International Journal of Public Health Science (IJPHS)
Vol. 14, No. 1, March 2025, pp. 94~106
ISSN: 2252-8806, DOI: 10.11591/ijphs.v14i1.24697

Development of disaster nursing competency assessment instruments

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Article Info

Article history:

Received Feb 28, 2024
Revised Apr 6, 2024
Accepted Apr 24, 2024

Keywords:

Assesment
Competency
Disaster
Instrument
Nursing

ABSTRACT

It is important to ensure that nurses have sufficient skills and knowledge to handle emergency situations. This competency assessment can help improve nurses' readiness to face disasters and emergency situations that may occur. To develop an unobtrusive (observation) instrument for assessing disaster nursing competency which refers to the International Council of Nurses (ICN) disaster nursing competency framework, especially earthquake and volcano disasters. The starting date for the design of the disaster nursing competency assessment instrument was 2023. Then, the implementation of the research to test the instrument, which had been validated by experts using disaster nursing practice simulations, was conducted for a month from February to March 2023. The research design uses design-based, the sample criteria were active student status, emergency nursing, and disaster management courses. The total number of respondents was 80 students, and in the initial stage of testing the instrument during disaster simulation observations, a limited sample of 20 respondents was taken at random and assessed by five lecturers as raters. The instrument development stage started with the specification of the ICN disaster nursing competency assessment instrument. The Aiken index for the unobtrusive observation technique instrument with competency assessment rubric is high, valid, and met reliability requirements. Multifaceted analysis compared students, items, and lecturers from small and large samples. The analysis reveals that students' difficulty levels vary according to the assessing lecturer, with some mastering all items and others only mastering specific ones.

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1. INTRODUCTION

Indonesia frequently experiences earthquakes on both small and large scales, causing many losses of life and property. The Indonesian region has very complex geological conditions owing to the presence of tectonic plates. This makes Indonesia's territory rich in natural resources, but the logical consequence of this complexity makes many areas prone to earthquakes, tsunamis, and volcanic eruptions along the ring of fire from Sumatra, Java, Bali, Nusa Tenggara, Banda and Maluku [1]. Not only Indonesia, but other countries are also faced with a lack of roles for nurses in responding to disaster management. Therefore, comprehensive competency is needed for nurses to balance the potential and complexity of disasters and their impacts, which may be greater in the future [2]–[5].

Disaster nursing competencies for nurses in general will help clarify their role in disaster management and assist in the development of education and training. Global disasters allow nurses to be

prepared with similar competencies so that they can work together to meet the health needs of residents affected by disasters. The competency in question covers four areas: prevention/mitigation competency (mitigation/prevention competencies), preparedness competencies, handling competencies (response competencies), and rehabilitation/recovery competencies (recovery/rehabilitation competencies). All nurses were expected to demonstrate this competency [6].

It should be noted that written national competency tests, for example, are not the only way to assess student learning outcomes; other techniques that can be used to complete them are testing techniques unobtrusive [7]. Through this technique, assessment of learning outcomes is carried out not in writing but by systematic observation (observation) without disturbing the student, giving assignments, conducting interviews, distributing questionnaires, and examining or analyzing documents (documentary analysis). Considering that vocational nursing education has greater practical learning outcomes (60%) than theory (40%), tests also play an important role, especially in assessing student learning processes and outcomes. For example, the domains of professional attitudes or ethics and skills as nurses' procedural actions can be assessed by direct practical observation during disaster response simulations. Disaster nursing competency was assessed using instruments unobtrusive, which were developed in a standardized manner by referring to the American Psychological Association, American Educational Research Association, and National Council on Measurment in Education.

The development of this competency assessment instrument is based on research methods "design-based research" and can be implemented in an authentic context with assessment by raters during observations of simulations of earthquake and volcano disaster response practices carried out by students. Design-based research is a research method that focuses its research on developing learning, both theories, tools, and models that can be utilized [8], [9]. This approach allows for the continuous improvement of the assessment instrument through iterative cycles of design, implementation, and evaluation. By incorporating feedback from raters and observing students in real-world scenarios, the instrument can accurately measure competency in disaster response practices.

Research aimed to develop instruments for the unobtrusive assessment of disaster nursing competency, which refers to the disaster nursing competency framework according to the International Council of Nurses (ICN), especially during earthquake and volcano disasters. Proving the validity and reliability of disaster nursing competency assessment instruments from mitigation, preparedness, handling, and recovery competencies. Information on the results of the statistical analysis of interactions between instrument items, raters, and students in the implementation of earthquake and volcano disaster simulations. The complexity of natural disaster problems in Indonesia, which has implications for disaster management before, during, and after a disaster, demands a large and important role for nurses. Meanwhile, based on a study of several articles from research results in many countries, including Indonesia, it has been shown that most nurses are slow to respond to natural disasters. Due to the lack of knowledge, skills, and experience in disaster management, it is recommended that disaster education be a priority in the nursing curriculum by referring to ICN disaster nursing competency achievements.

2. METHOD

2.1. Time and setting

The starting date for the design of the disaster nursing competency assessment instrument was 2023. Then, the implementation of the research to test the instrument, which had been validated by experts using disaster nursing practice simulations, was conducted for a month from February to March 2023. This time was adjusted to follow the 2022/2023 academic year of student lectures. Diploma III Nursing fifth and sixth semesters. Place of research implementation in the Nursing Department, Health Polytechnic Campus, Ministry of Health, Ternate. This location was chosen with the consideration that Ternate City has the characteristics of an area prone to earthquakes and Gamalama volcanic eruptions.

