

# Health Literacy Training for Public Health Nurses in Fukushima: A Multi-site Program Evaluation

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## Abstract

Public health nurses (PHNs) are community residents' access points to health information and services in Japan. After the Fukushima nuclear accident, they were challenged to communicate radiation-related health information to best meet community needs. We previously developed and evaluated the outcome of a single-site health literacy training program to augment PHNs' ability to improve community residents' access to written health information. This paper presents an evaluation of an identical training program using data combined from multiple sites, and further included proximal and distal evaluations to document the impact of health literacy training in a post-disaster setting. A total of 64 participants, primarily experienced PHNs, attended one of three multi-session health literacy workshops conducted in multiple sites across Fukushima. Quantitative and qualitative data on PHNs' training satisfaction, self-evaluation of achievements regarding training goals, and application of learned skills were collected and analyzed. Each workshop consisted of two 2-hour sessions introducing health literacy and assessment tools and developing skills to improve written materials, followed by a one-month follow-up assessment on PHNs' application of the gained skills in the field. Post-training evaluations on the appropriateness and usefulness of the workshop were highly positive. At the end of the one-month follow-up, 45% of participants had gained confidence in assessing and revising written materials and had applied the skills they had gained to develop and communicate health information in various settings and modes. This increase in confidence was associated with further application of the learned skills at the municipal level. However, participants reported difficulties in explaining risks, and the need to learn more about plain language to be able to paraphrase professional terms. This paper highlights the positive outcomes of health literacy training among PHNs. Practical strategies to reinforce their skills to use plain language and communicate the epidemiological concept of risk are also recommended.

**Key words** Health literacy, Fukushima nuclear accident, Education, Public health nurses

## Introduction

Accurate, timely, and accessible information provision is the foundation of collaboration between community authorities during any major health event. Rudd and colleagues assessed two US-based nationwide disseminations of written information (an AIDS brochure in 1988 and an anthrax postcard in 2001) and recommended establishing an expert team in delivering "clear, truthful and effective health messages during the time of

crisis" in order to "leave no one behind."<sup>1</sup> Likewise, Bromet reviewed previous nuclear accidents, describing how confusing information led to people's mounting anxiety, and recommended providing truthful information and setting up dosimetry monitoring centers.<sup>2</sup>

Since the Fukushima nuclear accident in 2011, local municipal offices have developed and distributed numerous written materials about the health effects of radiation in order to counteract the expected negative consequences of

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confusing messages. There has been a flood of information through various channels—from traditional channels such as television and newspapers, to more modern ones such as blogs and Twitter.<sup>3</sup> During the acute phase of the Fukushima disaster, Yamashita called the situation an “information disaster” because healthcare professionals struggled with communicating disaster-related information in an appropriate and coordinated way.<sup>4</sup> Sugimoto and colleagues reported findings from a survey conducted among over 1,500 residents in Fukushima that relying on rumors was associated with greater worries about radiation health effects.<sup>3</sup> However, they found that joint seminars by local governments and universities alleviated participants’ anxiety. The literature clearly suggests that coordinated and planned communication efforts are needed during and after a public health crisis.

Training programs for health professionals on both the national and local levels can support these efforts to promote effective communication with the public. In Japan, public health nurses working in prefectural and municipal offices are community residents’ access points to health services. They assess residents’ health needs and plan and implement community health activities, including information provision. After the nuclear accident, these nurses faced difficulties in communicating radiation-related information and voiced needs to improve their communication skills.<sup>5</sup> To mitigate these communication problems, a training program for improving written communication was developed for public health nurses. The program was shaped by findings from health literacy studies indicating that a good deal of health information is inaccessible to the general public, due in part to the use of unexplained jargon, sophisticated numeric concepts, and scientific terms. The training program was based on Rudd’s “Eliminating Barriers-Increasing Access Workshop,” and was adapted from an American context to a Japanese one. The adaptation process as well as the program format and content were reported in a recent issue of the Japan Medical Association Journal.<sup>6</sup> Furthering this work, the present study documents the proximal and distal evaluations of the health literacy training program provided to public health nurses with combined data from multiple sites.

