and Health Research: Wiley-Blackwell, 2011:69-83.

18. de Villiers MR, de Villiers PJ, Kent AP. The Delphi technique in health sciences education research. Med Teach 2005;**27**(7):639-43.

19. Bogner A. *Interviewing experts*. England: Palgrave Macmillan, 2009.

20. Parente FJ, Anderson-Parente JK. Delphi inquiry systems. In: Wright G, Ayton P, eds. Judgemental forecasting. Chichester: John Wiley, 1987.

21. Keeney S, Hasson F, McKenna H. Analysing Data from a Delphi and Reporting Results. The Delphi Technique in Nursing and Health Research: Wiley-Blackwell, 2011:84-95.

22. Toronto CE, Weatherford B. Health Literacy Education in Health Professions Schools: An Integrative Review. J Nurs Educ 2015;**54**(12):669-76.

23. Lambert M, Luke J, Downey B, et al. Health literacy: health professionals? understandings and their perceptions of barriers that Indigenous patients encounter. BMC Health Services Research 2014.

24. Kripalani S, Jacobson KL, Brown S, et al. Development and implementation of a health literacy training program for medical residents. Medical Education Online 2006;**11**(13):1-8.

25. Maniaci MJ, Heckman MG, Dawson NL. Functional health literacy and understanding of medications at discharge. Mayo Clin Proc 2008;**83**(5):554-8.

26. Callahan LF, Hawk V, Rudd R, et al. Adaptation of the health literacy universal

precautions toolkit for rheumatology and cardiology – Applications for pharmacy professionals to improve self-management and outcomes in patients with chronic disease. Research in Social and Administrative Pharmacy 2013;**9**:597-608.

27. Broussard B, Radkins JB, Compton MT. Developing Visually Based, Low-Literacy Health Education Tools for African Americans with Psychotic Disorders and Their Families. Community Ment Health J 2014.

28. Coleman CA, Appy S. Health literacy teaching in US medical schools, 2010. Fam Med 2012;**44**(7):504-7.

29. Green JA, Gonzaga AM, Cohen ED, et al. Addressing health literacy through clear health communication: A training program for internal medicine residents. Patient Educ Couns 2014;**95**(1):76-82.

30. Mackert M, Ball J, Lopez N. Health literacy awareness training for healthcare workers: Improving knowledge and intentions to use clear communication techniques. Patient Educ Couns 2011;**85**:e225-e28.

31. Mackert M. Health literacy knowledge among direct-to-consumer pharmaceutical advertising professionals. Health Communication 2011:1-9.

32. Primack BA, Wickett DJ, Kraemer KL, et al. Teaching Health Literacy Using Popular Television Programming: A Qualitative Pilot Study. American Journal

of Health Education 2010;**41**(3):147-54.

33. Levasseur M, Carrier A. Do rehabilitation professionals need to consider their clients' health literacy for effective practice? Clin Rehabil 2010;**24**(8):756-65.

34. Elo S, Kyngas H. The qualitative content analysis process. J Adv Nurs 2008;**62**(1):107-15.

35. Schlichting JA, Quinn MT, Heuer LJ, et al. Provider perceptions of limited health literacy in community health centers. Patient Educ Couns 2007;**69**(1-3):114-20.

36. Garcia SF, Hahn EA, Jacobs EA. Addressing low literacy and health literacy in clinical oncology practice. Journal of Supportive Oncology 2010;**8**(2):64-69.

37. Chi H-Y. Development and Evaluation on Adult Health Education Model—A Case Study on Adults with Junior High School (and under) Level of Education. In: Health Promotion Administration MoHaW, ROC, ed. Taipei: Health Promotion Administration, Ministry of Health and Welfare, 2008.

38. Keeney S, Hasson F, McKenna H. Ethical Considerations. The Delphi Technique in Nursing and Health Research: Wiley-Blackwell, 2011:105-13.

GRRAS checklist for reporting of studies of reliability and agreement

Version based on Table I in: Kottner J, Audigé L, Brorson S, Donner A, Gajeweski BJ, Hróbjartsson A, Robersts C, Shoukri M, Streiner DL. Guidelines for reporting reliability and agreement studies (GRRAS) were proposed. J Clin Epidemiol. 2011;64(1):96-106

Section	Item #	Checklist item	Reported on page #
Title/Abstract	1	Identify in title or abstract that interrater/intrarater reliability or agreement was investigated.	p2
Introduction	2	Name and describe the diagnostic or measurement device of interest explicitly.	p4
	3	Specify the subject population of interest.	p4
	4	Specify the rater population of interest (if applicable)	X
	5	Describe what is already known about reliability and agreement and provide a rationale for the study (if applicable).	X
Methods	6	Explain how the sample size was chosen. State the determined number of raters, subjects/objects, and replicate observations.	p7
	7	Describe the sampling method.	p6,7
	8	Describe the measurement/rating process (e.g. time interval between repeated measurements, availability of clinical information, blinding).	p7
	9	State whether measurements/ratings were conducted independently.	p7, 8
	10	Describe the statistical analysis.	p7, 8
Results	11	State the actual number of raters and subjects/objects which were included and the number of replicate observations which were conducted.	p9
	12	Describe the sample characteristics of raters and subjects (e.g. training, experience).	p9
	13	Report estimates of reliability and agreement including measures of statistical uncertainty.	p9
Discussion	14	Discuss the practical relevance of results.	p10, 11
Auxiliary material	15	Provide detailed results if possible (e.g. online).	X

BMJ Open

Exploring health literacy competencies toward patient education program for Chinese-speaking healthcare professionals: A Delphi study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2016-011772.R1
Article Type:	Research
Date Submitted by the Author:	20-Jun-2016
Complete List of Authors:	Chang, Lichun; Chang Gung University of Science and Technology, Nursing Chen, Yu Chi; National Yang-Ming University, Nursing Wu, Fei Ling; Chang Gung University of Science and Technology Liao, Li Ling; I-Shou University, Health management
Primary Subject Heading:	Medical education and training
Secondary Subject Heading:	Public health
Keywords:	health literacy, competencies, Delphi method, health profession

Exploring health literacy competencies toward patient education program for Chinese-speaking healthcare professionals: A Delphi study

Running Title: Competencies in health literacy practice

Corresponding author:
Li-Chun Chang, EdD, RN
Associate Professor
School of Nursing, Chang Gung University of Science and Technology
No. 261, Wen-Hua 1st Rd., Kwei-Shan, Tao-Yuan 33303 Taiwan, R.O.C.
Tel: +886-3-2118999, ext. 3209
Fax: +886-3-2118866
E-mail: lichunc61@yahoo.com.tw

Yu-Chi Chen, RN, PhD.
Assistant Professor, Institute of Clinical Nursing, National Yang-Ming University, Taipei, Taiwan
No. 155, Section 2, Lin-Nong Street, Taipei, 112 Taiwan
Tel: 886-2-28267093；Fax: 886-2-28202487
Email address: ycchen2@ym.edu.tw

Fei Ling Wu, RN, PhD
Assistant Professor,
School of Nursing, Chang Gung University of Science and Technology
No. 261, Wen-Hua 1st Rd., Kwei-Shan, Tao-Yuan 33303 Taiwan, R.O.C.
Email address: feilingwu0930@gmail.com

Li-Ling Liao, RN, PhD
Department of Health Management, I-Shou University, Taiwan
No.8, Yida Rd., Jiaosu Village Yanchao District, Kaohsiung City 82445, Taiwan
E-mail: hililin@isu.edu.tw
Telephone: 886-7-6151100-7420

Objectives: To achieve consensus on a set of competencies in health literacy practice based on a literature review and expert consultation

Setting: Hospitals and community health centers in Taiwan

Method: A two-stage modified Delphi study involving a literature review was conducted, followed by qualitative interviews and three rounds of email-based data collection over a three-month period in 2011.

Participants: Fifteen Chinese healthcare practitioners with more than six months' experience in patient education were interviewed to collect data on health literacy practice. Twenty-four experts (12 academic scholars in health literacy and 12 professionals with training related to health literacy practice) were invited to participate in the Delphi process.

Results: Qualitative data from the interviews were analyzed and summarized to form 99 competency items for health literacy practice, which were categorized into five domains of health literacy practice including those pertaining to knowledge and skills. Consensus was reached on 92 of 99 competencies, using a modified Delphi technique.

Conclusion: The 92 competencies in health literacy practice embraced core components of patient education in the Chinese healthcare profession.

Strengths and limitations of the study

- To the best of our knowledge, this was the first study to develop a competency guide in health literacy practice for Chinese health professionals.
- These competencies embraced core components of patient education in healthcare
- The main limitation of the study was that only 24 experts were recruited for the panel; however, we adopted subjective and objective methods to generate competencies in health literacy practice prior to achieving consensus in the Delphi process.
- Competencies in health literacy practice may provide a starting point for increased integration of health literacy concepts and skills into professional and continuing education programs.

INTRODUCTION

Health literacy, as defined by the World Health Organization, represents cognitive and social skills that determine the individual's motivation and ability to access, understand, and use information in ways that promote and maintain good health [1]. To determine the contribution that health literacy makes to health disciplines, the rediscovery of health education should be explored in alliances between health and educational sectors in pursuing the goal of improved literacy levels in the population [2]. Accordingly, investment in sustainable health education requires competent healthcare professionals who contribute to the improvement of healthcare quality and reduce medical error [3].

Health literacy practice involved the use of a set of patient-centered protocols and strategies to mitigate the effects of limited health literacy [4 5], which should be considered in health education programs. Healthcare providers' competencies in health literacy practice are vital in ensuring significant health outcomes through the efficiency of appropriate care plans [6]. Healthcare professionals demonstrating assessment qualifications in their clinical practice could meet clients' care needs and could help design appropriate interventions to enhance self-care abilities at a level that clients understand [7]. However, previous studies have shown that healthcare providers overestimate patients' health literacy because of misunderstanding or limited cognition concerning health literacy.

Health literacy as an outcome of health education and its practices, which has been explored in previous studies, could be categorized into three groups: health literacy assessment [8], communication activities [9], and educational strategies for patients with low health literacy [10]. Although the importance of health literacy practice and use of a variety of health literacy techniques varied significantly across

health disciplines, such as nutrition, nursing, and pharmacy [11], previous studies have demonstrated inadequate ability in health professionals with respect to limited recognition and awareness of health literacy [12], confidence [9], and skills [11 13] in caring for those with low health literacy. It is important that health professionals possess adequate awareness, knowledge, skills, and attitudes when treating patients with low health literacy[4]. Accordingly, identifying key elements of competencies in health literacy practice is an essential step in promoting the quality of care provided for individuals with low health literacy [14]. In this study, we reviewed the literature to identify the core domains of health literacy practice and use it as a guideline in interviews designed to collect information regarding health professionals' competencies. The Delphi technique was used to establish consensus on the proposed competencies.