2.2. Research design

The research design uses design-based research by referring to the model of Anderson and Shattuck, where research through design or design-based research was an unobtrusive instrument with observation techniques whose assessment was developed in a disaster simulation game for volcanic eruptions and earthquakes. The Drum-Buffer-Rope (DBR) method was chosen because its research focus was on learning development, both in theory and practice. In this case, the implementation of educational research into learning, especially the assessment of better disaster nursing practices. Researchers designed audio-visual case scenarios in authentic contexts such as real earthquakes occurring and simulated by students in disaster nursing practice interventions. The assessment of disaster nursing competency used an instrument developed by researchers, which was assessed by the lecturer, in this case, five raters. The aim of this development was to produce output in the form of a student competency assessment instrument to achieve their competencies

(four competency areas) using observation techniques to develop an assessment rubric. Observation techniques using holistic and analytical rubrics are also often used in health research [10]. The development of this instrument refers to the ICN framework which formulates nurse competencies in disaster management. As for the standardized assessment of disaster nursing competency using unobtrusive instruments developed by the American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurment in Education (NCME) [11].

2.3. Research sample

In this study, the population comprised D3 Nursing Level III students in the Nursing Department. The sampling was performed using the total sampling technique. The sample criteria were active student status, emergency nursing, and disaster management courses. The total number of respondents was 80 students, and in the initial stage of testing the instrument during disaster simulation observations, a limited sample of 20 respondents was taken at random and assessed by five lecturers as raters. Each rater assessed four competency areas in the rubric instrument for each respondent at the same time as the time allocation for each respondent ranging from 60-90 to minutes. Then, it was implemented on a large sample, namely 60 student respondents with the same five raters, and the time range for each respondent was also adjusted to the rater's agreement. We used multirater analysis to anticipate a small sample size. multi-rater statistical analysis can provide information on the results of interactions between instrument items, raters, and students in the implementation of earthquake and volcano disaster simulations, with small samples (20 students) and large samples (60 students).

2.4. Instrument grille

The preparation of the instrument grid was based on references from the ICN framework for disaster nursing competencies, which includes four competency areas: i) mitigation, ii) preparedness, iii) handling, and iv) recovery. Among these four competency areas, there are 10 aspects: i) risk reduction, disease prevention, and health promotion; ii) planning and policy development; iii) ethical practices, legal practices, and accountability; iv) communication and dissemination of information; v) education and preparedness; vi) community care; vii) individual and family care; viii) psychological care; ix) care for vulnerable groups; and x) the long-term recovery of individuals, families, and communities. The number of aspects does not indicate a priority scale.

2.5. Data analysis technique

The instrument development stage started with the specification of the ICN disaster nursing competency assessment instrument. This theory and several relevant theories underlie researchers to construct instruments and what aspects and indicators are used in compiling instrument items for competency achievements that are developed in an assessment rubric with a three-rank scale and scoring. For instrument validation, this research process was performed by submitting blueprints, rubric items, and assessment sheets to experts for qualitative and quantitative review. Five experts were asked for expert judgment, namely, one in the field of educational evaluation, three experts in the field of nursing, and one health practitioner in the field of disaster management. The experts were tasked with looking at the suitability of the indicators with the aim of developing the instrument, the suitability of the indicators with the material coverage or the suitability of the theory, reviewing the suitability of the instrument with the item indicators, looking at the correctness of the item concept, and looking at the correctness of the content, language, and culture, as well as qualitative input covering substantive and cultural aspects, especially the characteristics of local areas that are prone to earthquakes and volcanoes. The researchers then used input from experts to revise the rubric instrument. Researchers also asked linguists for input on language elements, especially those that are communicative or do not use the local language, and readability for instrument users, namely the lecturer level. Proving the validity of the instrument was a quantitative analysis with expert agreement using the Aiken agreement index [12], [13].

In relation to the number of items in the measuring instrument, if proven to be invalid, there are no standard rules regarding how many items are involved in the scale. However, there are several things that can be used as considerations, namely: i) The purpose of the measurement and the type of decision to be made, for example the instrument used for selection has more items than for a survey; ii) The breadth of the measurement domain and measurement dimensionality, where a broad domain and measurements with multiple dimensions require a greater number of items than those with a narrow domain with a single dimension; iii) Respondent characteristics, such as respondent fatigue and willingness to cooperate, also need to be considered. To anticipate the dropped items, the number of items tested must be greater. Four to six items are sufficient to measure one measurement domain.

Next was instrument testing by observing disaster simulations by raters on respondents (ratees) in two stages, namely on a limited sample and a large sample. Researchers obtain information about instrument reliability by using the same instrument for measurements based on different sample sizes and times. Then, with the many-facet Rasch model (MFRM), a more comprehensive analysis was carried out because it analyzes the interactions between instrument items, raters, and ratees or respondents who are observed during the disaster simulation. For this purpose, the Facets software full version 3.71/3.83 was used.

2.6. Ethical clearance

This study was approved by the research ethics committee, Poltekkes Kemenkes Ternate No.UM.02.03/6/359/2023. The participants were informed about the purpose of the study, their rights, and the procedures involved. They were also assured that their participation was voluntary and they could withdraw at any time without consequences. The participants provided written consent before participating in the study. Confidentiality of their personal information was strictly maintained throughout the research process.

