Development and Validation of a Checklist for Urban Health Service Centers in Terms of Health, Safety and Environmental Management

Reza Fathi Kaveh [a] iD **| Koorosh Kamali** [b] iD **| Maryam Khazaee- Pool** [c] iD **| Gholamreza Sadeghi** [d *] iD

a. Department of Health Safety and Environmental Management (HSE), School of Public Health, Zanjan University of Medical Sciences, Zanjan, Iran.
b. Department of Public Health, School of Public Health, Zanjan University of Medical Sciences, Zanjan, Iran.
c. Department of Public Health, School of Health, Mazandaran University of Medical Sciences, Sari, Iran.
d. Department of Environmental Health Engineering and Department of Health Safety and Environmental Management (HSE), School of Public Health, Zanjan University of Medical Sciences, Zanjan, Iran.

*Corresponding author: Department of Environmental Health Engineering and Department of Health Safety and Environmental Management (HSE), School of Public Health, Zanjan University of Medical Sciences, Zanjan, Iran. Postal code: 4515713656.
E-mail address: sadeghi.g@gmail.com

A B S T R A C T

Background: Comprehensive urban health service centers have an important role in disease prevention. However, there is no sufficient information about how these centers protect their assets and manage health, safety and environment (HSE) in their workplaces. On the other hand, there is no suitable tool to assess the HSE status in these centers. This study aimed to design and evaluate the face and content validity of the HSE checklist of urban health service centers.

Methods: All available related literature were reviewed to extract the initial items. A panel of experts was used to assess the content and face validity of the checklist through quantitative and qualitative methods.

Results: The final checklist consists of 11 components and 86 items. The CVR and the impact score of the remaining items ranged from 0.8 to 1 and 1.9 to 5, respectively. The CVI of the instrument was 0.86.

Conclusion: The designed checklist in this study is a suitable valid tool (face and content validity) based on the opinions of the expert panel and the target group. Therefore, it can be used to examine the HSE management situations in urban health service centers.

1. Introduction

Historically, urban health service centers (UHSCs) and their subdivisions have been responsible for different variety of urban population health services [1]. These centers are at the forefront of service providers in Iran's healthcare system.

According to the latest statistical yearbook of the National Statistics Center (2017), there were 2863 urban health centers all over the country that provide services to about 50,000,000 urban population. In addition, numerous employees of the country are working in these centers [2].

Healthcare system activities include high levels of safety and health risks [3]. Healthcare staff may face a wide range of risks associated with different types of pollutants

harmful factors including infectious agents, chemical agents, carcinogens, musculoskeletal disorders, accidents, radiation, etc. [4].

Healthcare workers expose to pathogenic and harmful agents more than many other workplaces and therefore they need more attention. It is important to mind that they include some specialists [3] and concerning the sensitivity and importance of services that they provide, their disability lead to poor performance and can burden great costs; consequently, evaluating health factors in their workplace is widely considered to be the most important issue [5].

In the current health system, work conditions of healthcare workers has received a little attention. Moreover, safety and health policies often focus on patients and clients [5].

Therefore, there is a necessity to assess health, safety and environment in these centers by using an appropriate tool to collect the data needed for planning their HSE management system.

Despite comprehensive studies that have been done in the field of public health, few studies have been conducted on HSE management system in health centers and to the best of our knowledge no one has developed a tool in this regard. It highlights a need for a standard tool to identify health, safety, and environmental aspects in these centers.

Therefore, this study aimed to design and validate the face and content validity of a checklist for the assessment of health, safety, and environment in urban health service centers.

2. Materials and Methods

This is a cognitive and validation study that was carried out in two phases (Figure 1). In the first phase, available relevant literature were reviewed and the initial items for the checklist were extracted. In the second phase face validity was evaluated. For this porpoise, qualitative and quantitative content and face validity were assessed with the participation of 10 HSE experienced experts in instrument development, as well as using the opinions of 10 heads of UHSCs and other experts who were working at these centers. The study was conducted in Tehran and Zanjan, 2019. HSE experts from Zanjan University of Medical Sciences and other universities were selected for content validity assessment phase. Moreover, supervisors and experts of UHSCs from Tehran participated in evaluating the face validity of the checklist. Figure1 shows all the study phases in summary.