METHODS

A modified Delphi technique was used to achieve the aims of the study. The first round of the Delphi process was replaced by a literature review and face-to-face interviews designed to collect data regarding health literacy practice from clinical settings. This study was approved by the institutional review board at the institution with which the authors were affiliated.

Identifying the key domains of competencies in health literacy practice

We searched Medline, PsyclNFO, PubMed, and OVID nursing collections for original studies and expert review papers concerning health literacy practice between 2005 and 2015. We entered "health literacy" as the main keyword in the search to retrieve the relevant literature, and other related terms, such as training, teaching, practice, education, and profession, were added with the Boolean operator "AND" to refine our search. Only the literature on recommendations for health professionals

related to health were included. However, articles which belonged to interviewing skills, cultural competency and motivational interviewing were generally not included.

Qualitative interviews with healthcare professionals to generate competency items for health literacy practice

The results of the literature review were used as interview guidelines to structure the interview framework. The recommended health literacy items identified through literature review were also confirmed in the interview process. The four interview questions included "describe the attributes of patients who were difficult to teach," "describe ways in which clients with low health literacy can be assisted," "describe the way that assessments are conducted," and "describe the communication techniques used in your patient education practice."

First, two experienced health educators were recruited via referrals from hospital managers. Snowball sampling, also known as accidental sampling, was used to identify other suitable interviewees, and additional participants were introduced by the interviewees. After agreeing to participate, they engaged in recorded one-to-one interviews conducted by trained investigators. At this stage, 15 healthcare practitioners with more than six months' experience in patient education, including five nurses working in clinical, internal, and surgical wards; four case managers; two health educators; three nutritionists; and a pharmacist, were interviewed between September 27 and November 12, 2011. Thirteen interviews were conducted at participants' offices at the hospital, and two interviews with health educators were conducted at community health centers; the interviews lasted between 60 and 90 min. All interviews were conducted by authors with qualitative interview and health education experience. Moreover, the interview transcripts were analyzed by the

principle author, and the results were validated by all authors.

Delphi process

A Delphi process is defined as a multi-stage survey that ultimately attempts to achieve consensus on an important issue; its basic characteristics include anonymity, iteration, controlled feedback, and statistical aggregation to create a group response [15] [16]. Moreover, the method is highly recommended for issues that have not been explored in depth and it is based on the premise that pooled intelligence enhances individual judgment and captured the opinions through an anonymous enquiry process [17]. The questionnaire for the second round of data collection feeds back the results of the first round, mainly in the form of median or arithmetic mean values and distribution parameters [18].

The first round of data collection was replaced by a literature review and face-to-face interviews to elicit the opinions of the expert panel. The second to fourth rounds involved questionnaires distributed via mail and followed the classic Delphi approach.

Expert recruitment

With respect to the sample size for the Delphi process, Parente and Anderson-Parente [19] recommended a lower limit of 10 participants after the deduction of potential dropouts. In Taiwan, health literacy research has attracted academic and practical experts since 2008, and the majority of the health literacy literature has focused on patient factors. Because the number of experts with experience in health literacy research or practice was limited, we searched for Delphi technique experts from a list of professionals who had received a government-funded health literacy grant. In addition, we examined a list of professionals who had published research articles in the area. Approximately eight Delphi technique experts and recommended

health professionals (who were trained in health literacy practice), were invited to participate in the study. Twenty-four experts (12 academic scholars in health literacy and 12 professionals with training related to health literacy practice) were invited to participate in the second to fourth rounds of data collection.

Delphi procedure

The modified Delphi method used in this study consisted of three rounds of email-based data collection, each of which lasted for one month during a three-month period from January to April 2012. In each round, the experts were invited to rate the importance of each question using a five-point Likert-type scale ranging from 1 (not important) to 5 (very important) as the grading system. These individuals were aware that questions scored higher than 3 would be considered as important items. Group consensus was achieved if the criteria, including a mean and mode of at least 4.0 and a standard deviation of ≤1 were met. The quartile deviation was also provided to experts for consensus consideration in the Delphi process. Moreover, we also checked items that were ranked as 4 or greater on a Likert scale of 1–5 by more than 80% of respondents in the final round.

The questionnaire contained space for an answer and feedback or further comments for each statement. In statements for which consensus was not achieved, feedback and comments were used to adjust the statement for the following round. The statements for all three rounds of the Delphi process were retained to ensure that they were all equally as likely to gain the highest importance rating and level of consensus [20]. Experts were provided with feedback and a summary of the results of the previous round, and their individual modified and amended items were color coded to prevent confusion during reading in the second and third rounds.

RESULTS

Literature review

Literature searches using the keywords "training," "teaching," "competence," and "profession" in combination with "health literacy" produced 35, 35, 5, and 55 articles, respectively. A total of 106 articles were searched. After excluding duplicates (n=14), anonymous authors (n=6), non-English articles (n=6), and subjects that were not relevant to the health profession (n=18), 62 articles were relevant to the topic. Of these, 43 were discussion articles, and 19 were empirical studies, of which two were excluded, as the full text was not available. In the 17 complete articles, communication strategies (n = 9, 52.94%) and understanding health literacy knowledge (n = 8, 47.05%) were the most frequently mentioned health literacy practices. Assessment methods for low health literacy and appropriately written education materials or resources for patients were also crucial to health literacy practice. None of these studies or discussion articles were Chinese (see Table 1).

Table 1. The results of the literature review regarding health literacy practice in health professionals between 2005 and 2015

Themes in the literature	n (%)	Source
Assessment methods for low health literacy	5 (29.4%)	14 21-24
Appropriate written patient education materials or resources	5 (29.4%)	14 21 22 25 26
Communication strategies	9 (52.94%)	3 14 21 23-25 27-29
Understanding or knowledge of health literacy	8 (47.05%)	3 12 14 22 23 27 28 30
Association between literacy or health literacy and patient outcomes	1 (5.8%)	27
Evaluating health literacy education	2 (11.7%)	31 32
Teaching information and methods	2 (11.7%)	33 34
Implementing a health literacy program for patients	2 (11.7%)	12 33

Qualitative interview for health professionals

The deductive content analysis described by Elo and Kyngas [35] was used to confirm four domains of health literacy practice, based on a review of related literature. In total, 648 meaningful statements were extracted from the interviews. Interview results were summarized as health literacy practices and used to compare categorization results from the literature review for further classification. Thereafter, 99 meaning units were identified and classified into two domains with six subdomains including those pertaining to knowledge (i.e., knowledge of health literacy and recognition of the characteristics of patients with low health literacy) and skills (i.e., designing a patient education plan for patients with low health literacy, assessing health literacy assessment, adopting low-literacy health education strategies, and evaluating an educational plan for patients with low health literacy attributes). In the analysis, 56 questions were derived from interviews, and 43 questions were selected from health literacy research publications.

The consensus results of the Delphi process

Twenty-four experts have completed each round of Delphi survey. In the second round, 10 of 99 items did not reach consensus, eight items had mean or mode scores between 3.5 and 4.0 with a standard deviation of >1, and two items had mean or mode scores between 3.0 and 3.5. In the third round, none of the 99 items had a mean or mode score of <3.0, while 92 reached consensus with 80% agreement, four had mean scores between 3.5 and 3.9, and three had scores of 4.0 with a standard deviation of >1. Ultimately, in the final questionnaire, which was used in the fourth round and created according to experts' opinions, healthcare professionals' competencies in health literacy practice consisted of 92 consensus items, with seven items deleted (see table 2).

Table 2. Results of consensus-group ratings for healthcare professionals' competencies in health literacy practice (n = 24)

Competency item	Source	Round accepted	Final round				
			% of ≥4	Mean	Mode	SD	QD
Knowledge domain							
Knowledge of health literacy							
K1* Health literacy refers only to a person's ability to read.	Devraj, et al. [36]	2	83.3	4.0	4	1.0	0.5
K2*Adequate health literacy is the ability to read, understand, and process health information.	Devraj, et al. [36]	2	91.7	4.3	4	0.7	0.5
K3*Those with low health literacy have poorer health outcomes relative to those with sufficient health literacy	Institute of Medicine [5]	2	87.5	4.6	5	0.7	0.5
K4. Age is a risk factor that decreases health literacy.	Devraj, et al. [36]	3	83.3	4.0	4	0.7	0.5
K5. Patients with high educational levels may present with low health literacy.	Interview	2	87.5	4.7	5	0.7	0.3
K6. Limited health literacy can produce barriers to clear, effective communication	Schwartzberg, et al. [11]	2	87.5	4.7	5	0.7	0.3
K7* Using an appropriate tool is the best way to assess health literacy and identify patients with low health literacy.	Institute of Medicine [5]	2	83.3	4.2	5	1.0	0.8
K8. Individuals with high educational levels also need an easy method of learning complicated health information.	Interview	2	83.3	4.3	5	1.0	0.8
K9. The general rule is to write consent documents at a seventh-grade reading level.	Institute of Medicine [5]	2	83.3	4.0	4	1.0	1.0
K10. Suitable educational materials designed for people with low literacy should be understandable at levels below the sixth grade in elementary school.	Institute of Medicine [5]	Delete	54.2	3.8	3	1.1	1.0
K11. People with low health literacy need extra medical support and therefore have higher healthcare costs.	Weiss and Palmer [37]	2	87.5	4.4	5	0.9	0.8
K12. Health education materials should be written at or below a seventh-grade reading level.	Institute of Medicine [5]	2	83.3	4.0	4	1.0	1.0
K13. Health literacy could affect physician-patient communication.	Schwartzberg, et al. 11	2	87.5	4.7	5	0.7	0.3
K14. Persons with low health literacy experience limited comprehension of health information, leading to care problems.	Institute of Medicine [5]	Delete	54.2	3.4	4	1.3	1.0
Recognition of attributes of patients with low health literacy							
Patients with low health literacy …							
A1. may pretend to understand what the health educator says and ask for help at home.	Interview	Delete	45.8	3.8	3	0.8	0.8