## Methods

### Design and sample

A proximal post-training program evaluation and a distal (i.e., one-month) follow-up evaluation were conducted and analyzed. A total of 64 participants, mostly public health nurses working in three regions of Fukushima (central, coastal, and mountainous), attended a workshop organized in each region. The preliminary results from the first workshop, which was held in the central region, have been reported previously.<sup>6</sup> By referring to Thabane and colleagues’ tutorial on pilot studies and with publisher permission to use the data from our preliminary report,<sup>7</sup> the data from the workshop conducted in the central region (Source: Table 3, p.150, JMAJ, May/June 2014—Vol.57, No.3) was included in the present analysis along with the data from the other two regions to ensure coverage from all workshops conducted across Fukushima. Each workshop comprised two sessions. There was no change in terms of program content and evaluation methods between the first workshop conducted in the central region and the two workshops subsequently conducted in the coastal and mountainous regions.

### Measures

Quantitative and qualitative data on public health nurses’ training satisfaction, self-evaluation of achievements of training goals, and application of learned skills were collected through surveys at the end of each session and at a one-month follow-up.

In the surveys at the ends of the first and second sessions, there were six evaluation indicators related to adequacy of teaching materials, time allocation, facilitation, knowledge gain, and practicality of the lecture and exercises. Five-point Likert-scales were used, ranging from “highly disagree” (1) to “highly agree” (5).

In the follow-up survey, we assessed public health nurses’ achievements regarding 12 specific training goals: four items were on basic knowledge of health literacy, four were on material assessment, and four were on material development. In addition, we asked participants to describe their applications in daily practice, identify barriers in applying learned skills, indicate what they wanted to learn further, and describe what they planned for the city’s com-

**Table 1** Content of the health literacy training program in Fukushima City

First session	Second session	Follow-up survey
1. Ice-breaking activity	1. Review quiz	1. Review of one-month application
2. Lecture	2. Lecture	2. Training evaluation
• General background of health literacy	Techniques to improve;	3. Distribute additional information leaflet about tips to apply health literacy in practice
• Instructions to use material assessment tools	• Text	
3. Exercise	• Graphics	
• Assessment of an assigned written health material	• Risk presentation	
4. Training evaluation	3. Exercise	
5. Homework	• Revision of their own materials that they had assessed as homework	
• Assessment of materials that participants themselves developed	4. Training evaluation	
	5. Homework	
	• Apply learned knowledge and skills in practice	

The table was reproduced with publisher permission (Source: Table 2, p.149, JMAJ, May/June 2014—Vol.57, No.3).<sup>6</sup>

munity health activities.

We further assessed the readability of materials that participants voluntarily submitted in order to concretely examine the extent to which participants were able to apply the content of the workshop. First, we applied the Japanese version of a systematic assessment tool known as the Suitability Assessment of Materials (SAM).<sup>8</sup> The tool comprises 23 items covering five areas: content, literacy demand, graphics, layout and type, and learning stimulation and motivation. Each item is scored with “superior (score 2),” “adequate (1),” or “poor (0).” A total score ranges from 0 to 46. Next, we determined each material’s grade level, which is often calculated by using a tool that determines the level of difficulty of the material in terms of the complexity of words and sentences. This grade level was calculated by using a free online tool named Obi-2.<sup>9</sup>

### Intervention

The model workshop protocol was developed by Rudd as part of the Health Literacy Studies project at the Harvard T.H. Chan School of Public Health.<sup>10</sup> The workshop was originally designed for public health professionals interested in improving health literacy in their practice in the US with a focus on the critical elements of health communication that prove problematic for the public. The workshop emphasized that the lessons learned from assessments of health materials can be applied to both oral and written

communication. Rudd’s workshop processes, content, and tools were adapted to respond to the needs of public health nurses in Fukushima.<sup>6</sup> In brief, major modifications were made to incorporate tools appropriate for the Japanese language and communication of risk specific to Fukushima.