3. RESULTS AND DISCUSSION

In order to produce nurses who are competent in disaster response, it is deemed necessary to support quality and standardized instruments in assessing graduate competency. The importance of nursing competency assessment instruments also developed because previously there were no standardized and standard instruments with specificities yet earthquake and volcanic disasters to assess the supporting competencies of graduates, especially at the Ministry of Health Polytechnic with superior disaster programs. Instrument unobtrusive (observation) is the choice of researchers to develop as a complement or support for national competency tests in the form of written tests, considering that nursing vocational education in practical learning outcomes is greater than theory, technical unobtrusive; this also plays an important role, especially in the context of assessing student learning processes and outcomes, such as professional attitudes or ethics in nursing services and the domain of skills as nurses' procedural actions can be assessed by practical observations during disaster response simulations.

The results presented from the expert assessment yielded 11 items with moderate validity and 17 items with high validity. The criterion used to interpret this is a criterion of less than 0.4. It is said to have low validity, between 0.4-0.8, validity is medium, and if it is more than 0.8, it is said to be high [12], [13]. This V index value ranges between 0-1, so the results show that all items are in the valid or very valid category because the lowest result is 0.75, and the highest is 0.95. For example, on the first item, the scores given by experts were different: one person scored five categories as very relevant, and four people scored four categories as relevant. Thus, by calculating the Aiken index, expert agreement was obtained for this item, with moderate category content validity. The smallest number of rating categories formulated by Aiken was two, and the highest rating was seven [12], [13]. In this instrument development study, five rating categories and five validators were used. Based on the standards proposed by Aiken, Aiken's V standard for this instrument is 0.80 with a probability of 0.04; therefore, the validity of all items is acceptable.

Table 1 shows that for the competency assessment rubric instrument in disaster nursing, an Aiken index of 0.85 was obtained, which means it is in the high category, was obtained. This indicates a high level of agreement among experts regarding the relevance and clarity of the items in the rubric. The high Aiken index suggests that the instrument is valid and reliable for assessing competency in disaster nursing. A high Aiken index also indicates that the instrument has good content validity, as experts agree on the relevance of the items. This strengthens the credibility of the competency assessment rubric in disaster nursing.

Table 1. Results of Aiken coefficient calculations for assessment instruments disaster nursing competencies

Scale	A1	A2	A3	A4	A5	s1	s2	s3	s4	s5	∑s	V
Item 1-28	137	128	112	115	125	109	100	84	87	97	477	0.85

In Table 2, a summary of the measured data shows the data fit to the model or the suitability of the data to the model. This can be seen from the chi-square probability value of 0.000, which means that the entire data fit the model so that the data could be analyzed further with a multi-rater Rasch model. Then, the explained variance value of 20% meets the requirements for the unidimensional assumption so that data can be analyzed from this instrumented test. The results of the multi-rater statistical analysis can provide information on the results of interactions between instrument items, raters, and students in the implementation of earthquake and volcano disaster simulations, with small samples (20 students) and large samples (60 students). The results of the analysis of the sample of 20 students are displayed in Table 2. The interpretations are as:

Table 2. Summary data

Cat	Score	Exp	Resd	StRes	
2.62	2.62	2.62	.00	.00	Mean (Count: 2800)
.55	.55	.24	.49	1.01	S.D. (Population)
.55	.55	.24	.49	1.01	S.D. (Sample)

Data log-likelihood Chi-square = 3,614.0381
Approximate degrees of freedom = 2,748
The Chi-squared significance prob. = .0000
Count Mean S.D. Params
Responses used for estimation = 2,800 2.62 0.55 52
Count of measurable responses = 2,800
Raw-score variance of observations = 0.30 100.00%
Variance explained by Rasch measures = 0.06 20.00%
Variance of residuals = 0.24 80.00%

Table 3 shows the statistical fit results of the assessment lecturers. Where in the "Measure" column which shows the logit scale, you can see that assessor B has a logit value of -1.44, which in his assessment is considered low. The lecturer assessing D has the lowest logit value, namely -3.06, indicating that it is the cheapest or tends to give a large value. Furthermore, for the standard psychometric fit statistical attributes, all values met the requirements. The reliability value obtained was 0.98, indicating that the assessors were reliable with five lecturers. Similarly, the probability was indicated by a Chi-square value of 0.00. For the exact agreement value, 69.6% of the expectation of 56.9% was obtained, where a minimum requirement of 20% and not exceeding 90% was met. This shows that the rater or assessor lecturer in their work performs assessments independently, meaning that one rater lecturer does not cheat on another rater. Detailed information can be seen in Table 3.

Table 3. Appraiser fit analysis results

Total score	Total count	Obsvd average	Fair (M) average	Model Measure	S.E	Infit MnSq	Infit Zstd	Outfit MnSq	Outfit Zstd	Estim correlation Discrim	PtMea	PtExp	Exact agreement Obs %	Exp %	Examiner
1393	560	2.49	2.53	-1.44	08	.98	-.3	1.01	.1	.99	.36	.41	66.1	54.2	2B
1394	560	2.49	2.53	-1.44	08	.98	-1.2	.94	-.9	1.05	.37	.41	63.5	54.2	3C
1461	560	2.61	2.65	-1.88	.08	1.10	1.6	1.03	.4	.96	.42	.38	74.7	57.4	5E
1504	560	2.69	2.73	-2.20	.09	1.00	.0	.87	-1.5	1.07	.44	.35	78.8	58.9	1A
1589	560	2.84	2.87	-2.06	.12	1.01	.0	1.19	1.4	.95	.19	.27	64.7	59.8	4D
1468.2	560.0	2.62	2.66	-2.00	.09	1.00	.0	1.01	-.1		.36				Mean (Count: 5)
73.6	.0	.13	13	.60	.01	.05	.9	.11	1.1		.09				S.D. (Population)
82.3	.0	.15	.14	.67	.02	.06	1.0	.12	1.2		.10				S.D. (Sample)