A2. will say, “I can do this, there is no need to teach me” to cover up for their lack of understanding.	Interview	2	91.7	4.6	5	0.7	0.5
A3. will repeat the same questions.	Interview	2	83.3	4.4	5	1.0	0.5
A4. will not tell you if they cannot read.	Devraj, et al. [36]	3	83.3	4.0	4	1.0	1.0
A5. are more likely to misinterpret medication instructions provided on prescription labels.	Devraj, et al. [36]	2	87.5	4.1	4	0.8	0.8
A6. will easily misunderstand prescription instructions.	Devraj, et al. [36]	2	83.3	4.4	5	1.0	0.5
A7. cannot understand medication indications.	Kripalani, et al. [23]	2	83.3	4.6	5	1.0	0.3
A8. will often bring family members along when talking to healthcare professionals.	Devraj, et al. [36]	2	83.3	4.4	5	1.0	0.5
A9. will make excuses to avoid reading health information materials when given material to read.	Kripalani, et al. [23]	2	87.5	4.4	5	0.7	0.5
A10* often complain about their medicine.	Devraj, et al. [36]	2	87.5	4.4	5	0.7	0.5
A11. only seek assistance when symptoms worsen.	Jukkala, et al. [38]	2	87.5	4.7	5	0.7	0.3
A12. cannot understand medical forms and are therefore unable to complete them accurately.	Institute of Medicine [5]	2	87.5	4.7	5	0.7	0.3
A13. are likely to put a lot of folded paper in their pockets or wallets.	Kripalani, et al. [23]	3	83.3	4.0	4	0.8	0.8
A14. do not make necessary appointments or attend follow up.	Institute of Medicine [5]	2	87.5	4.3	4	0.7	0.5
A15. may be likely to pose few questions to professionals.	Interview	2	83.3	4.4	5	0.9	0.8
A16. cannot talk about how to take medicine.	Kripalani, et al. [23]	2	87.5	4.1	4	0.8	0.8
Skill domain							
Designing a health education plan for patients with low health literacy							
D1. Handle the psychical barriers to conducting health behaviors for clients	Interview	2	87.5	4.6	5	0.7	0.5
D2. Cooperate with other professionals to design health education plans	Interview	2	87.5	4.7	5	0.7	0.3
D3. Design audio-visual teaching materials	Interview	2	87.5	4.7	5	0.7	0.3
D4. Have the language ability to handle different patients	Interview	2	87.5	4.6	5	0.7	0.5
D5. Provide group health education	Interview	Delete	79.2	4.0	5	1.1	0.5
D6. Implement behavior modification counseling	Interview	2	83.3	4.4	5	1.0	0.5
D7. Design computer-based teaching aids	Interview	2	83.3	4.6	5	1.0	0.3
D8. Design health education flyers with less than 20% text	Interview	2	83.3	4.4	5	1.0	0.5
D9. Apply appropriate education theories in the curriculum	Interview	2	83.3	4.7	5	1.0	0.0
D10. Establish a personal profile of teaching materials	Interview	2	87.5	4.7	5	0.7	0.3
D11. Design a teaching plan for multicultural populations	Interview	2	87.5	4.6	5	0.7	0.5
D12. Design education materials for illiterate individuals	Interview	2	83.3	4.4	5	1.0	0.5

Assessing health literacy for patients with low health literacy	Interview						
As1. Determine the right teaching time for various clients	Interview	2	87.5	4.7	5	0.7	0.3
As2. Determine potential education barriers based on patient characteristics	Interview	2	83.3	4.7	5	1.0	0.0
As3. Apply appropriate tools to assess patient health literacy levels	Institute of Medicine [5]	2	83.3	4.7	5	1.0	0.0
As4. Conduct health assessments by collecting personal, organizational, and community data	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
As5. Identify the classical attributes of low health literacy prior to teaching	Kripalani, et al. [23]	2	87.5	4.8	5	0.7	0.0
Adopting low-literacy health education strategies							
S1. Use plain language instead of medical jargon	Kripalani, et al. [23]	2	87.5	4.8	5	0.7	0.0
S2. Use storytelling to make clients understand	Kripalani, et al. [23]	2	87.5	4.7	5	0.7	0.3
S3. Use metaphors to explain the disease to clients	Kripalani, et al. [23]	2	87.5	4.7	5	0.7	0.3
S4. Use life-oriented examples to explain the care that patients need	Interview	2	83.3	4.4	5	1.0	0.5
S5. Teach using language the student understands	Interview	2	83.3	4.7	5	1.0	0.0
S6. Explain health education using materials available to the patient	Interview	2	83.3	4.7	5	1.0	0.0
S7. Connect new learning with previous experience	Interview	2	83.3	4.7	5	1.0	0.0
S8. Limiting curricula to two or three new topics	Schwartzberg, et al. 11	2	83.3	4.7	5	1.0	0.0
S9. Use the teach-back technique	Kripalani, et al. [23]	2	83.3	4.6	5	1.0	0.3
S10. Teach repeatedly when clients cannot understand the teaching content	Williams, et al. [39]	2	83.3	4.7	5	1.0	0.0
S11. Teach difficult materials repeatedly	Interview	Delete	50	3.4	4	1.1	0.5
S12. Use the demonstrate-do technique	Interview	2	83.3	4.7	5	1.0	0.0
S13. Provide health education materials and encourage clients to discuss them with their families	Interview	2	87.5	4.8	5	0.7	0.0
S14. Provide health education materials with “Questions & Answers”	Interview	2	83.3	4.7	5	1.0	0.0
S15. Use simple words to explain care plans and related treatment	Schwartzberg, et al. 11	2	87.5	4.8	5	0.7	0.0
S16. Base decisions regarding teaching focus on treatment progress	Interview	2	83.3	4.6	5	1.0	0.3
S17. Summarize the key points of teaching at the end of the interview	Kripalani, et al. [23]	2	87.5	4.8	5	0.7	0.0
S18. Instruct others in the creation of a care plan rather than explaining the disease or condition	Interview	2	95.8	4.8	5	0.4	0.3
S19. Use pictorial methods, rather than words, to emphasize importance of issues for clients	Kripalani, et al. [23]	2	83.3	4.7	5	1.0	0.0
S20. Provide self-designed sticks to allow clients to mark their records	Interview	2	87.5	4.8	5	0.7	0.0
S21. Use the one-by-one method and pictorial image material	Interview	2	87.5	4.8	5	0.7	0.0
S22. Use media to benefit teaching outcomes	Interview	2	83.3	4.7	5	1.0	0.0

S23. Design teaching materials as teaching aids in health education	Interview	2	83.3	4.4	5	1.0	0.5
S24. Use online or internet teaching	Interview	2	83.3	4.7	5	1.0	0.0
S25. Consider disobedient behavior to be temperate coping behavior	Interview	2	83.3	4.2	5	1.0	0.8
S26. Offer more encouragement to patients and illiterate clients	Interview	2	83.3	4.7	5	1.0	0.0
S27. Understand clients' disobedient behaviors	Interview	2	87.5	4.6	5	0.7	0.5
S28. Invite caregivers to participate in the teaching plan	Interview	2	83.3	4.6	5	0.9	0.5
S29. Encourage clients and their families and clarify unclear parts of teaching via telephone	Interview	2	87.5	4.8	5	0.7	0.0
S30. Present oneself to clients as a resource	Interview	2	87.5	4.7	5	0.7	0.3
S31. Create an environment of mutual trust	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
S32. Encourage sharing between clients	Interview	2	87.5	4.8	5	0.7	0.0
S33. Create an embarrassment-free environment	Institute of Medicine [5]	2	83.3	4.6	5	0.9	0.5
S34. Ensure clients' confidentiality	Interview	Delete	79.2	4.0	5	1.1	0.0
S35. Encourage clients to take notes during interviews	Interview	2	87.5	4.8	5	0.7	0.0
S36. Teach clients to ask, "What is my main problem?"	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
S37. Teach clients to ask, "What do I need to do?"	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
S38. Teach clients to ask, "What can I do to help my body?"	Institute of Medicine [5]	2	87.5	4.7	5	0.7	0.3
S39. Encourage clients to use the question-posing method	Interview	2	87.5	4.8	5	0.7	0.0
S40. Encourage clients to talk about what doctors say to them	Interview	2	87.5	4.8	5	0.7	0.0
S41. Encourage clients to demonstrate learned skills to determine their understanding	Interview	2	87.5	4.8	5	0.7	0.0
S42. Ask clients to provide evidence of their health behavior	Interview	2	87.5	4.8	5	0.7	0.0
S43. Make eye contact with patients to ensure concentration	Interview	2	83.5	4.6	5	0.9	0.5
S44. Ask clients to restate the key points that they have learned	Interview	2	87.5	4.8	5	0.7	0.0
S45. Pay attention to questions that patients ask repeatedly	Interview	2	87.5	4.8	5	0.7	0.0
S46. Pay attention to nonverbal (e.g., facial) expressions to determine whether the patient has understood	Interview	2	87.5	4.8	5	0.7	0.0
Evaluating an educational plan for patients with low health literacy							
E1. Build up the right evaluation criteria for health literacy practice	Interview	2	83.3	4.7	5	1.0	0.0
E2. Conduct appropriate evaluations to demonstrate the effectiveness of health literacy practice	Interview	2	83.3	4.1	5	1.0	1.0
E3. Modify education plans to fit patients' problems	Interview	2	87.5	4.7	5	0.7	0.3

E4. Illustrate the appropriate effectiveness of teaching based on health literacy	Interview	2	87.5	4.6	5	0.7	0.5
E5. Encourage clients with low health literacy to share the successful action outcome	Interview	Delete	79.2	4.0	5	0.9	0.5
E6. Design various evaluation approaches according to clients' health literacy levels	Interview	2	87.5	4.8	5	0.7	0.0

K: knowledge of health literacy; A: recognition of attributes of patients with low health literacy; D: designing a health education plan for patients with low health literacy; As: assessing health literacy for low health literate patients; S: adopting low-literacy health education strategies; E: evaluating an educational plan for patients with low health literacy; * reverse items

DISCUSSION

In Taiwan and the rest of the world, most health literacy studies have focused on the patient's perspective. Only a few have explored health professionals' competencies in promoting patients' health literacy. Understanding health professionals' ability in health literacy practice is a basic step in establishing practice-based competencies. Delphi studies lack a consistent and well-defined standard for the application of group consensus[40]. In addition to the predetermined levels of agreement mentioned in previous study[14], we used other consensus standards suggested by de Villers[17] including the values of mean, standard deviation and interquartile range to understand the level of consensus or lack thereof.

Although assessment of health literacy knowledge is an essential component of health literacy practices for health professionals, the result of our study has found that the measurement of health literacy knowledge could be either subjective or objective. The subjective measurement involved the participant's perceived knowledge of health literacy[41] or the health literacy knowledge demonstrated by the participants[42]. The objectives assessment of health literacy knowledge performed in the current study was similar to that performed in the study conducted by Devraj, et al.[36], in which health literacy knowledge was designed in test items that participants were required to answer to determine their health literacy levels. This could help in the evaluation of health literacy levels in untrained health professionals.