2.1. Data Collection

In the first phase, two related groups of literature were reviewed; UHSCs and HSE-MS. The aims of assessing UHSCs were to identify and obtain necessary information about health service centers and related issues such as their position in the health system of the country, management

structure, staff and workplace characteristics, work processes, providing services, workplace harmful factors, HSE aspects, stakeholder characteristics, related laws and regulations, instructions and guidelines, directives. In addition the scientific published works were selected for analysis studied reviewed in this regard.

National laws and regulations, guidelines, structures, checklists, and all the available texts related to health, safety, and environment were reviewed in the second literature reviewing section. Relevant standards including ISO 14000, ISO 9000, and ISO 45000 were also considered. Table 1 shows the list of assessed resources for developing initial checklist items.

2.2. Designing Primary Items

Based on the information obtained from the literature review and considering the seven elements of HSE-MS as well as the UHSCs activity and workplace characteristics, the primary components of the checklist were defined. Then, each domain was evaluated and the smallest issues related to HSE in any domain were studied and analyzed to obtain the utmost possible items. Finally, the primary checklist of health, safety and environmental management was developed.

2.3. Evaluating Psychometric Properties of Checklist

2.3.1. Validity

In order to measure the validity of the checklist, both content and face validity were evaluated. Content and face validity are usual criteria to evaluate tool validity [6].

2.3.1.1 Content Validity

Content validity was calculated both qualitatively and quantitatively. The checklist was sent to 10 university staff members that were engaged in the field of HSE and also were experienced at tool designing. The objectives of the study were explained to them, and they were asked to answer the questions about the checklist items in a Likert spectrum. Aspects that they must declare were "necessity", "simplicity and fluency", "relevance and specificity" and "transparency and clarity". Also, they were asked to make comments and suggestions regarding the order of items, grammar, wording, and the overall format of the checklist [7, 8]. Staying in contact with the experts panel, following up and getting their comments were done by email.

2.3.1.1. A- Qualitative Content Validity

To determine the content validity qualitatively, the opinions of experts are the main criterion. Therefore, 10 HSE experts were asked to submit their comments about the content of the items and the overall format of the checklist. Based on their comments, the necessary changes were made [9].
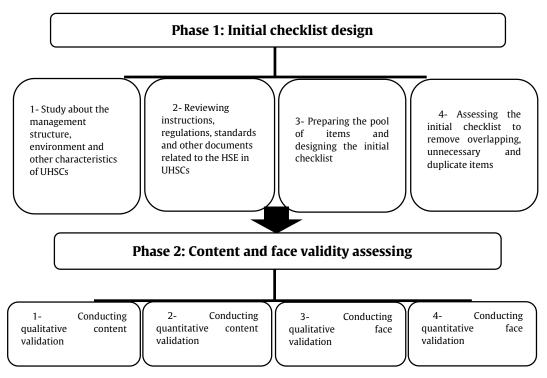
Figure 1: Study steps

2.3.1.1.B- Quantitative Content Validity

To determine this type of validity based on Lawshe's method, Content Validity Ratio (CVR) and Content Validity Index (CVI) were used [7].

2.3.1.1.B-1- Content Validity Ratio

To calculate this index, the opinions of 10 HSE experts were used. The experts selected one option for each item in a designed form: "1- necessary", "2- useful but not necessary", and "3- not necessary".

After collecting and analyzing the opinions of experts, CVR was calculated by Equation 1 [10].

Equation 1: Content Validity Ratio Calculating

$$CVR = \frac{n_E - \frac{N}{2}}{\frac{N}{2}}$$

Where: n_E is the number of experts indicating an item is necessary and N is the total number of experts.

To calculate and rank the CVR, Lawshe theory and CVR decision table were used. Based on this method, according to the number of experts (n=10), the items with CVR $\geq$ 0.62 were considered of necessary to assess the intended concept, and items with CVR < 0.62 were judged unnecessary and were removed [10].

2.3.1.1.B-2- Content Validity Index

In this study, the CVI was calculated in two ways including item CVI (I-CVI) and scale level CVI (S-CVI) [7, 11].

2.3.1.1.B-3- Item Content Validity Index (I-CVI)

To calculate I-CVI, each item was evaluated by 10 experts. A 4-point Likert scale was used for the relevance and specificity of items and the responses include: 1= phrase is perfectly relevant and appropriate, 2= phrase is relevant but needs to be reviewed, 3= phrase needs correction and 4= phrase is irrelevant [7, 12, 13].