Model, Populn: RMSE .09 Adj (True) S.D .59 Separation 6.61 Strata 9.14 Reliability (not inter-rater) .98
Model, Fixed (all same) Chi-square: 181.1 d.f.: 4 significances (probability): .00
Inter-Rater agreement opportunities: 5600 Exact agreements: 3896=69.6% Expected: 3185.7=56.9%

The information obtained from the fit analysis of students in Table 4 showed that the abilities of the 20 respondents vary, as shown by the logit scale in the "Measure" column. The high logit value for student 11, namely 1.46, means that his ability is higher and is considered the best by the assessing lecturer. Meanwhile, the lowest logit of -1.36 was found for student number 17, indicating that this student's ability was low or considered less capable. This can be trusted if the statistical requirements are met, namely, the separation value is 4.04, reliability is 0.94, and chi-square is 0.00. Detailed information can be seen in Table 4.

In Figure 1, the results of the Wright map or item person map analysis are displayed, where the position of each facet element is sequentially, namely, students, instrument items, and lecturer raters. On the logit measure scale, the highest was 2 and the lowest was -4. In the "Student" column whose position is on a scale of 1 logit and above there are six respondents (51, 43, 49, 44, 58, and 60), this shows they are students with high abilities according to the rater. Positions on the negative scale included three students (15, 21, and 56) whose abilities were low. Meanwhile, the remaining 51 students out of 60 respondents were on a logit scale between -1 and 1, meaning that they had average abilities. In the "Item" column, there are no positions above the logit scale 1, meaning there are no items that are the most difficult for students according to the rater lecturer. All instrument items are between logit -1 and 1, which shows that the items have varying degrees of difficulty, from four items (I-16, I-17, I-18, and I-19) that are difficult to I-6. The easiest to do or the lowest level of difficulty of the 28 assessment items. If connected by a straight line between students and items, there are six students whose positions are at the top of all the items, meaning that they are able to master all the items on the assessment rubric, while the rest are only on certain items. For example, eight students (1, 20, 24, 29, 40, 46, 52, and 59) with all the items positioned below the straight line, meaning that

with moderate ability, the students had not mastered the competency achievements in all the assessment rubric items. Next, in the "Assessor" or rater lecturer column, the position at the top is lecturer E who tends to give small marks, followed by lecturers assessing B, C, and A. At the bottom of the rater position is Lecturer D, who tends to give high or low marks. If we compare the assessing lecturers and students or look at the straight line from the logit scale, it shows that only assessing lecturer D passed all the students. The three students whose position was on the negative logit scale were not passed by the lecturer assessing E if a straight line was drawn; their position was below lecturer E, while the lecturers assessing B and C did not pass student numbers 21 and 56, and the lecturer assessing A only did not pass student number 56. More detail can be seen in Figure 1.

Wright Maps are one of the most useful aspects of Rasch measurements because they allow researchers to easily explain research results to readers. Rasch modeling changes raw ordinal data by looking at the odds-probabilities to use a logarithm function, thus producing measurement data that are equal intervals called logit (log odds unit) [14], [15]. Logit is interval data with better quality resulting from the probabilistic transformation of Rasch modeling. The wright map (student-item-assessor map) of the results of the MFRM analysis is shown in Table 4. The first column presents the logit scale. The second column of students shows their abilities; some are capable, and some are less or less. The third column of the instrument items shows the level of difficulty in terms of logit and standard deviation. Items with an average logit difficulty level of 0, logit (+) difficulty are high, logit (-) are too easy, and logit items with one range of difficulty are good. The fourth column shows the assessment of the lecturer raters, where there are those who are stingy on their grades and those who are cheap on their grades.

Table 4. Fit analysis results for student respondents

Total	Total	Obsvd	Fair (M)	Model		Infit		Outfit		Estim correlation				
Score	Count	Average	Average	Measure	S.E	MnSq	Zstd	MnSq	Zstd	Discrim	PtMea	PtExp	NU	Students
405	140	2.89	2.90	1.46	.27	.96	-.1	1.16	.6	1.00	.16	.18	11	11
403	140	2.86	2.88	1.31	.26	.9.900	-.4	.75	-.8	1.07	.30	.19	13	13
398	140	2.84	2.87	1.13	.24	.91	-.4	.76	-.9	1.07	.31	.21	10	10
396	140	2.83	2.85	1.02	.23	.94	-.4	.99	.0	1.03	25	.22	8	8
380	140	2.71	2.74	.91	.22	1.21	-.2	.92	-.2	1.02	.23	.23	18	18
374	140	2.71	2.74	.27	.18	1.18	1.5	1.30	1.7	.82	.17	.28	7	7
373	140	2.67	2.70	.27	.18	1.04	1.3	1.48	2.6	.79	.14	.30	9	9
365	140	2.61	2.70	0.4	.17	.82	.3	1.02	.6	1.00	.16	.18	2	2
365	140	2.61	2.90	1.46	.27	.96	-.1	1.16	-.8	1.07	.30	.19	5	5
358	140	2.56	2.88	1.31	.26	.9.900	-.4	.75	-.9	1.07	.31	.21	3	3
355	140	2.54	2.87	1.13	.24	.91	-.4	.76	.0	1.03	25	.22	14	14
353	140	2.52	2.85	1.02	.23	.94	-.4	.99	-.2	1.02	.23	.23	19	19
349	140	2.49	2.74	.91	.22	1.21	-.2	.92	1.7	.82	.17	.28	4	4
348	140	2.49	2.74	.27	.18	1.18	1.5	1.30	2.6	.79	.14	.30	16	16
344	140	2.46	2.70	.27	.18	1.04	1.3	1.48	.6	1.00	.16	.18	20	20
344	140	2.46	2.48	-.70	.15	1.08	.7	1.02	-.2	.94	.41	.36	15	15
338	140	2.41	2.44	-.84	.15	.93	-.6	.90	-.9	1.13	.44	.36	12	12
313	140	2.25	2.25	-1.36	.14	.99	.0	.97	.2	1.03	41	.39	17	17
367.1	140	2.62	2.65	.00	.18	.99	.0	1.01	.1		.30			Mean (Count: 20)
24.5	.0	.17	.17	.78	.04	.13	1.1	.19	1.2		.09			S.D. (Population)
25.1	.0	.18	.18	.80	.04	.13	1.1	.20	1.2		.09			S.D. (Sample)