The items used in the current study were similar to those used in other studies, in that the assessment included the definition of health literacy[11], reading levels in patients with low health literacy[10], essential support for LHL patients[23], and the consequences of low health literacy[38]. Kripalani, et al.[23], Devraj, et al.[36] and Coleman, et al. [14] classified the signs of low health literacy as knowledge items. For clearly

differential conceptual knowledge or practical recognition of low health literacy, we grouped the signs of low health literacy confirmed during the interviews in the dimension of recognition of the attributes of patients with low health literacy.

The reason for this discrepancy could be that the study subjects were physicians in three of the 17 studies and believed that health literacy was a communication skill. Coleman used the same five crucial domains to examine competencies in health literacy practice but divided the competencies into educational and practice domains [14]. However, we incorporated a literature review and interviews into an educational process that aimed to meet the World Health Organization's goals of promoting health literacy to the general public via educational systems[4]. Extending the application of written or oral communication skills as it relates to health literacy competencies in health education programs is critical to the improvement of public health literacy.

The competency items used in the current study were similar to those used in previous studies. However, because of differences in first round of Delphi process and the Chinese descriptions in the practical narratives confirmed during the interviews, the meanings of the items somewhat differed from those provided by Coleman et al[14]. The language differences could be considered as a study limitation. In the current study, we integrated the literature and interviews to produce the competencies of health literacy practice, which might be suitable for use with Chinese-speaking professionals.

It is worth noting that five of the seven questions for which a consensus could not be reached were interview items. These items were related to health education and captured via interview but have not been mentioned specifically in the health literacy literature; therefore, the experts could not reach consensus. The remaining two questions for which a consensus could not be reached were literature items. It is

possible that, although the concepts originated from the literature, the experts considered the consent and health education materials analyzed during the interviews duplicate information. K14 was a detailed description of low health literacy caused by communication barriers, which resulted from adverse effects on the patient's health, but it was also a repetition of K6.

Potential biases in traditional Delphi studies include the imposition of preconceptions on respondents and the use of poor techniques to summarize and present group responses[43]. To avoid the drawbacks involving the imposition of preconceptions on respondents, a thorough review of the literature concerning the modified Delphi method was performed to collect information regarding competencies in health literacy practice, and qualitative interviews were conducted to confirm those generated by healthcare professionals in their own settings. This approach could increase the diversity of the item pool. Irrelevant or duplicate questions could be removed after the experts have reached a consensus.

CONCLUSIONS

The health literacy competencies identified in this study constitute an important and necessary step in the systematic design and evaluation of curricula required to produce a healthcare workforce that both accounts for and addresses the issues surrounding low health literacy. Most studies have suggested that health literacy and health education or communication skills are closely related. The present study applied these education principles in a holistic and continuous process to construct an index for assessing practice competencies.

A modified Delphi technique was used to achieve consensus on health literacy competencies for Chinese-speaking healthcare professionals. Further empirical studies are required to validate whether the 92 items identified can be grouped into the six

domains of competencies in health literacy practice. Moreover, further work is required to prioritize these 92 items, and educational research is required to validate the competencies in health literacy practice and determine which should be taught, which healthcare professionals should receive training, which settings should be used, and which teaching methods should be adopted to improve patient-centered outcomes.

Contributors

Chen Yu-Chi, Wu Fei Ling, and Chang Li Chun conducted the qualitative interviews. Liao Li Ling and Chang Li Chun analyzed the interview and Delphi data. Chang Li Chun wrote the manuscript. All authors critically revised and approved the final manuscript.

Acknowledgements

The authors would like to thank the experts and interviewees involved in the study. We also appreciate the helpful comments received from the anonymous reviewers at BMJ Open.

Funding

This project was funded by the Ministry of Science and Technology, Taiwan (NSC 100-2511-S-255-001-MY2), and financial assistance was received from Chang Gung Memorial Hospital (BMRP 978).

Competing interests

None declared.

Ethics approval

Chang Gung Memorial Hospital

Data sharing statement

No additional data are available.

REFERENCES

1. Nutbeam D. health promotion glossary. *Health Promotion* 1998;**1**(1):113-27.

2. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot Int* 2000;**15**(3):259-67.

3. Coleman CA, Fromer A. A health literacy training intervention for physicians and other health professionals. *Fam Med* 2015;**47**(5):388-92.

4. Institute of Medicine Committee on Health Literacy. In: Nielsen-Bohlman L, Panzer AM, Kindig DA, eds. Health Literacy: A Prescription to End Confusion. Washington (DC): National Academies Press (US). Copyright 2004 by the National Academy of Sciences. All rights reserved., 2004.

5. Estacio EV, McKinley RK, Saidy-Khan S, et al. Health literacy: Why it matters to South Asian men with diabetes. *Prim Health Care Res Dev* 2014:1-5.

6. Atcherson S, Zraick R, Hadden K. A need for health literacy curriculum: Knowledge of health literacy among us audiologists and speech-language pathologists in Arkansas. *Education Healt*h 2013;**26**(2):85-88.

7. Smith DL, Gutman SA. Health literacy in occupational therapy practice and research. Am J Occup Ther 2011;**65**(4):367-9.

8. Dickens C, Lambert BL, Cromwell T, et al. Nurse overestimation of patients' health literacy. *J Health Commu*n 2013;**18**(sup1):62-69.

9. Nadia KA, Robert PF, Sharmin M, et al. Do medical trainees feel confident communicating with low health literacy patients? *J Community Hosp Intern Med Perspect.* 2014;**4**.

10. Cafiero M. Nurse practitioners' knowledge, experience, and intention to use health literacy strategies in clinical practice. *J Health Commun* 2013;**18**(sup1):70-81.

11. Schwartzberg JG, Cowett A, VanGeest J, et al. Communication techniques for patients with low health literacy: A survey of physicians, nurses, and pharmacists. *Am J Health Behav* 2007;**31**(suppl 1):S96-S104.

12. Macabasco-O'Connell A, Fry-Bowers EK. Knowledge and perceptions of health literacy among nursing professionals. *J Health Commu*n 2011;**16**(Suppl 3):295-307.

13. Seligman HK, Wang FF, Palacios JL, et al. Physician notification of their diabetes patients' limited health literacy. A randomized, controlled trial. *J Gen Intern Med* 2005;**20**(11):1001-07.

14. Coleman CA, Hudson S, Maine LL. Health literacy practices and educational

competencies for health professionals: a consensus study. *J Health Commu*n 2013;**18**(Suppl 1):82-102.

15. Linstone H, Turoff M. *The Delphi method: Techniques and applications.* Addison-Wesley: Reading, PA, 1975.

16. Keeney S, Hasson F, McKenna H. *Conducting the Research Using the Delphi Technique*. The Delphi Technique in Nursing and Health Research: Wiley-Blackwell, 2011:69-83.

17. de Villiers MR, de Villiers PJ, Kent AP. The Delphi technique in health sciences education research. *Med Teach* 2005;**27**(7):639-43.

18. Bogner A. *Interviewing experts*. England: Palgrave Macmillan, 2009.

19. Parente FJ, Anderson-Parente JK. *Delphi inquiry systems*. In: Wright G, Ayton P, eds. Judgemental forecasting. Chichester: John Wiley, 1987.

20. Keeney S, Hasson F, McKenna H. *Analysing Data from a Delphi and Reporting Results. The Delphi Technique in Nursing and Health Research*: Wiley-Blackwell, 2011:84-95.

21. Toronto CE, Weatherford B. Health Literacy Education in Health Professions Schools: An Integrative Review. *J Nurs Educ* 2015;**54**(12):669-76.

22. Lambert M, Luke J, Downey B, et al. Health literacy: health professionals? understandings and their perceptions of barriers that Indigenous patients

encounter. *BMC Health Serv Res* 2014; **29**(14):614

23. Kripalani S, Jacobson KL, Brown S, et al. Development and implementation of a health literacy training program for medical residents. *Med Educ Online* 2006;**11**(13):1-8.

24. Maniaci MJ, Heckman MG, Dawson NL. Functional health literacy and understanding of medications at discharge. *Mayo Clin Proc* 2008;**83**(5):554-8.

25. Callahan LF, Hawk V, Rudd R, et al. Adaptation of the health literacy universal precautions toolkit for rheumatology and cardiology – Applications for pharmacy professionals to improve self-management and outcomes in patients with chronic disease. *Res Social Adm Pharm* 2013;**9**:597-608.

26. Broussard B, Radkins JB, Compton MT. Developing Visually Based, Low-Literacy Health Education Tools for African Americans with Psychotic Disorders and Their Families. *Community Ment Health* J 2014.

27. Coleman CA, Appy S. Health literacy teaching in US medical schools, 2010. *Fam Med* 2012;**44**(7):504-7.

28. Green JA, Gonzaga AM, Cohen ED, et al. Addressing health literacy through clear health communication: A training program for internal medicine residents. *Patient Educ Couns* 2014;**95**(1):76-82.

29. Mackert M, Ball J, Lopez N. Health literacy awareness training for healthcare

workers: Improving knowledge and intentions to use clear communication techniques. *Patient Educ Couns* 2011;**85**:e225-e28.

30. Mackert M. Health literacy knowledge among direct-to-consumer pharmaceutical advertising professionals. *Health Commun* 2011:1-9.

31. Primack BA, Wickett DJ, Kraemer KL, et al. Teaching Health Literacy Using Popular Television Programming: A Qualitative Pilot Study. *Am J Health Educ* 2010;**41**(3):147-54.

32**.** Price-Haywood EG, Harden-Barrios J, Cooper LA. Comparative effectiveness of audit-feedback versus additional physician communication trainingto improve canc er screening for patients with limited health literacy. *J Gen Intern Med* 2014. **29**(8):1113-21.

33. Levasseur M, Carrier A. Do rehabilitation professionals need to consider their clients' health literacy for effective practice? *Clin Rehabil* 2010;**24**(8):756-65.

34. Zanchetta MS, Maheu C, Fontaine C, et al. Awakening professionals' critical awareness of health literacy issues within a francophone linguistic-minority population in Ontario. Chronic Diseases & Injuries in Canada 2014;**34**(4):236.

35. Elo S, Kyngas H. The qualitative content analysis process. *J Adv Nur*s 2008;**62**(1):107-15.

36. Devraj R, Butler LM, Gupchup GV, et al. Active-Learning Strategies to Develop

Health Literacy Knowledge and Skills. *Am J Pharm Edu*c 2010;**74**(8):137-45.

37. Weiss BD, Palmer R. Relationship between health care costs and very low literacy skills in a medically needy and indigent Medicaid population. *J Am Board Fam Pract* 2004;**17**(1):44-7.

38. Jukkala A, Deupree JP, Graham S. Knowledge of limited health literacy at an academic health center. *J Contin Educ Nur*s 2009;**40**(7):298-302; quiz 03-4, 36.