The workshop was conducted over the course of two days with a one-month follow-up focused on field application. Each session was designed to take two hours and comprised lectures, exercises, and discussions. Of note, the session time of the workshop conducted in the mountainous region was shortened from two to 1.5 hours due to logistical reasons, but the content was kept identical by eliminating break times. The main objectives of the first session were to learn about health literacy research and findings and to develop skills in the use of assessment tools for the examination of written health materials. The second session focused on the application of insights for re-structuring and improving the materials assessed in the first session. The workshop was designed in a way that allowed the lessons learned in the assessment of written materials to be applied to oral presentations and discussions as well. **Table 1** illustrates the overall structure of the program.<sup>6</sup>

### Analytic strategy

A basic evaluation framework for the workshop was published previously.<sup>6</sup> In the present paper, we also report the results of qualitative analyses

of participants' written opinions about their training and the health literacy assessments of their written materials to deepen our understanding of the workshops' outcomes.

Quantitative data were analyzed using STATA statistical software, version 13 (Stata Corporation, College Station, TX). Qualitative data from the follow-up survey were analyzed by referring to Carey and colleagues' coding and intercoder agreement methods.<sup>11</sup> A code list was developed by the first and second authors through a process of independent categorization and comparison of obtained results using the data from the central region.<sup>6</sup> The finalized code list was used to analyze data from the workshops conducted in the other two regions. These two authors performed coding independently, and the results were compared and finalized by the first author.

To triangulate the quantitative and qualitative data, data related to respondents' confidence in assessing and revising written materials (quantitative data) were cross-tabulated with their written responses (qualitative data) to ascertain if they had expressed plans to apply the skills they had learned to municipal activities. In order to investigate the degree of knowledge application in the field, participants' descriptions of their applications in daily practice were analyzed using Steps Coding and Theorization (SCAT).<sup>12</sup> This qualitative analysis method is appropriate for small-scale qualitative studies with a limited amount of qualitative data including answers to open-ended questions in surveys. The analysis consists of two steps—first, decontextualization to generate themes from sentences, followed by theorization via summarizing collected information to construct theories. The first step comprises four smaller steps: listing key words, paraphrasing them, extracting higher-order concepts, and creating major themes. In the theorization step, we developed a storyline from the emerging themes through recontextualization. We previously applied and reported the same method used in the analysis of the content of public health nurses' discussion meetings.<sup>5</sup>

In addition, two participants submitted samples of their written materials before and after revision. These were works done during the one-month follow-up. Submitted materials were scored using the SAM independently by two researchers (the first author and a public health researcher who had attended the health literacy

workshop), and the results were compared to achieve consensus.

### Ethical consideration

The training was implemented in collaboration with the Fukushima Prefectural Office and the Fukushima City Health and Welfare Center. Since anonymous data with no identifiers collected for training quality improvement were used, an ethical review at the Fukushima Medical University was waived in accordance with the Ethical Guidelines for Epidemiological Research issued by the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Health, Labour and Welfare.

### Results

Among 59 participants with their profile data available, 54 were public health nurses and five were nutritionists or administrative staff working in a health sector with the public health nurses. The median years of working experience was 14, ranging from less than one year to 38 years, and 56% had an experience of 10 years or longer. Twenty-seven (46%) attended both sessions.

**Table 2** shows the results of the surveys at the end of each session with a response proportion of 88% (45/51) for the first evaluation and 98% (43/44) for the second evaluation. Over 85% of respondents agreed to all statements ascertaining the appropriateness and usefulness of both sessions.