Thus, the items that scored 3 or 4 were placed in Equation 2 and the content validity index was calculated for each item [14].

Equation 2: calculating the content validity index of item

$$\text{I-CVI} = \frac{\text{Number of experts who have given a score of 3 or 4}}{\text{Total number of experts}}$$

After extracting the results, items were accepted according to the following criteria:
- CVI score above 0.79 was judged as appropriate.
- CVI score between 0.70 - 0.79 was questionable and the item was revised.
- CVI score less than 0.70 was unacceptable and the item was removed from the checklist [6, 14, 15].

Table 1: List of all regulations, guidelines, checklists, standards, and other documents

No	Applied regulations, instructions, checklists, standards, and documents	Related organization
1	Occupational health management audit checklist for health, safety and environmental management system based on the OGP model	Ministry of Oil
2	HSE-MS Internal Audit Checklist of Health, Safety and Environment Management System	Tehran Municipality
3	Checklist for evaluating the health management system of the schools in Iran	Ministry of Education
4	Occupational health inspection checklist for workshops (single and multi-unit inspecting form)	Ministry of Health and Medical Education
5	Comprehensive environmental health checklist	Ministry of Health and Medical Education
6	Checklist for Health Management System Audit	Iranian National Gas Company
7	Specialized checklist for technical inspections, implementation of buildings safety and fire regulations	Tehran Fire and Safety Services Organization
8	Instructions and checklist of five programs of disaster risk management and passive defense	Ministry of Health and Medical Education
9	Workshops general safety checklist	Ministry of Cooperatives, Labor and Social Welfare
10	ISO 14000 Audit Checklist	International Organization for Standardization
11	ISO 45000 Audit Checklist	International Organization for Standardization
12	ISO 9000 Audit Checklist	International Organization for Standardization
13	Environmental Management System Requirements - ISO 14000	International Organization for Standardization
14	Requirements of occupational health and safety management system - ISO 45000	International Organization for Standardization
15	Quality Management System Requirements - ISO 9000	International Organization for Standardization
16	A collection of laws, regulations, rules and standards for the human environment	Department of Environment
17	A collection of environmental laws and regulations (Volumes I and II)	The law office of the parliament and the environmental department
18	Resolution "Plan to honor the people and satisfy the clients in the administrative system"	Presidential cooperation of Management Development and Human Capital
19	HSE guidelines in chemical laboratories	Iranian National Oil Company
20	Regulations for medical diagnostic laboratories establishment and management	Ministry of Health and Medical Education
21	National Building Regulations (22 Topics)	Ministry of Roads and Urban Development
22	Collection of Occupational Safety and Health Regulations	Ministry of Cooperatives, Labor and Social Welfare
23	Guideline for Health Management System and Performance Indicators Evaluation	Ministry of Oil
24	Guideline for Occupational Health and Safety Management System	International Labor Organization
25	Guideline for Establishing and Developing a Health, Safety and Environmental management System (HSE-MS)	Ministry of Oil
26	Environmental management and HSE management systems recognizing	Department of Environment
27	Guideline for establishing a health, safety and environmental management system	National Company for Refining and Distribution of Petroleum Products
28	A Guideline for Development and Deployment of Health, Safety and Environmental Management Systems	International Association of Oil and Gas Producers

2.3.1.1.B-4-Tool (Scale) Content Validity Index(S-CVI)

The instrument content validity index was calculated by S-CVI/Ave method. In this method, checklist CVI is the average of I-CVRs whose CVR was acceptable (≥ 0.62). According to many tool developers, S-CVI/Ave≥ 0.80 is considered acceptable [12].

Equation 3 was used to calculate S-CVI/Ave [16].

Equation no. 3: Tool (Scale) Content Validity Index Calculating Score:

$$\text{S-CVI/Ave} = \frac{\text{Total CVR of remained items}}{\text{Number of remained items}}$$

2.3.1.2. Face Validity

Face validity was evaluated through qualitative and quantitative methods as well as content validity. First, qualitative face validity was investigated by the research team and then based on the UHSCs (target group) supervisors and experts' opinions, quantitative face validity was conducted by calculating the impact score for each item based on the opinions of this group [7, 9].