39. Williams MV, Davis T, Parker RM, et al. The role of health literacy in patient-physician communication. *Fam Me*d 2002;**34**(5):383-89.

40. Williams PL, Webb C. The Delphi technique: a methodological discussion. *J Adv Nurs* 1994;**19**(1):180-6.

41. Mackert M, Ball J, Lopez N. Health literacy awareness training for healthcare workers: Improving knowledge and intentions to use clear communication techniques. *Patient Educ Couns* 2011;**85**(3):e225-e28.

42. Ha H, Lopez T: Developing health literacy knowledge and skills through case-based learning. *Am J Pharm Educ* 2014, 78(1):17.

43 Keeney S, Hasson F, McKenna H. *Ethical Considerations. The Delphi Technique in Nursing and Health Research*: Wiley-Blackwell, 2011:105-13.

GRRAS checklist for reporting of studies of reliability and agreement

Version based on Table I in: Kottner J, Audigé L, Brorson S, Donner A, Gajeweski BJ, Hróbjartsson A, Robersts C, Shoukri M, Streiner DL. Guidelines for reporting reliability and agreement studies (GRRAS) were proposed. J Clin Epidemiol. 2011;64(1):96-106

Section	Item #	Checklist item	Reported on page #
Title/Abstract	1	Identify in title or abstract that interrater/intrarater reliability or agreement was investigated.	p2
Introduction	2	Name and describe the diagnostic or measurement device of interest explicitly.	p4
	3	Specify the subject population of interest.	p4
	4	Specify the rater population of interest (if applicable)	X
	5	Describe what is already known about reliability and agreement and provide a rationale for the study (if applicable).	X
Methods	6	Explain how the sample size was chosen. State the determined number of raters, subjects/objects, and replicate observations.	p7
	7	Describe the sampling method.	p6,7
	8	Describe the measurement/rating process (e.g. time interval between repeated measurements, availability of clinical information, blinding).	p7
	9	State whether measurements/ratings were conducted independently.	p7, 8
	10	Describe the statistical analysis.	p7, 8
Results	11	State the actual number of raters and subjects/objects which were included and the number of replicate observations which were conducted.	p9
	12	Describe the sample characteristics of raters and subjects (e.g. training, experience).	p9
	13	Report estimates of reliability and agreement including measures of statistical uncertainty.	p9
Discussion	14	Discuss the practical relevance of results.	p10, 16-17
Auxiliary material	15	Provide detailed results if possible (e.g. online).	X

BMJ Open

Exploring health literacy competencies toward patient education program for Chinese-speaking healthcare professionals: A Delphi study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2016-011772.R2
Article Type:	Research
Date Submitted by the Author:	02-Sep-2016
Complete List of Authors:	Chang, Lichun; Chang Gung University of Science and Technology, Nursing Chen, Yu Chi; National Yang-Ming University, Nursing Wu, Fei Ling; Chang Gung University of Science and Technology Liao, Li Ling; I-Shou University, Health management
Primary Subject Heading:	Medical education and training
Secondary Subject Heading:	Public health
Keywords:	health literacy, competencies, Delphi method, health profession

Exploring health literacy competencies toward patient education program for Chinese-speaking healthcare professionals: A Delphi study

Running Title: Competencies in health literacy practice

Corresponding author:
Li-Chun Chang, EdD, RN
Associate Professor
School of Nursing, Chang Gung University of Science and Technology
No. 261, Wen-Hua 1st Rd., Kwei-Shan, Tao-Yuan 33303 Taiwan, R.O.C.
Tel: +886-3-2118999, ext. 3209
Fax: +886-3-2118866
E-mail: lichunc61@yahoo.com.tw

Yu-Chi Chen, RN, PhD.
Assistant Professor, Institute of Clinical Nursing, National Yang-Ming University, Taipei, Taiwan
No. 155, Section 2, Lin-Nong Street, Taipei, 112 Taiwan
Tel: 886-2-28267093；Fax: 886-2-28202487
Email address: ycchen2@ym.edu.tw

Fei Ling Wu, RN, PhD
Assistant Professor,
School of Nursing, Chang Gung University of Science and Technology
No. 261, Wen-Hua 1st Rd., Kwei-Shan, Tao-Yuan 33303 Taiwan, R.O.C.
Email address: feilingwu0930@gmail.com

Li-Ling Liao, RN, PhD
Assistant Professor,
Department of Health Management, I-Shou University, Taiwan
No.8, Yida Rd., Jiaosu Village Yanchao District, Kaohsiung City 82445, Taiwan
E-mail: hililin@isu.edu.tw
Telephone: 886-7-6151100-7420

Objectives: To achieve consensus on a set of competencies in health literacy practice based on a literature review and expert consultation

Setting: Hospitals and community health centers in Taiwan

Method: A two-stage modified Delphi study involving a literature review was conducted, followed by qualitative interviews and three rounds of email-based data collection over a three-month period in 2011.

Participants: Fifteen Chinese healthcare practitioners with more than six months' experience in patient education were interviewed to collect data on health literacy practice. Twenty-four experts (12 academic scholars in health literacy and 12 professionals with training related to health literacy practice) were invited to participate in the Delphi process.

Results: Qualitative data from the interviews were analyzed and summarized to form 99 competency items for health literacy practice, which were categorized into five domains of health literacy practice including those pertaining to knowledge and skills. Consensus was reached on 92 of 99 competencies, using a modified Delphi technique.

Conclusion: The 92 competencies in health literacy practice embraced core components of patient education in the Chinese healthcare profession.

Strengths and limitations of the study

- To the best of our knowledge, this was the first study to develop a competency guide in health literacy practice for Chinese health professionals.
- These competencies embraced core components of patient education in healthcare
- The main limitation of the study was that only 24 experts were recruited for the panel; however, we adopted subjective and objective methods to generate competencies in health literacy practice prior to achieving consensus in the Delphi process.
- Competencies in health literacy practice may provide a starting point for increased integration of health literacy concepts and skills into professional and continuing education programs.

INTRODUCTION

Health literacy, as defined by the World Health Organization, represents cognitive and social skills that determine the individual's motivation and ability to access, understand, and use information in ways that promote and maintain good health [1]. To determine the contribution that health literacy makes to health disciplines, the rediscovery of health education should be explored in alliances between health and educational sectors in pursuing the goal of improved literacy levels in the population [2]. Accordingly, investment in sustainable health education requires competent healthcare professionals who contribute to the improvement of healthcare quality and reduce medical error [3].

Health literacy practice involved the use of a set of patient-centered protocols and strategies to mitigate the effects of limited health literacy [4 5], which should be considered in health education programs. Healthcare providers' competencies in health literacy practice are vital in ensuring significant health outcomes through the efficiency of appropriate care plans [6]. Healthcare professionals demonstrating assessment qualifications in their clinical practice could meet clients' care needs and could help design appropriate interventions to enhance self-care abilities at a level that clients understand [7]. However, previous studies have shown that healthcare providers overestimate patients' health literacy because of misunderstanding or limited cognition concerning health literacy.

Health literacy as an outcome of health education and its practices, which has been explored in previous studies, could be categorized into three groups: health literacy assessment [8], communication activities [9], and educational strategies for patients with low health literacy [10]. Although the importance of health literacy practice and use of a variety of health literacy techniques varied significantly across

health disciplines, such as nutrition, nursing, and pharmacy [11], previous studies have demonstrated inadequate ability in health professionals with respect to limited recognition and awareness of health literacy [12], confidence [9], and skills [11 13] in caring for those with low health literacy. It is important that health professionals possess adequate awareness, knowledge, skills, and attitudes when treating patients with low health literacy[4]. Accordingly, identifying key elements of competencies in health literacy practice is an essential step in promoting the quality of care provided for individuals with low health literacy [14]. In this study, we reviewed the literature to identify the core domains of health literacy practice and use it as a guideline in interviews designed to collect information regarding health professionals' competencies. The Delphi technique was used to establish consensus on the proposed competencies.

METHODS

A modified Delphi technique was used to achieve the aims of the study. The first round of the Delphi process was replaced by a literature review and face-to-face interviews designed to collect data regarding health literacy practice from clinical settings. This study was approved by the institutional review board at the institution with which the authors were affiliated.

Identifying the key domains of competencies in health literacy practice

We searched Medline, PsyclNFO, PubMed, and OVID nursing collections for original studies and expert review papers concerning health literacy practice between 2005 and 2015. We entered "health literacy" as the main keyword in the search to retrieve the relevant literature, and other related terms, such as training, teaching, practice, education, and profession, were added with the Boolean operator "AND" to refine our search. Only the literature on recommendations for health professionals

related to health were included. However, articles which belonged to interviewing skills, cultural competency and motivational interviewing were generally not included.

Qualitative interviews with healthcare professionals to generate competency items for health literacy practice

The results of the literature review were used as interview guidelines to structure the interview framework. The recommended health literacy items identified through literature review were also confirmed in the interview process. The four interview questions included "describe the attributes of patients who were difficult to teach," "describe ways in which clients with low health literacy can be assisted," "describe the way that assessments are conducted," and "describe the communication techniques used in your patient education practice."

First, two experienced health educators were recruited via referrals from hospital managers. Snowball sampling, also known as accidental sampling, was used to identify other suitable interviewees, and additional participants were introduced by the interviewees. After agreeing to participate, they engaged in recorded one-to-one interviews conducted by trained investigators. At this stage, 15 healthcare practitioners with more than six months' experience in patient education, including five nurses working in clinical, internal, and surgical wards; four case managers; two health educators; three nutritionists; and a pharmacist, were interviewed between September 27 and November 12, 2011. Thirteen interviews were conducted at participants' offices at the hospital, and two interviews with health educators were conducted at community health centers; the interviews lasted between 60 and 90 min. All interviews were conducted by authors with qualitative interview and health education experience. Moreover, the interview transcripts were analyzed by the

principle author, and the results were validated by all authors.

Delphi process

A Delphi process is defined as a multi-stage survey that ultimately attempts to achieve consensus on an important issue; its basic characteristics include anonymity, iteration, controlled feedback, and statistical aggregation to create a group response [15] [16]. Moreover, the method is highly recommended for issues that have not been explored in depth and it is based on the premise that pooled intelligence enhances individual judgment and captured the opinions through an anonymous enquiry process [17]. The questionnaire for the second round of data collection feeds back the results of the first round, mainly in the form of median or arithmetic mean values and distribution parameters [18].

The first round of data collection was replaced by a literature review and face-to-face interviews to elicit the opinions of the expert panel. The second to fourth rounds involved questionnaires distributed via mail and followed the classic Delphi approach.