**Table 3** shows the results of participants' self-evaluations of achievements regarding the training objectives at the one-month follow-up survey; the response proportion was 92% (59/64). Forty-five percent of participants reported gaining confidence in assessing and revising written materials, and 47% reported applying the skills they had learned in the workshops during the follow-up period. These proportions were higher among those who attended both sessions; 54% of them reported a gain in confidence, whereas only 38% of participants who had attended one workshop reported such a gain. The same trend was observed for the application of skills—it was 54% for participants who had attended both sessions and 42% for those who had only attended one session. Furthermore, 63% of the respondents reported that they could explain health literacy needs; 71% reported that they

**Table 2** Participants' session evaluation at the end of the first and second sessions

Statements	N (%) of 4 and 5 <sup>a</sup>	
	First session (N=45)	Second session (N=43)
Teaching materials were appropriate.	42 (93)	43 (100)
Time allocation was appropriate.	40 (89)	41 (95)
Facilitation was appropriate.	43 (96)	43 (100)
I gained knowledge about health literacy.	41 (93)	42 (93)
What I learned from the lecture is useful for health activities.	42 (93)	43 (100)
What I learned from the discussion is useful for health activities.	41 (91)	43 (100)

<sup>a</sup> A five-point Likert-scale ranging from 'highly disagree' (1) to 'highly agree' (5) was used, and the numbers in the table are the proportions of the participants who answered 'agree' and 'highly agree.'

**Table 3** Participants' self-evaluation of achievements toward training objectives in the follow-up survey

Statements	N (%) of 4 and 5 <sup>a</sup>		
	Total (N=59)	Attended once (N=32)	Attended twice (N=27)
<b>Workshop evaluation</b>			
I gained confidence in assessing and revising written materials.	26 (45)	12 (38)	14 (54)
I applied learned skills in practice.	27 (47)	13 (42)	14 (54)
<b>Self-evaluation of achievements</b>			
Knowledge about health literacy			
I can explain health literacy needs.	37 (63)	20 (63)	17 (63)
I can explain the definition of health literacy.	23 (39)	10 (31)	13 (48)
I can explain numeracy levels.	14 (25)	5 (17)	9 (33)
I can explain about people's health literacy level in Japan.	16 (28)	5 (17)	11 (41)
Skills in assessing written materials			
I can use the Marker Method (a communication method to ask readers to mark difficult words and phrases).	41 (71)	17 (55)	24 (89)
I can use Obi-2 (software to assess readability).	19 (34)	5 (17)	14 (52)
I can use the SAM (a systematic assessment of written materials from layout to content).	15 (26)	6 (20)	9 (33)
I can use single-item screening method of health literacy level.	16 (29)	6 (20)	10 (38)
Skills to revise written materials			
I can write easy-to-read text.	29 (49)	16 (50)	13 (48)
I can develop a leaflet step-by-step.	19 (32)	9 (28)	10 (37)
I can develop easy-to-understand graphics.	17 (29)	8 (25)	9 (33)
I can explain risk.	7 (12)	3 (9)	4 (15)

<sup>a</sup> A five-point Likert-scale ranging from 'highly disagree' (1) to 'highly agree' (5) was used, and the numbers in the table are the proportions of the participants who answered 'agree' and 'highly agree.' Total numbers of some items do not add up to the numbers indicated in the top row due to missing data.

could use the Marker Method; and 49% reported that they could write texts that are easy to read. However, only 12% could explain risk during

practice.

**Table 4** illustrates the frequencies of codes from the follow-up survey. The component that

**Table 4** Frequencies of coded answers in the follow-up survey

Codes (Total N of respondents)	N <sup>a</sup>
Application of learned skills (44)	
Applied to developing and communicating health information/education materials	24
No opportunity to apply thus far	9
Will apply	8
Applied to other written materials and verbal communication	7
Application barriers (28)	
Technical difficulties to improve sentences, tables, and graphs	18
Workplace difficulties related to sharing learned skills, changing work norms, and time and cost constrains	7
No opportunity to apply thus far	4
Further learning (27)	
Need to continue learning by practicing and attending more training	14
Need to learn more skills in communicating scientific/technical information and verbal/motivational communication	13
Not in particular	1
Plans for municipal activities (18)	
Apply health literacy skills in health information/education and planning of health activities	12
Work with community and different sectors	7
Not in particular	4

<sup>a</sup> Codes were created from the open-ended responses from participants, and intercoder agreement was calculated as part of the analysis.

received the highest number of responses in the follow-up evaluation was the application of learned skills at the individual level for health-related information/education materials (N=24).