To this end, the items were first examined by the research team in terms of the level of difficulty, suitability, and ambiguity. Then the items were entered into a form that was prepared for measuring face validity. After that, the tool was given to 10 people in the target group (supervisors and experts of UHSCs with more than 3 years of experience in the management of these centers). First, the aims of the project

were explained to them, and they were asked to comment on the appearance of the checklist, possible difficulties in phrases and words understanding, items relation and suitability, the possibility of ambiguity, and inaccurate interpretations of phrases.

Then, based on the opinions of this group suggestions, necessary changes were made [17, 18]. In addition, a 5-point Likert scale was used to check the necessity or importance of each item and responses include:1="Item is absolutely important", 2= "Item is important to some extent", 3= "Item is moderately important", 4="Item is slightly important", and 5= "Item is not important at all". Then, based on their answers and using equation no. 4, the impact score of each item was calculated [19, 20].

Equation 4: Item Calculating

Impact Score = Frequency (%) × Importance

In this equation, frequency refers to the percentage of respondents who have chosen one of these two options; "Item is absolutely important" and "Item is important to some extent ". Importance in this equation is the average of importance scores based on the Likert scale for each item. On this scale, options were assigned a score of 5 to 1. In this study, the criterion for each of item suitability was impact score of ≥ 1.5 [19, 20].

3. Results and Discussion

Based on the data obtained from the UHSCs and HSE-MS review and with regard to the study domain, 292 items were prepared based on the HSE- MS model elements and components that should be considered in the intended concept. The items were divided into 8 components and the initial structures of the checklist were developed. In the next assessment by the research team, in order to full coverage of the under-study concept and better classification of items, the number of components were divided into 16. The checklist was revised in terms of spelling errors, repetitive words and phrases, and order of items. The outcome was a checklist with 16 components and 139 items.

3.1. Quantitative Content Validity Assessing Results

Based on the obtained data from expert panel, the content validity ratio (CVR) and item content validity index (I-CVI) were calculated. Similarly, instrument validity index(S-CVI) was evaluated using the average method (S-CVI / Ave).

3.1.1. Calculating the Content Validity Ratio

Based on the experts' standpoints and obtained CVRs, 86 items gained acceptable CVR (0.62, based on the number of specialists that were 10) and were considered necessary for further investigation. Moreover, 53 items gained CVR under

the criteria value and were removed from the checklist. The remaining items CVR values ranged from 0.8 to 1.

3.1.2. Calculating Content Validity Index (CVI)

Content validity index was calculated for the remaining items (I-CVI) and for the whole checklist (S-CVI) using Equations 2 and 3, respectively [7, 11].

3.1.3. Item Content Validity Index (I-CVI)

After calculating the results by above mentioned equation, 112 items with I-CVI > 0.79 were considered relevant items. Furthermore, 22 items had I-CVI between 0.70 and 0.79 that needed revision. Five items which obtained I-CVI < 0.70 were removed. These 5 items also were judged to be removed in the CVR section.

3.1.4. Tool (scale) Content Validity Index (S-CVI)

The content validity index of the instrument was calculated by S-CVI/Ave method using equation no 3. In the CVR calculating section, 86 items obtained CVR ≥ 0.62 and their total CVR was 74.2. After placing it in equation no 3, the checklist CVI value was 0.86, which showed that the content validity of the instrument is reasonable [16].

$$\text{S-CVI/Ave} = \frac{\text{Total CVR of the remaining items}}{\text{Number of remaining items}} = \frac{74.2}{86} = 0.862$$

3.2. Qualitative Content Validity Results

Experts' qualitative recommendations include merging some overlapped components and items into one, replace some unsuitable words by relevant ones, and some grammar errors corrections. For example, 4 components consist of "Fire Safety", "HSE in Warehouses", "Lifts and Elevators Safety", and "HSE in Laboratory" were replaced with "Safety and Occupational Health" component.

After evaluating the content validity (quantitative and qualitative), a checklist with 11 components and 86 items was obtained (Table 2).

3.3. Quantitative Face Validity Assessment Results

Item impact score was calculated based on the target group standpoints and using equation no. 4 [19, 20]. The impact score for all items were ≥ 1.5 and the average impact score was 3.68. The impact score value for items ranged from 1.9 to 5. After calculating the items Impact Score based on the respondent's standpoints, it was identified that all items received an impact score above 1.5, therefore all of them were considered suitable by the respondents.