Expert recruitment

With respect to the sample size for the Delphi process, Parente and Anderson-Parente [19] recommended a lower limit of 10 participants after the deduction of potential dropouts. In Taiwan, health literacy research has attracted academic and practical experts since 2008, and the majority of the health literacy literature has focused on patient factors. Because the number of experts with experience in health literacy research or practice was limited, we searched for Delphi technique experts from a list of professionals who had received a government-funded health literacy grant. In addition, we examined a list of professionals who had published research articles in the area. Approximately eight Delphi technique experts and recommended

health professionals (who were trained in health literacy practice), were invited to participate in the study. Twenty-four experts (12 academic scholars in health literacy and 12 professionals with training related to health literacy practice) were invited to participate in the second to fourth rounds of data collection.

Delphi procedure

The modified Delphi method used in this study consisted of three rounds of email-based data collection, each of which lasted for one month during a three-month period from January to April 2012. In each round, the experts were invited to rate the importance of each question using a five-point Likert-type scale ranging from 1 (not important) to 5 (very important) as the grading system. These individuals were aware that questions scored higher than 3 would be considered as important items. Group consensus was achieved if the criteria, including a mean and mode of at least 4.0 and a standard deviation of ≤1 were met. The quartile deviation was also provided to experts for consensus consideration in the Delphi process. Moreover, we also checked items that were ranked as 4 or greater on a Likert scale of 1–5 by more than 80% of respondents in the final round.

The questionnaire contained space for an answer and feedback or further comments for each statement. In statements for which consensus was not achieved, feedback and comments were used to adjust the statement for the following round. The statements for all three rounds of the Delphi process were retained to ensure that they were all equally as likely to gain the highest importance rating and level of consensus [20]. Experts were provided with feedback and a summary of the results of the previous round, and their individual modified and amended items were color coded to prevent confusion during reading in the second and third rounds.

RESULTS

Literature review

Literature searches using the keywords "training," "teaching," "competence," and "profession" in combination with "health literacy" produced 35, 35, 5, and 55 articles, respectively. A total of 106 articles were searched. After excluding duplicates (n=14), anonymous authors (n=6), non-English articles (n=6), and subjects that were not relevant to the health profession (n=18), 62 articles were relevant to the topic. Of these, 43 were discussion articles, and 19 were empirical studies, of which two were excluded, as the full text was not available. In the 17 complete articles, communication strategies (n = 9, 52.94%) and understanding health literacy knowledge (n = 8, 47.05%) were the most frequently mentioned health literacy practices. Assessment methods for low health literacy and appropriately written education materials or resources for patients were also crucial to health literacy practice. None of these studies or discussion articles were Chinese (see Table 1).

Table 1. The results of the literature review regarding health literacy practice in health professionals between 2005 and 2015

Themes in the literature	n (%)	Source
Assessment methods for low health literacy	5 (29.4%)	14 21-24
Appropriate written patient education materials or resources	5 (29.4%)	14 21 22 25 26
Communication strategies	9 (52.94%)	3 14 21 23-25 27-29
Understanding or knowledge of health literacy	8 (47.05%)	3 12 14 22 23 27 28 30
Association between literacy or health literacy and patient outcomes	1 (5.8%)	27
Evaluating health literacy education	2 (11.7%)	31 32
Teaching information and methods	2 (11.7%)	33 34
Implementing a health literacy program for patients	2 (11.7%)	12 33

Qualitative interview for health professionals

The deductive content analysis described by Elo and Kyngas [35] was used to confirm four domains of health literacy practice, based on a review of related literature. In total, 648 meaningful statements were extracted from the interviews. Interview results were summarized as health literacy practices and used to compare categorization results from the literature review for further classification. Thereafter, 99 meaning units were identified and classified into two domains with six subdomains including those pertaining to knowledge (i.e., knowledge of health literacy and recognition of the characteristics of patients with low health literacy) and skills (i.e., designing a patient education plan for patients with low health literacy, assessing health literacy assessment, adopting low-literacy health education strategies, and evaluating an educational plan for patients with low health literacy attributes). In the analysis, 56 questions were derived from interviews, and 43 questions were selected from health literacy research publications.

The consensus results of the Delphi process

Twenty-four experts have completed each round of Delphi survey. In the second round, 10 of 99 items did not reach consensus, eight items had mean or mode scores between 3.5 and 4.0 with a standard deviation of >1, and two items had mean or mode scores between 3.0 and 3.5. In the third round, none of the 99 items had a mean or mode score of <3.0, while 92 reached consensus with 80% agreement, four had mean scores between 3.5 and 3.9, and three had scores of 4.0 with a standard deviation of >1. Ultimately, in the final questionnaire, which was used in the fourth round and created according to experts' opinions, healthcare professionals' competencies in health literacy practice consisted of 92 consensus items, with seven items deleted (see table 2).

Table 2. Results of consensus-group ratings for healthcare professionals' competencies in health literacy practice (n = 24)

Competency item	Source	Round accepted	Final round				
			% of ≥4	Mean	Mode	SD	QD
Knowledge domain							
Knowledge of health literacy							
K1 Health literacy refers only to a person's ability to read. (False)	Devraj, et al. [36]	2	83.3	4.0	4	1.0	0.5
K2 Adequate health literacy is the ability to read, understand, and process health information. (False)	Devraj, et al. [36]	2	91.7	4.3	4	0.7	0.5
K3 Those with low health literacy have poorer health outcomes relative to those with sufficient health literacy (True)	Institute of Medicine [5]	2	87.5	4.6	5	0.7	0.5
K4. Age is a risk factor that decreases health literacy. (True)	Devraj, et al. [36]	3	83.3	4.0	4	0.7	0.5
K5. Patients with high educational levels may present with low health literacy. (True)	Interview	2	87.5	4.7	5	0.7	0.3
K6. Limited health literacy can produce barriers to clear, effective communication. (True)	Schwartzberg, et al. [11]	2	87.5	4.7	5	0.7	0.3
K7 Using an appropriate tool is the best way to assess health literacy and identify patients with low health literacy. (True)	Institute of Medicine [5]	2	83.3	4.2	5	1.0	0.8
K8. Individuals with high educational levels also need an easy method of learning complicated health information. (True)	Interview	2	83.3	4.3	5	1.0	0.8
K9. The general rule is to write consent documents at a seventh-grade reading level. (True)	Institute of Medicine [5]	2	83.3	4.0	4	1.0	1.0
K10. Suitable educational materials designed for people with low literacy should be understandable at levels below the sixth grade in elementary school. (True)	Institute of Medicine [5]	Delete	54.2	3.8	3	1.1	1.0
K11. People with low health literacy need extra medical support and therefore have higher healthcare costs. (True)	Weiss and Palmer [37]	2	87.5	4.4	5	0.9	0.8
K12. Health education materials should be written at or below a seventh-grade reading level. (True)	Institute of Medicine [5]	2	83.3	4.0	4	1.0	1.0
K13. Health literacy could affect physician-patient communication. (True)	Schwartzberg, et al. 11	2	87.5	4.7	5	0.7	0.3
K14. Persons with low health literacy experience limited comprehension of health information, leading to care problems. (True)	Institute of Medicine [5]	Delete	54.2	3.4	4	1.3	1.0
Recognition of attributes of patients with low health literacy (If you agree the attributes, please marked ✓in the box.)							
Patients with low health literacy …							

A1. may pretend to understand what the health educator says and ask for help at home.□	Interview	Delete	45.8	3.8	3	0.8	0.8
A2. will say, “I can do this, there is no need to teach me” to cover up for their lack of understanding. □	Interview	2	91.7	4.6	5	0.7	0.5
A3. will repeat the same questions. □	Interview	2	83.3	4.4	5	1.0	0.5
A4. will not tell you if they cannot read. □	Devraj, et al. [36]	3	83.3	4.0	4	1.0	1.0
A5. are more likely to misinterpret medication instructions provided on prescription labels. □	Devraj, et al. [36]	2	87.5	4.1	4	0.8	0.8
A6. will easily misunderstand prescription instructions. □	Devraj, et al. [36]	2	83.3	4.4	5	1.0	0.5
A7. cannot understand medication indications. □	Kripalani, et al. [23]	2	83.3	4.6	5	1.0	0.3
A8. will often bring family members along when talking to healthcare professionals. □	Devraj, et al. [36]	2	83.3	4.4	5	1.0	0.5
A9. will make excuses to avoid reading health information materials when given material to read. □	Kripalani, et al. [23]	2	87.5	4.4	5	0.7	0.5
A10* often complain about their medicine. □	Devraj, et al. [36]	2	87.5	4.4	5	0.7	0.5
A11. only seek assistance when symptoms worsen. □	Jukkala, et al. [38]	2	87.5	4.7	5	0.7	0.3
A12. cannot understand medical forms and are therefore unable to complete them accurately. □	Institute of Medicine [5]	2	87.5	4.7	5	0.7	0.3
A13. are likely to put a lot of folded paper in their pockets or wallets. □	Kripalani, et al. [23]	3	83.3	4.0	4	0.8	0.8
A14. do not make necessary appointments or attend follow up. □	Institute of Medicine [5]	2	87.5	4.3	4	0.7	0.5
A15. may be likely to pose few questions to professionals. □	Interview	2	83.3	4.4	5	0.9	0.8
A16. cannot talk about how to take medicine. □	Kripalani, et al. [23]	2	87.5	4.1	4	0.8	0.8
Skill domain							
Designing a health education plan for patients with low health literacy							
D1. Handle the psychical barriers to conducting health behaviors for clients	Interview	2	87.5	4.6	5	0.7	0.5
D2. Cooperate with other professionals to design health education plans	Interview	2	87.5	4.7	5	0.7	0.3
D3. Design audio-visual teaching materials	Interview	2	87.5	4.7	5	0.7	0.3
D4. Have the language ability to handle different patients	Interview	2	87.5	4.6	5	0.7	0.5
D5. Provide group health education	Interview	Delete	79.2	4.0	5	1.1	0.5
D6. Implement behavior modification counseling	Interview	2	83.3	4.4	5	1.0	0.5
D7. Design computer-based teaching aids	Interview	2	83.3	4.6	5	1.0	0.3
D8. Design health education flyers with less than 20% text	Interview	2	83.3	4.4	5	1.0	0.5
D9. Apply appropriate education theories in the curriculum	Interview	2	83.3	4.7	5	1.0	0.0
D10. Establish a personal profile of teaching materials	Interview	2	87.5	4.7	5	0.7	0.3
D11. Design a teaching plan for multicultural populations	Interview	2	87.5	4.6	5	0.7	0.5