SCAT was then applied to qualitatively analyze participants' opinions about the application of the learned skills. A synthesis of the themes revealed that at the individual level, health literacy training led to participants' immediate use of learned skills in various settings (including school health education, parenting support, support groups for the elderly, and home visits) and for different types of materials (including leaflets, oral presentations, and e-mails). Participants also responded on how the training had prompted them to adopt a health literacy perspective when reviewing their communication activities thereafter. Immediate application reaffirmed the importance of health literacy for the participants. The public health nurses reported that they subsequently applied their learned skills. For example, two nurses wrote:

*“We revised our leaflets, compared the materials before and after the revision, and learned the*

*importance of developing easy-to-understand materials.”*

*“I used the software to assess the materials I use. It was good that I could evaluate its readability. I want to continue using [this skill] when developing information materials.”*

The training further revealed an impact at the organizational level. Nurses reported that the planning and implementation of several health promotion activities became more health-literacy-driven. According to the reports, this served to further increase nurses' professional confidence and the building of teamwork. For example, two nurses wrote:

*“When I gave a talk about exercise and practiced at an elderly club, I used topic sentences and SAM to make a leaflet. I was able to clearly communicate my points and facilitate [the session] smoothly.”*

*“I assessed my flyer announcing a health education class by using the readability assessment tool, explained [it] to a section chief, and revised [the] expressions [by myself]. After that, I did group*

*work to share opinions [with my colleagues] to revise [the flyer further]. As a result, I believe that my flyer is easier to understand among citizens.”*

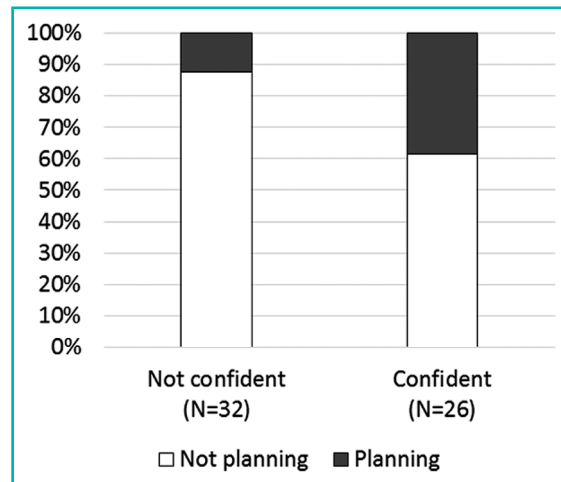
The other frequently given opinions, noted in **Table 4**, were about barriers to application and indications of further learning needs. Respondents found that writing in plain language made sentences lengthier, and they reported difficulties in balancing readability and amount of information. Consequently, they indicated that they wanted to learn more skills focused on vocabulary and how best to paraphrase medical and administrative terms.

As shown in **Fig. 1**, participants’ gained confidence in assessing and revising written materials was significantly associated with their intention to apply learned skills to municipal activities (chi-square test,  $P=0.03$ ).

The readability assessment of the two submitted written materials revealed that the grade-level decreased from 9 to 8 in both (lower scores indicate greater ease of reading). The total score of the SAM increased, because of an increase mostly in “content” and “graphics, layout and type,” from a score of 33 to a score of 36 in one case and from a score of 32 to one of 40 in another. The material that showed the 8-point increase was an information leaflet about influenza, and its revised version eliminated medical terms about symptoms and complications, instead adding more information about recommended preventative behaviors, and used topic sentences more effectively.

## Discussion

Participants of the three workshops gave high ratings in their evaluations of the appropriateness and usefulness of the training that they received at the workshops. About half of these participants reported that they had gained confidence in assessing and revising written materials, which was more evident among participants who had attended both sessions. Furthermore, participants who had gained confidence were more likely to apply their learning in their work at the municipal level. Such applications were reported in various settings and modes, leading to a positive cycle of increasing confidence and continuous application of the health literacy skills gained in the workshop. The assessment of actual samples



**Fig. 1** Gained confidence in assessing and revising written materials and intention to plan municipal health literacy activities

Confidence in assessing and revising written materials was asked at the end of a one-month follow-up. A five-point Likert-scale ranging from ‘highly disagree’ (1) to ‘highly agree’ (5) was used, and 4 and 5 were categorized as confident. Those who wrote opinions about plans to apply learned skills to municipal activities were categorized as “planning,” excluding those who answered “not in particular” (N = 4 as shown in Table 4).