Model, Populn: RMSE .19 Adj (True) S.D. .75 Separation 4.04 Strata 5.72 Reliability .94
Model, Fixed (all same) Chi-square: 298.1 d.f.: 19 significance (probability): .00

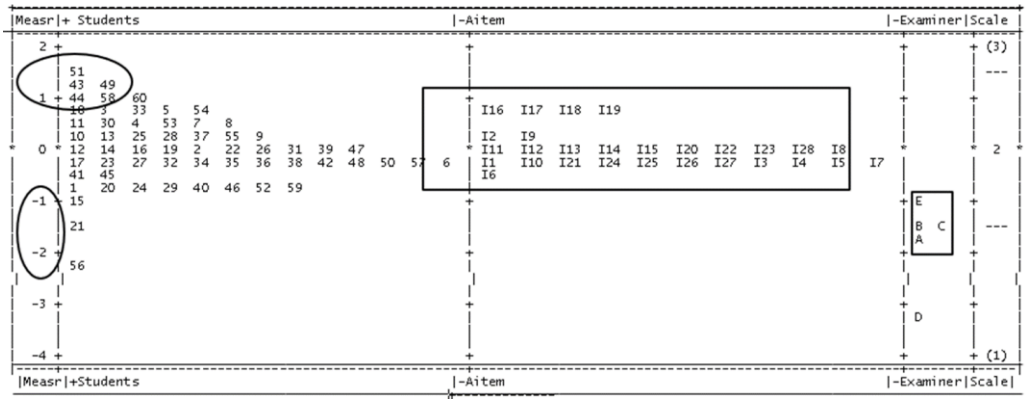

Figure 1. Results of wright map analysis

Researchers in developing unobtrusive observation technique instruments to assess these competencies refer to ICN disaster nursing, which consists of mitigation, preparedness, handling, and recovery competencies. In these four competency areas, 10 aspects were then developed with a total of 26 indicators and 28 achievement items in accordance with the abilities of Diploma III students at the KKNI level. This instrument has its own characteristics in achieving competency, especially in natural disasters, earthquakes, and volcanic eruptions. In the pre-disaster stage, management begins long before the disaster and the situation have the potential to become a disaster. Disaster management is prioritized in the pre-disaster phase to reduce disaster risk. This results in almost all activities being prioritized within the pre-disaster scope. Disaster response alone is not enough, as it produces only temporary results at very high costs. Since then, disaster risk reduction has become the mainstay of international disaster-related development [16].

Reducing risk, preventing disease, and promoting health are among the indicators needed by nurses at the diploma level, where it is hoped that student competency can be achieved in conditions of earthquakes and volcanic eruptions. Health workers who participate in disaster management, including nurses, can be present in many places, such as evacuation centers, hospitals, health centers, and mobile clinics [17], [18]. Nurses can act as managers, leaders, and caregivers if their place is in a hospital. His role is as an evacuation coordinator and executor in the evacuation center. The competency achievements and roles of nurses are clearly described at the nursing diploma level in teaching materials for emergency nursing and disaster management issued by the Indonesian Health PPSDM Agency in 2016.

The ability of nurses to work together with other professional health workers, government, community leaders, and community organizations in developing stages of disease prevention and risk reduction during earthquakes and volcanic eruptions. Likewise, carrying out educational activities in the community related to preparedness. A series of activities can be conducted to eliminate or reduce disaster risks, either by reducing the threat of disasters or by parties who are vulnerable to being threatened by disasters. Early warnings are given as soon as possible to the public regarding the possibility of a disaster. Infectious disease outbreaks may occur when a catastrophic earthquake results in substantial population movement to unplanned and overcrowded shelters with limited access to food and clean water. Disease outbreaks can also occur because of damage to water or sanitation systems and deterioration of sanitary conditions directly caused by earthquakes. Tsunamis are generally associated with earthquakes but can also be caused by powerful volcanic eruptions or underwater landslides [19].

Furthermore, regarding the health promotion indicator, it is hoped that competent nurses will carry out educational activities for the community related to disaster preparedness. Nurses are actively involved with the National Red Cross, various government agencies, community institutions, and environmental organizations in simulating preparations for facing the threat of natural disasters and in providing education to communities in earthquake-prone or volcano-prone areas. This includes preparing village volunteers as alert youths to support the disaster-resilient village program. This is in line with a study conducted by Japanese researchers to review eight major natural disasters in Indonesia that were followed by infectious disease outbreaks [20], the result is that to obtain a resilient society, community-based disaster risk reduction planning with integrated health education in schools, including the dissemination of information, is very important. Infectious diseases transmitted through water and air were the most common illnesses after eight major natural disasters, as a result of their aftereffects. Facing this challenge, schools and community organizations can become agents for disseminating health promotion information, so that people are aware of health risks and practice good practices related to prevention, response, and recovery. Health education and its promotion can be integrated into curriculum-based programs or short courses, modules from training, print, and visual media [21].