D12. Design education materials for illiterate individuals	Interview	2	83.3	4.4	5	1.0	0.5
Assessing health literacy for patients with low health literacy	Interview						
As1. Determine the right teaching time for various clients	Interview	2	87.5	4.7	5	0.7	0.3
As2. Determine potential education barriers based on patient characteristics	Interview	2	83.3	4.7	5	1.0	0.0
As3. Apply appropriate tools to assess patient health literacy levels	Institute of Medicine [5]	2	83.3	4.7	5	1.0	0.0
As4. Conduct health assessments by collecting personal, organizational, and community data	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
As5. Identify the classical attributes of low health literacy prior to teaching	Kripalani, et al. [23]	2	87.5	4.8	5	0.7	0.0
Adopting low-literacy health education strategies							
S1. Use plain language instead of medical jargon	Kripalani, et al. [23]	2	87.5	4.8	5	0.7	0.0
S2. Use storytelling to make clients understand	Kripalani, et al. [23]	2	87.5	4.7	5	0.7	0.3
S3. Use metaphors to explain the disease to clients	Kripalani, et al. [23]	2	87.5	4.7	5	0.7	0.3
S4. Use life-oriented examples to explain the care that patients need	Interview	2	83.3	4.4	5	1.0	0.5
S5. Teach using language the student understands	Interview	2	83.3	4.7	5	1.0	0.0
S6. Explain health education using materials available to the patient	Interview	2	83.3	4.7	5	1.0	0.0
S7. Connect new learning with previous experience	Interview	2	83.3	4.7	5	1.0	0.0
S8. Limiting curricula to two or three new topics	Schwartzberg, et al. 11	2	83.3	4.7	5	1.0	0.0
S9. Use the teach-back technique	Kripalani, et al. [23]	2	83.3	4.6	5	1.0	0.3
S10. Teach repeatedly when clients cannot understand the teaching content	Williams, et al. [39]	2	83.3	4.7	5	1.0	0.0
S11. Teach difficult materials repeatedly	Interview	Delete	50	3.4	4	1.1	0.5
S12. Use the demonstrate-do technique	Interview	2	83.3	4.7	5	1.0	0.0
S13. Provide health education materials and encourage clients to discuss them with their families	Interview	2	87.5	4.8	5	0.7	0.0
S14. Provide health education materials with “Questions & Answers”	Interview	2	83.3	4.7	5	1.0	0.0
S15. Use simple words to explain care plans and related treatment	Schwartzberg, et al. 11	2	87.5	4.8	5	0.7	0.0
S16. Base decisions regarding teaching focus on treatment progress	Interview	2	83.3	4.6	5	1.0	0.3
S17. Summarize the key points of teaching at the end of the interview	Kripalani, et al. [23]	2	87.5	4.8	5	0.7	0.0
S18. Instruct others in the creation of a care plan rather than explaining the disease or condition	Interview	2	95.8	4.8	5	0.4	0.3
S19. Use pictorial methods, rather than words, to emphasize importance of issues for clients	Kripalani, et al. [23]	2	83.3	4.7	5	1.0	0.0
S20. Provide self-designed sticks to allow clients to mark their records	Interview	2	87.5	4.8	5	0.7	0.0
S21. Use the one-by-one method and pictorial image material	Interview	2	87.5	4.8	5	0.7	0.0

S22. Use media to benefit teaching outcomes	Interview	2	83.3	4.7	5	1.0	0.0
S23. Design teaching materials as teaching aids in health education	Interview	2	83.3	4.4	5	1.0	0.5
S24. Use online or internet teaching	Interview	2	83.3	4.7	5	1.0	0.0
S25. Consider disobedient behavior to be temperate coping behavior	Interview	2	83.3	4.2	5	1.0	0.8
S26. Offer more encouragement to patients and illiterate clients	Interview	2	83.3	4.7	5	1.0	0.0
S27. Understand clients' disobedient behaviors	Interview	2	87.5	4.6	5	0.7	0.5
S28. Invite caregivers to participate in the teaching plan	Interview	2	83.3	4.6	5	0.9	0.5
S29. Encourage clients and their families and clarify unclear parts of teaching via telephone	Interview	2	87.5	4.8	5	0.7	0.0
S30. Present oneself to clients as a resource	Interview	2	87.5	4.7	5	0.7	0.3
S31. Create an environment of mutual trust	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
S32. Encourage sharing between clients	Interview	2	87.5	4.8	5	0.7	0.0
S33. Create an embarrassment-free environment	Institute of Medicine [5]	2	83.3	4.6	5	0.9	0.5
S34. Ensure clients' confidentiality	Interview	Delete	79.2	4.0	5	1.1	0.0
S35. Encourage clients to take notes during interviews	Interview	2	87.5	4.8	5	0.7	0.0
S36. Teach clients to ask, "What is my main problem?"	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
S37. Teach clients to ask, "What do I need to do?"	Institute of Medicine [5]	2	87.5	4.8	5	0.7	0.0
S38. Teach clients to ask, "What can I do to help my body?"	Institute of Medicine [5]	2	87.5	4.7	5	0.7	0.3
S39. Encourage clients to use the question-posing method	Interview	2	87.5	4.8	5	0.7	0.0
S40. Encourage clients to talk about what doctors say to them	Interview	2	87.5	4.8	5	0.7	0.0
S41. Encourage clients to demonstrate learned skills to determine their understanding	Interview	2	87.5	4.8	5	0.7	0.0
S42. Ask clients to provide evidence of their health behavior	Interview	2	87.5	4.8	5	0.7	0.0
S43. Make eye contact with patients to ensure concentration	Interview	2	83.5	4.6	5	0.9	0.5
S44. Ask clients to restate the key points that they have learned	Interview	2	87.5	4.8	5	0.7	0.0
S45. Pay attention to questions that patients ask repeatedly	Interview	2	87.5	4.8	5	0.7	0.0
S46. Pay attention to nonverbal (e.g., facial) expressions to determine whether the patient has understood	Interview	2	87.5	4.8	5	0.7	0.0
Evaluating an educational plan for patients with low health literacy							
E1. Build up the right evaluation criteria for health literacy practice	Interview	2	83.3	4.7	5	1.0	0.0
E2. Conduct appropriate evaluations to demonstrate the effectiveness of health literacy practice	Interview	2	83.3	4.1	5	1.0	1.0

E3. Modify education plans to fit patients' problems	Interview	2	87.5	4.7	5	0.7	0.3
E4. Illustrate the appropriate effectiveness of teaching based on health literacy	Interview	2	87.5	4.6	5	0.7	0.5
E5. Encourage clients with low health literacy to share the successful action outcome	Interview	Delete	79.2	4.0	5	0.9	0.5
E6. Design various evaluation approaches according to clients' health literacy levels	Interview	2	87.5	4.8	5	0.7	0.0

K: knowledge of health literacy; A: recognition of attributes of patients with low health literacy; D: designing a health education plan for patients with low health literacy; As: assessing health literacy for low health literate patients; S: adopting low-literacy health education strategies; E: evaluating an educational plan for patients with low health literacy.

DISCUSSION

In Taiwan and the rest of the world, most health literacy studies have focused on the patient's perspective. Only a few have explored health professionals' competencies in promoting patients' health literacy. Understanding health professionals' ability in health literacy practice is a basic step in establishing practice-based competencies. Delphi studies lack a consistent and well-defined standard for the application of group consensus[40]. In addition to the predetermined levels of agreement mentioned in previous study[14], we used other consensus standards suggested by de Villers[17] including the values of mean, standard deviation and interquartile range to understand the level of consensus or lack thereof.

Although assessment of health literacy knowledge is an essential component of health literacy practices for health professionals, the result of our study has found that the measurement of health literacy knowledge could be either subjective or objective. The subjective measurement involved the participant's perceived knowledge of health literacy[41] or the health literacy knowledge demonstrated by the participants[42]. The objectives assessment of health literacy knowledge performed in the current study was similar to that performed in the study conducted by Devraj, et al.[36], in which health literacy knowledge was designed in test items that participants were required to answer to determine their health literacy levels. This could help in the evaluation of health literacy levels in untrained health professionals.

The items used in the current study were similar to those used in other studies, in that the assessment included the definition of health literacy[11], reading levels in patients with low health literacy[10], essential support for LHL patients[23], and the consequences of low health literacy[38]. Kripalani, et al.[23], Devraj, et al.[36] and Coleman, et al. [14] classified the signs of low health literacy as knowledge items. For clearly

differential conceptual knowledge or practical recognition of low health literacy, we grouped the signs of low health literacy confirmed during the interviews in the dimension of recognition of the attributes of patients with low health literacy. When health professionals adopted appropriate methods embedded health literacy competences to provide care for them, this attributes may not be the problems in healthcare settings[23]. Undoubtedly, it is important for health professionals that they need to aware of and recognize these signs when they conducted the assessment for patients.

The reason for this discrepancy could be that the study subjects were physicians in three of the 17 studies and believed that health literacy was a communication skill. Coleman used the same five crucial domains to examine competencies in health literacy practice but divided the competencies into educational and practice domains [14]. However, we incorporated a literature review and interviews into an educational process that aimed to meet the World Health Organization's goals of promoting health literacy to the general public via educational systems[4]. Extending the application of written or oral communication skills as it relates to health literacy competencies in health education programs is critical to the improvement of public health literacy.

The competency items used in the current study were similar to those used in previous studies. However, because of differences in first round of Delphi process and the Chinese descriptions in the practical narratives confirmed during the interviews, the meanings of the items somewhat differed from those provided by Coleman et al[14]. The language differences could be considered as a study limitation. In the current study, we integrated the literature and interviews to produce the competencies of health literacy practice, which might be suitable for use with Chinese-speaking professionals.

It is worth noting that five of the seven questions for which a consensus could not be reached were interview items. These items were related to health education and captured via interview but have not been mentioned specifically in the health literacy literature; therefore, the experts could not reach consensus. The remaining two questions for which a consensus could not be reached were literature items. It is possible that, although the concepts originated from the literature, the experts considered the consent and health education materials analyzed during the interviews duplicate information. K14 was a detailed description of low health literacy caused by communication barriers, which resulted from adverse effects on the patient's health, but it was also a repetition of K6.

Potential biases in traditional Delphi studies include the imposition of preconceptions on respondents and the use of poor techniques to summarize and present group responses[43]. To avoid the drawbacks involving the imposition of preconceptions on respondents, a thorough review of the literature concerning the modified Delphi method was performed to collect information regarding competencies in health literacy practice, and qualitative interviews were conducted to confirm those generated by healthcare professionals in their own settings. This approach could increase the diversity of the item pool. Irrelevant or duplicate questions could be removed after the experts have reached a consensus.

CONCLUSIONS

The health literacy competencies identified in this study constitute an important and necessary step in the systematic design and evaluation of curricula required to produce a healthcare workforce that both accounts for and addresses the issues surrounding low health literacy. Most studies have suggested that health literacy and health education or communication skills are closely related. The present study

applied these education principles in a holistic and continuous process to construct an index for assessing practice competencies.