Table 2: Final Checklist's components items

No	Components	Number of items
1	Leadership and commitment, policy and strategic targets	7
2	Organization, resources and documentation	12
3	Risk management	3
4	Health, safety and environmental inspections and controls	4
5	Status of health facilities	14
6	Ergonomics	5
7	Emergency management, disaster risk reduction, passive defense and related activities	8
8	Occupational safety and health	26
9	Environmental management	3
10	Audit	2
11	Review	2

Determining psychometric properties of tools has always been a difficult, time-consuming, and sometimes costly process. Additionally, validity of results and findings of studies strongly depend on the quality of the designed tools and conducted psychometric processes [16, 20]. Although validity is one of the essential features of measurement tools [8], tools that have been used to assess the HSE status of organizations in the country have often passed the psychometric steps incompletely. This gap is probably due to the time-consuming and costly steps of tool designing and validation, as well as the lack of access to specialists who are knowledgeable in tool developing or because of their lack of interest to participate in such studies. This issue leads to develop some tools that hardly can be relied on [21].

So far, several studies have been conducted in the field of health centers in hospitals; however UHSCs and other health units have often been neglected. In a similar study by Arghami *et al.* (2016), a checklist was developed containing4 components and 62 items. The instrument CVI and the items CVR in their study were 0.99 and > 0.7, respectively, which contradicts with the results of the present study [21].

Moreover, Yari *et al.* (2009), provided no information about the psychometric steps of the checklist [22]. In another study by Moslemi Aghili *et al.* (2009), which was designed for schools, they reported no information about the checklist psychometrics [23]. Meshkati *et al.* (2016) used a 25-item checklist to assess the status of occupational health and safety in surgery rooms of 20 hospitals. In this study, no psychometrics of the checklist was reported [24].

The findings of the current study, are consistent with previous study by Zahra Farsi (2012-2015). Items CVR, impact score, and instruments CVI in that study were > 0.62, 1.5, and 0.79, respectively [25].

The purpose of the current study was to design and evaluate the content and face validity of the Health, Safety and Environmental Management System (HSE-MS) Checklist in Urban Health Service Centers. In a systematic review conducted by the research team, no registered similar instrument was found in the country and even in the world by the time.

It is obvious that studies on the evaluation of HSE or one of its three main components, namely health, safety, and environment, have been conducted in some other fields such as hospitals, urban parks, process industries, educational organizations (such as education ministry unites or universities), and other centers which has little in common with the objectives of the present work. Therefore, the present checklist is the first specialized checklist to assess the HSE management status of urban health service centers that can be used to investigate the HSE status of these centers in their operational status. This checklist can be used before and after the establishment of HSE management system in these centers and shows the existing conditions before the establishment as well as the rate of progress after that.

The main model for the development of this checklist was the HSE-MS model and its seven elements were used as a basis for designing the structures. Then, based on the workplace, structural, and occupational characteristics of the UHSCs, initial structures were changed and the primary checklist was formed.

Notably, the research team does not claim that the present checklist is complete and perfect since no study has been conducted in this field. Therefore, HSE activists can use this tool in the real environment and their feedbacks can help to enrich and evolve this checklist as much as possible in the future.

4. Conclusion

Since the domains and items of the current checklist have been well assessed by the research team, and represent all the topics of the under- reviewing domain, it is a suitable tool by HSE activists in the field of UHSCs and health systems. Furthermore, it can be used as a guideline for self-assessment or voluntary HSE-related activities. Moreover, different centers such as health system headquarters, comprehensive rural health service centers, infirmaries, clinics, and other organizations could benefit from applying this instrument.

Therefore, anyone familiar with HSE field can easily use this checklist to assess the UHSCs HSE status. In addition to the subjects that aim to protect the workforce and physical assets, this checklist is also aimed to deal with other related factors in these centers such as client satisfaction, external

stakeholders, and national assets including environmental protection and energy resources conservation.

Authors' Contributions

G.S., and K.K., designed the study. R.F.K., performed the study, G.S., and K.K., supervised the study. M.K.P., K.K., and G.S., performed data analysis. R.F.K., prepared the draft manuscript. G.S., edited the manuscript. All the authors reviewed the results and approved the final version of the manuscript.

Conflicts of Interest

The Authors declare that there is no conflict of interes.

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