Nurses are also involved in health promotion programs to prepare communities to face disasters, which include the following; providing information about the use of personal protective equipment such as glasses, masks, or clothing that covers the arms and legs; self-help efforts in the community; first aid training for families, such as helping other family members; how to store and carry food supplies and safe water use; nurses can also provide several emergency telephone numbers and addresses such as ambulances, fire departments, and hospitals; providing information about equipment that can be brought such as radios, necessary clothing, flashlights, and their batteries; and providing information on evacuation routes, gathering points, shelter options, and disaster posts [18].

Furthermore, for preparedness competency, there are several important indicators for nursing students regarding their achievement targets, including ethical practices, legal practices, accountability, communication networks during disasters and health information management processes, participation in training the community, and carrying out preparedness activities. In this case, nurses make decisions according to priorities by following a code of ethics without discriminating between races, in line with the cultural, social, and spiritual beliefs of society and individuals. Several reviews of research results have emphasized the importance of ethics in disaster management [22]–[24]. It discusses the authority of nurses in

making ethical decisions, the principles and values that guide ethical decision-making in disasters, as well as legal practices and accountability; it is possible for a nurse to be said to have malpractice and then compensate for all losses resulting from services provided below standard, even in emergency conditions. Therefore, nurses providing services must be based on standard operating procedures that have been regulated. This has also been formulated by researchers in the assessment rubric that students must achieve in terms of preparedness.

Preparedness steps to anticipate the possibility of a disaster were implemented to avoid property loss, loss of life, and changes in the order of community life. Health crises resulting from earthquakes and volcanic eruptions can occur, including refugee problems, mass casualties, environmental sanitation problems, food and nutrition problems, problems with clean water availability, the spread of infectious diseases, and the spread of disease vectors. Diseases, including respiratory tract infections, skin diseases such as itching, and diarrhea, can occur after a disaster. Reporting on new cases of disease that occur within 24 hours or diseases that appear more than 24 hours, almost all countries require it [25], [26]. Preparedness efforts are carried out when a disaster begins to be recognized so that nurses can activate disaster alert posts with all supporting elements, technical training or standby training, simulations, and rehearsals for each disaster management sector, readiness for support and mobilization of available logistics or resources, readiness for integrated rapid communication and information systems to support work in disaster situations, readiness and installation of tools in the early warning system (early warning), and contingency planning (contingency plan). The preparedness stage ends or continues until the next stage if a disaster occurs [27].

Furthermore, disaster management during the disaster phase is the emergency response phase. Indicators of disaster management competency achievement in this observation instrument were developed from aspects of community, individual, and family nursing care, psychological care, and care for vulnerable groups or those with special needs [2], [28]. The emergency response phase is the stage of taking action or deploying aid to help people affected by a disaster avoid increasing the number of fatalities. Disaster management during emergency response includes the assessment of airway, breathing, circulation, and disability (ABCD) in a systematic, fast, and precise manner; assessment of available resources, location, loss, and damage; determining the emergency status of a disaster; rescuing and evacuating affected communities; fulfilling victims' basic needs; protecting risk groups; and immediate restoration of critical infrastructure and facilities.

In the action phase, a real emergency action is taken to protect oneself or property. Concrete activities carried out include orders to evacuate, search for and rescue victims, ensure security at the disaster site, assess losses incurred, distribute equipment in emergency situations, send or hand over material goods, and provide evacuation places. Based on the background of minimal involvement in disaster response or management, regular disaster drills will provide nurses with knowledge of what to expect, realistic expectations, and the feeling that they are prepared to handle similar situations in the future [29].

Based on medical services, disasters are divided into acute and sub-acute phases. In this acute phase, the first 48 h after the disaster occurs is called the rescue and emergency medical services phase. Nurses must think critically and prioritize what must be done first. In this phase, emergency medical assistance is provided to injured victims and for rescue. Approximately one week after a disaster occurs, it is called the sub-acute phase. In this phase, apart from the above actions, nurses also provide care to victims who were injured during evacuation, as well as taking action to anticipate the possibility of health problems arising during evacuation. The nurse then implemented community nursing care adapted to the culture of the local community [30].

If an earthquake or volcanic eruption occurs, at-risk groups such as children, pregnant women, infants, the elderly, and people with disabilities are at greater risk of experiencing the negative impacts of the disaster than others. It is important for nurses to help overcome the problems faced by this at-risk group in disaster management. Vulnerable community groups must receive priority [31], [32]. It was further explained that the most common impact of this disaster was fetal miscarriage and premature birth caused by mothers easily experiencing stress, either due to environmental pressure around them or hormonal changes, because stress is one of the factors that cause abortion. In addition, impact trauma can also occur when a disaster strikes and injuries result in bleeding or premature separation of the placenta and tearing of the uterus. This situation can threaten the mother and the fruit of her pregnancy, resulting in fetal distress. For this reason, mothers who are pregnant and after giving birth receive priority during natural disasters on the grounds that there are two lives. For this reason, it is considered a competency achievement in the assessment rubric developed by the researchers.