A modified Delphi technique was used to achieve consensus on health literacy competencies for Chinese-speaking healthcare professionals. Further empirical studies are required to validate whether the 92 items identified can be grouped into the six domains of competencies in health literacy practice. Moreover, further work is required to prioritize these 92 items, and educational research is required to validate the competencies in health literacy practice and determine which should be taught, which healthcare professionals should receive training, which settings should be used, and which teaching methods should be adopted to improve patient-centered outcomes.

Contributors

Chen Yu-Chi, Wu Fei Ling, and Chang Li Chun conducted the qualitative interviews. Liao Li Ling and Chang Li Chun analyzed the interview and Delphi data. Chang Li Chun wrote the manuscript. All authors critically revised and approved the final manuscript.

Acknowledgements

The authors would like to thank the experts and interviewees involved in the study. We also appreciate the helpful comments received from the anonymous reviewers at BMJ Open.

Funding

This project was funded by the Ministry of Science and Technology, Taiwan (NSC 100-2511-S-255-001-MY2), and financial assistance was received from Chang Gung Memorial Hospital (BMRP 978).

Competing interests

None declared.

Ethics approval

Chang Gung Memorial Hospital

Data sharing statement

No additional data are available.

REFERENCES

1. Nutbeam D. health promotion glossary. *Health Promotion* 1998;**1**(1):113-27.

2. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot Int* 2000;**15**(3):259-67.

3. Coleman CA, Fromer A. A health literacy training intervention for physicians and other health professionals. *Fam Med* 2015;**47**(5):388-92.

4. Institute of Medicine Committee on Health Literacy. In: Nielsen-Bohlman L, Panzer AM, Kindig DA, eds. Health Literacy: A Prescription to End Confusion. Washington (DC): National Academies Press (US). Copyright 2004 by the National Academy of Sciences. All rights reserved., 2004.

5. Estacio EV, McKinley RK, Saidy-Khan S, et al. Health literacy: Why it matters to South Asian men with diabetes. *Prim Health Care Res Dev* 2014:1-5.

6. Atcherson S, Zraick R, Hadden K. A need for health literacy curriculum: Knowledge of health literacy among us audiologists and speech-language pathologists in Arkansas. *Education Healt*h 2013;**26**(2):85-88.

7. Smith DL, Gutman SA. Health literacy in occupational therapy practice and research. Am J Occup Ther 2011;**65**(4):367-9.

8. Dickens C, Lambert BL, Cromwell T, et al. Nurse overestimation of patients' health literacy. *J Health Commu*n 2013;**18**(sup1):62-69.

9. Ali, NK, Ferguson, RP, Mitha, S, et al. Do medical trainees feel confident communicating with low health literacy patients? *J Community Hosp Intern Med Perspect*. 2014;**4**.

10. Cafiero M. Nurse practitioners' knowledge, experience, and intention to use health literacy strategies in clinical practice. *J Health Commun* 2013;**18**(sup1):70-81.

11. Schwartzberg JG, Cowett A, VanGeest J, et al. Communication techniques for patients with low health literacy: A survey of physicians, nurses, and pharmacists. *Am J Health Behav* 2007;**31**(suppl 1):S96-S104.

12. Macabasco-O'Connell A, Fry-Bowers EK. Knowledge and perceptions of health literacy among nursing professionals. *J Health Commu*n 2011;**16**(Suppl 3):295-307.

13. Seligman HK, Wang FF, Palacios JL, et al. Physician notification of their diabetes

patients' limited health literacy. A randomized, controlled trial. *J Gen Intern Med* 2005;**20**(11):1001-07.

14. Coleman CA, Hudson S, Maine LL. Health literacy practices and educational competencies for health professionals: a consensus study. *J Health Commu*n 2013;**18**(Suppl 1):82-102.

15. Linstone H, Turoff M. *The Delphi method: Techniques and applications.* Addison-Wesley: Reading, PA, 1975.

16. Keeney S, Hasson F, McKenna H. *Conducting the Research Using the Delphi Techniqu*e. The Delphi Technique in Nursing and Health Research: Wiley-Blackwell, 2011:69-83.

17. de Villiers MR, de Villiers PJ, Kent AP. The Delphi technique in health sciences education research. *Med Teach* 2005;**27**(7):639-43.

18. Bogner A. *Interviewing experts*. England: Palgrave Macmillan, 2009.

19. Parente FJ, Anderson-Parente JK. *Delphi inquiry system*s. In: Wright G, Ayton P, eds. Judgemental forecasting. Chichester: John Wiley, 1987.

20. Keeney S, Hasson F, McKenna H. *Analysing Data from a Delphi and Reporting Results. The Delphi Technique in Nursing and Health Researc*h: Wiley-Blackwell, 2011:84-95.

21. Toronto CE, Weatherford B. Health Literacy Education in Health Professions

Schools: An Integrative Review. *J Nurs Educ* 2015;**54**(12):669-76.

22. Lambert M, Luke J, Downey B, et al. Health literacy: health professionals? understandings and their perceptions of barriers that Indigenous patients encounter. *BMC Health Serv Res* 2014; **29**(14):614

23. Kripalani S, Jacobson KL, Brown S, et al. Development and implementation of a health literacy training program for medical residents. *Med Educ Online* 2006;**11**(13):1-8.

24. Maniaci MJ, Heckman MG, Dawson NL. Functional health literacy and understanding of medications at discharge. *Mayo Clin Proc* 2008;**83**(5):554-8.

25. Callahan LF, Hawk V, Rudd R, et al. Adaptation of the health literacy universal precautions toolkit for rheumatology and cardiology – Applications for pharmacy professionals to improve self-management and outcomes in patients with chronic disease. *Res Social Adm Pharm* 2013;**9**:597-608.

26. Broussard B, Radkins JB, Compton MT. Developing Visually Based, Low-Literacy Health Education Tools for African Americans with Psychotic Disorders and Their Families. *Community Ment Health* J 2014.

27. Coleman CA, Appy S. Health literacy teaching in US medical schools, 2010. *Fam Med* 2012;**44**(7):504-7.

28. Green JA, Gonzaga AM, Cohen ED, et al. Addressing health literacy through clear

health communication: A training program for internal medicine residents. *Patient Educ Couns* 2014;**95**(1):76-82.

29. Mackert M, Ball J, Lopez N. Health literacy awareness training for healthcare workers: Improving knowledge and intentions to use clear communication techniques. *Patient Educ Couns* 2011;**85**:e225-e28.

30. Mackert M. Health literacy knowledge among direct-to-consumer pharmaceutical advertising professionals. *Health Commun* 2011:1-9.

31. Primack BA, Wickett DJ, Kraemer KL, et al. Teaching Health Literacy Using Popular Television Programming: A Qualitative Pilot Study. *Am J Health Educ* 2010;**41**(3):147-54.

32**.** Price-Haywood EG, Harden-Barrios J, Cooper LA. Comparative effectiveness of audit-feedback versus additional physician communication trainingto improve canc er screening for patients with limited health literacy. *J Gen Intern Med* 2014. **2**9(8):1113-21.

33. Levasseur M, Carrier A. Do rehabilitation professionals need to consider their clients' health literacy for effective practice? *Clin Rehabil* 2010;**24**(8):756-65.

34. Zanchetta MS, Maheu C, Fontaine C, et al. Awakening professionals' critical awareness of health literacy issues within a francophone linguistic-minority population in Ontario. *Chronic Diseases & Injuries in Canada* 2014;**34**(4):236.

35. Elo S, Kyngas H. The qualitative content analysis process. *J Adv Nur*s 2008;**62**(1):107-15.

36. Devraj R, Butler LM, Gupchup GV, et al. Active-Learning Strategies to Develop Health Literacy Knowledge and Skills. *Am J Pharm Edu*c 2010;**74**(8):137-45.

37. Weiss BD, Palmer R. Relationship between health care costs and very low literacy skills in a medically needy and indigent Medicaid population. *J Am Board Fam Pract* 2004;**17**(1):44-7.

38. Jukkala A, Deupree JP, Graham S. Knowledge of limited health literacy at an academic health center. *J Contin Educ Nur*s 2009;**40**(7):298-302; quiz 03-4, 36.

39. Williams MV, Davis T, Parker RM, et al. The role of health literacy in patient-physician communication. *Fam Me*d 2002;**34**(5):383-89.

40. Williams PL, Webb C. The Delphi technique: a methodological discussion. *J Adv Nurs* 1994;**19**(1):180-6.

41. Mackert M, Ball J, Lopez N. Health literacy awareness training for healthcare workers: Improving knowledge and intentions to use clear communication techniques. *Patient Educ Couns* 2011;**85**(3):e225-e28.

42. Ha H, Lopez T: Developing health literacy knowledge and skills through case-based learning. *Am J Pharm Educ* 2014, 78(1):17.

43 Keeney S, Hasson F, McKenna H. *Ethical Considerations. The Delphi Technique*

in Nursing and Health Research: Wiley-Blackwell, 2011:105-13.

GRRAS checklist for reporting of studies of reliability and agreement

Version based on Table I in: Kottner J, Audigé L, Brorson S, Donner A, Gajeweski BJ, Hróbjartsson A, Robersts C, Shoukri M, Streiner DL. Guidelines for reporting reliability and agreement studies (GRRAS) were proposed. J Clin Epidemiol. 2011;64(1):96-106

Section	Item #	Checklist item	Reported on page #
Title/Abstract	1	Identify in title or abstract that interrater/intrarater reliability or agreement was investigated.	p2
Introduction	2	Name and describe the diagnostic or measurement device of interest explicitly.	p4
	3	Specify the subject population of interest.	p4
	4	Specify the rater population of interest (if applicable)	X
	5	Describe what is already known about reliability and agreement and provide a rationale for the study (if applicable).	X
Methods	6	Explain how the sample size was chosen. State the determined number of raters, subjects/objects, and replicate observations.	p7
	7	Describe the sampling method.	p6,7
	8	Describe the measurement/rating process (e.g. time interval between repeated measurements, availability of clinical information, blinding).	p7
	9	State whether measurements/ratings were conducted independently.	p6-7
	10	Describe the statistical analysis.	p7, 8
Results	11	State the actual number of raters and subjects/objects which were included and the number of replicate observations which were conducted.	p9
	12	Describe the sample characteristics of raters and subjects (e.g. training, experience).	p9
	13	Report estimates of reliability and agreement including measures of statistical uncertainty.	P10
Discussion	14	Discuss the practical relevance of results.	p16-19
Auxiliary material	15	Provide detailed results if possible (e.g. online).	X