$P=0.03$  by chi-square test.

of participants’ written materials yielded clear indication of improved readability and content. Furthermore, we note that the materials chosen for rewriting were both for health promotion rather than for disaster- or risk-related materials. We speculate that the workshop participants may not have yet been comfortable addressing more difficult materials or those with many scientific terms. In addition, our analyses revealed that there are still needs for further training in the paraphrasing of medical and administrative terms and interpretations and explanations of “risk.”

It is noteworthy that there was a positive loop of application and confidence according to both the quantitative and the qualitative analysis results. This favorable influence was observed both at the individual and organizational levels. It is well-recognized that practice and field applications are key to improving health literacy skills.<sup>13</sup> Such constant learning efforts at the individual level can lead to the building of a health-literacy-conscious environment at the

organizational level. One previous study conducted an in-depth investigation of the roles of Japanese public health nurses in the community, and found that the major constructs were identifying and responding to community needs, and building a trust relationship through an “open communication channel.”<sup>14</sup> When public health nurses improve their communication skills, it can enhance many aspects of their roles in the community and build their professional confidence.

We observed that the workshop participants continued to struggle with paraphrasing professional terms and describing “risk.” The National Institute for Japanese Language and Linguistics released a glossary of terms used at hospitals,<sup>15</sup> and a few terms were included in our training workshop. However, the glossary was developed for clinical use and does not contain a sufficient number of words that public health nurses use in health promotion activities. With regard to the difficulty of communicating “risk,” this was the major topic discussed at the Institute of Medicine’s recent health literacy workshop in 2013.<sup>16</sup> The report pointed out that communication of risk is not only about explaining epidemiologic risk, but also about addressing people’s personal values and conveying the abstract notion of uncertainty implied in any discussion of risk. This is most certainly the case in the aftermath of the Fukushima nuclear accident; differences in risk perception deepened people’s concerns about their health and safety.<sup>5</sup> The report further recommended the usage of plain words, careful explanation of numbers, and the use of appropriate and well-tested graphics.

To close the theory-praxis gap, we first recommend developing a public health version of a glossary of terms. This should be developed through a participatory and iterative process with nurses and community residents. Both must be part of the development of health communication messages as well as in the assessment and pilot testing for clarity of these messages. Second, further training is needed to provide opportunities for nurses to review basic epidemiological concepts, to work with experts in writing plain language for “translation” and explanation, and most importantly, to practice explaining sophisticated terms to community residents. Both individual and organizational commitments are needed for the nurses to spend time and effort on improving their individual

skills and municipal health services through a health literacy approach.

There are three major limitations in the present report. First, not all participants attended both sessions. Better recruitment effort is required to maximize the training effects. Second, we did not have a control group. However, this was a formative program evaluation that aimed to explore lessons learned and discuss ways to improve.<sup>17</sup> Third, this evaluation focused on the proximal and distal outcomes of a health literacy training program in the context of health promotion activities after the Fukushima disaster. Additional research specific to the use and application of disaster-related information are required to generate insight that can contribute to our knowledge of disaster preparedness and recovery.

A health literacy workshop has great potential for improving public health nurses’ communication skills and community health services. In Fukushima, this health literacy initiative took place only after the disaster, but clearly should have been started beforehand as part of a rigorous orientation and training program for community-based work. Furthermore, this experience offers insight into the need for plain language training on all levels. The presented workshop can serve as an example for improving national preparedness for risk communication in future public health crisis scenarios. Mandated formative research would of course aid this process. Over time, more rigorous pilot testing of materials with members of the intended audience along with revisions and explanations will enable officials to develop materials that are well suited for use in communities and for public distribution.

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