Providing nursing care to pregnant women when a disaster occurs includes assessing the pregnant woman and the fetus of her pregnancy, as well as dealing with the health problems she faces. Nurses carry out assessments on pregnant women, including whether their weight is increasing or not, whether there is swelling in the legs, whether blood pressure is increasing or not, whether they have anemia or decreased hemoglobin, fetal movement, and whether the fetal heart rate is beating. Meanwhile, what must be assessed

regarding the condition of a newborn baby is whether the baby's body temperature is hypothermic, body fluids, and breast milk intake. What is no less important for nurses to pay attention to when dealing with this disaster for pregnant women and after giving birth is reducing the risk of lowering blood pressure, increasing oxygen needs, preparing for a safe birth, and caring for newborn babies. There are many factors that must be considered when caring for newborn babies, namely maintaining a stable body temperature, keeping clothes dry, and maximizing the intake of breast milk, food, or formula milk as a substitute for breast milk. Furthermore, nursing care for pregnant women and newborn babies after a disaster is directed at helping mothers carry out their duties, such as helping pregnant women meet their daily needs until they give birth in a safe condition. Meanwhile, postpartum mothers are assisted in providing exclusive breastfeeding, complementary foods for breast milk, and ready-to-eat food during the first five days after the disaster.

Children are also included in the risk group for natural disasters because they are still in the process of growth and development, and their various physical and mental functions are not yet mature. In the preparedness phase, nurses can involve children in designing plans when a disaster occurs. They must know what equipment they need to survive and why. It is important for children to know emergency telephone numbers and when or how to ask for help. They also need to know how to confirm the safety of their families, where refugees are accommodated, where to evacuate, and how to contact their family members. The child must know all important information about his family such as telephone numbers, names, and addresses, as well as where to meet in an emergency. It is further explained that nursing care for children in the event of an immediate disaster prioritizes the provision of emergency medicines and first aid to save their lives; ensures that as far as possible, they are not separated from their parents; and assesses their basic needs (guaranteed clean water, healthy nutritious food, safe and comfortable housing, basic sanitation facilities such as toilets and rubbish bins) to ensure their survival, growth, and development. The impact of disasters on children includes fear, anxiety, loss of something, pain, and the feeling of facing death [33]. Problem-solving to overcome their stress due to the disaster is to recognize stress reactions in them, support the family or carers, and the adults around them to give them strength, clearly convey the facts of the disaster they experienced, share experiences and feelings to help them express their feelings, support them so they can carry out routine activities as usual, and provide a place to play and do activities.

The vulnerable group that requires nursing intervention is also the elderly. Care for the elderly before a disaster includes preparing for community reconstruction and using refugee shelters. This event in elderly people can have an impact on physical, mental, and social aspects. From a physical perspective, this disaster causes them to experience a decrease in homeostasis, their capacity for readiness and adaptation, and even causes weakness or frequent illness. They also experience decreased functioning of their body organs. Regarding the mental aspect, this disaster makes it increasingly difficult for them to adjust to losing something; increasingly not holding back his emotions, isolating himself, behaving like he was back in his childhood. In the social aspect, this disaster caused them to lose their homes and property, resulting in them losing hope of living again and hope for the future [34]. The priority when a disaster occurs is to move elderly people to a safer location using concrete rescue methods so that they can be evacuated as soon as possible [35]. Elderly people who are rescued need emergency safety services (triage, treatment, and transportation) as soon as possible. Treatment measures after a disaster include helping them adapt to the environment, managing their illness and preventing other secondary illnesses, and preparing for life reconstruction and mental care.

Next, related to Government Regulation Number 21 of 2008 concerning the implementation of disaster management, people with disabilities are one of the at-risk groups. Studies conducted on disabilities and disasters suggest that the participation of vulnerable groups, including people with disabilities, is necessary to build their capacity to face disasters. In pre-disaster conditions, nurses can intervene for people with disabilities, including coordinating breastfeeding and discussing with communities or organizations of people with disabilities about disasters and preparing everything in case a disaster occurs, mapping their needs when a disaster occurs, and teaching them and those closest to them how to minimize risks. During a disaster, the actions taken include moving them away from the disaster area, evacuating disabled people who were left behind by their families when the disaster occurred, accommodating them in refugee camps, and taking the victim to a health service facility if their condition requires a referral. In the post-disaster period, nurses can be involved by playing an active role in disaster service posts and counseling to minimize trauma, as well as providing assistance in nursing care in daily living activities.

The indicators of achievement in recovery competency in the assessment rubric are individual, family, and community recovery from the aspects of long-term care need [36]–[38]. This phase is sometimes difficult to accurately distinguish when and from when. However, in this recovery phase, each person or community will try their best to restore their body's functions to the way they were before the disaster occurred. Most people repair their makeshift or emergency accommodation, move to a temporary home, start their children's school, or work again as an adult while their environment recovers. Next, we rehabilitate

lifelines and activities to reopen the business premises. However, this phase is still only restorative and does not restore normal function before the disaster. Another name for this phase is the transition period from an emergency to a calm situation.

Nurses in this post-disaster phase can provide the information, advocacy, and support needed by individuals, families, and communities, especially vulnerable or at-risk groups. Nurses can also make referrals and collaborate with organizations or social institutions according to the needs of those affected by earthquakes or volcanic eruptions. Disasters will leave a special impression on the psychological, physical, and social conditions of the victims [39]. Existing psychological stress can continue to develop until post-traumatic stress disorder (PTSD) occurs, which is a syndrome with three main categories: first, the symptoms of trauma are confirmed to be recognized; second, the person experiences repeated symptoms of the trauma through flashbacks of dreams or other triggering events when someone may indicate a physical disorder. In addition, people with PTSD can experience reduced concentration, feel guilty, and have impaired memory. Nurses are involved with community groups and related professionals who collaborate with cross-sector elements in handling the health problems faced by residents after a disaster. This is to accelerate the recovery phase to return to a healthy and safely controlled condition.

The validity of the instrument in this study was determined based on the agreement of experts in the field of educational evaluation, nursing, and practitioners in the field of disaster management, as well as by calculating the Aiken index coefficient. Expert agreement according to the field or what is said to be a measurable domain can determine the level of content validity (content-related). This is because measurement tools, such as written tests or unwritten tests with unobtrusive techniques, can be proven valid if the expert is confident that the tool measures abilities that are mastered and defined in the psychological aspect or construct being measured. To determine this expert agreement, we used a validity index, including the index proposed by Aiken. Expert agreement can also be assessed through inter-rater reliability, where multiple experts independently evaluate the tool to ensure consistency in their judgments. This comprehensive approach helps to establish the credibility and accuracy of the measurement tool in assessing disaster management competencies [40].

Looking at the results displayed from the expert assessment, high- and medium-validity items were obtained. Temporary for the observation instrument, the Aiken Index Assessment Rubric is in the high category. Researchers have succeeded in proving the validity of the instrument based on expert agreement using the Aiken V agreement index, or it could be said that the instrumentunobtrusivedeveloped has been proven valid. ParaExperts also provide qualitative advice covering substantive aspects and local cultural customs with the characteristics of areas prone to earthquakes and volcanoes. The researcher has also received advice from a linguist who looks at aspects of language, especially whether it is communicative or does not use the local language and its readability for later users, namely teaching lecturers. The linguist's input ensures that the instrument is not only culturally appropriate but also easily understandable for its intended users. This comprehensive approach strengthens the validity and reliability of the instrument for future research and applications [41].

In accordance with the aim of developing this assessment tool to obtain empirical data in the field that can be analyzed further, a simulation of disaster management practices was carried out by students majoring in nursing. This is also a consideration for researchers in connection with one of the stages in the DBR method of this research, namely implementation in an authentic context; therefore, a practical simulation was designed with earthquake and volcanic eruption scenarios, such as real disaster situations. The disaster practice simulation was assessed by five raters using assessment tools that had been validated by experts. The implementation was carried out twice on a limited sample and a large sample to compare the results of interactions between facets on different samples, but with the same rater and rate with the same characteristics. Based on the results of the multifaceted analysis of the disaster nursing competency assessment instrument by comparing the interaction of facet elements from small and large samples, there were differences in the consistency of the assessments. This is possibly an adaptation process with the existing rubric observation instrument because it is something new for them. Therefore, it requires an adjustment process to minimize errors or assessment bias, or there are other things that have not been detected by researchers. The information obtained is valuable for providing feedback to assess lecturers regarding their reasons for giving scores to students so that subjective elements can be minimized.

In the assessment instrument developed from the results of the Wright Map analysis, it was found that there was no item position above the logit scale of 1, meaning that there were no items that were the most difficult for students according to the assessing lecturer. All instrument items are between logit -1 and 1, which indicates that the items have varying levels of difficulty from difficult to easiest to do, or the lowest level of difficulty of the 28 assessment items. If we connect students and items, there are students who are at the top of all the items, meaning they are able to master all the items on the competency assessment rubric, while the rest are only on certain items. Furthermore, information related to the assessor lecturers in the position above means lecturers who tend to give small grades, followed by other assessor lecturers until the lowest grades were those

who tended to give high or cheap grades. When comparing the assessment lecturers and students, the logit scale showed that there were differences between the implementation groups in the small and large samples, whereas in the small sample (20), all the assessing lecturers passed all the students. However, in the large sample (60), only one lecturer assessor passed all students. Meanwhile, there were several students whose positions on the negative logit scale were not passed by certain assessing lecturers [42].

4. CONCLUSION

Four indicators and four assessment rubric items were developed for mitigation competency. Seven indicators and seven assessment rubric items were developed for preparedness competency. To handle competence, 13 indicators and 15 assessment rubric items were developed. Two indicators and two assessment rubric items were developed for recovery competency. The development of this assessment instrument meets the demands of validity based on expert judgment, which is analyzed using the Aiken V index coefficient. The results of the analysis show that the Aiken index for the unobtrusive observation technique instrument with this competency assessment rubric is categorized as high, and the measuring tool developed is proven to be valid. The results of the multifaceted analysis of the disaster nursing competency assessment instrument by comparing the interaction of facet elements, namely students, items, and assessing lecturers from small and large samples, showed differences, even though they met the reliability requirements. The results of the analysis show that none of the instrument items are the most difficult for students, according to the assessment lecturer, and have varying degrees of difficulty. Some students were able to master all the items on the competency assessment rubric, while the rest only mastered certain items. Differences in lecturer consistency between the assessments were also detected. This instrument has a unique characteristic because the competency achievement items are specifically for earthquake disasters and volcanic eruptions; thus, later after being standardized, it can be used by nursing education institutions at the Diploma III level. Before using this instrument as a guide to assess disaster nursing competency, it is best to disseminate outreach to lecturers who will be appointed as assessors. Nursing universities that have superior disaster response programs in areas prone to earthquakes and volcanoes can use this instrument as a tool for evaluating teaching and learning activities. Simultaneously, you can issue a certificate with these skill specifications as a supporting document by the institution for issuing a certificate accompanying the diploma, apart from the national graduate competency certificate as a condition for issuing a Certificate of Registration as a Nurse. Future research is expected to develop other unobtrusive test instruments for assessing nursing competency in types of natural disasters other than earthquakes and volcanoes, so that they have their own characteristics.

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