Decision Support System using Multi-Factor Evaluation Process Algorithm

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Abstract. A nurse, often shortened to nurse or med, is a person whose function is to visit patients to carry out treatment or medication. Nurses must care for and handle any patients who are undergoing treatment or patients who are sick. There are many nurses in the hospital. Each patient gets a class according to the hospital they are settled. These classes differ in terms of the facilities offered and the services they provide. For the VIP class, both excellent facilities and excellent services are needed. The nurses who care for the patients will be incredibly nervous and stressed out. Nurses working in this setting require acute levels of skill. Part of a decision support system that uses the MFEP method can determine very good or skilled nurses based on their job history. According to their training or skills, the different departments' nurses can be divided into their group.

1. Introduction

The hospital is one of many different treatment centres [1]. Each hospital has an ambulance service that serves them. At the hospital, we have employees who work at the hospital. Nearly all of the employees that work at the hospital are nurses. Like doctors, medical assistants, and assistants in surgery, nurses’ function to provide patients are undergoing treatment, with assistance and care in the
process. Every nurse is assigned on the job to ensure the safe and healthy condition of patients' rooms. Not all nurses are able every performs well.

Hospitals all have different types and classes of beds. The higher the permitted cholesterol in the blood, the more the patient has to pay for the hospital services. In order for the hospital to determine which nurses will be provided, it is necessary to have access to nurse performance [2]. It is a standard where the VIP class must have nurses who have excellent performance, are friendly and have extensive knowledge of health to provide good service to the patients and families.

It is complicated to determine nurse’s performance. Decision support systems can help the hospital determine which nurses are good for specific classes based on data. The Multi-Factor Evaluation Process (MFEP) method[3]–[5] is one method a nurse uses to determine the best nurse to work in the hospital. Some factors used as a reference in conducting an assessment include ethical, moral, emotional, legal, financial, cognitive and technical skills. The decision support system is essential to be developed to have better quality and better services in the hospital. A nurse (or an attendant) serves as one who will look after (or attend) the patient who will psychologically confirm any required changes and ensure that the patient is at ease. It is hoped that with the creation of this research, the hospital can place nurses according to their respective abilities.

2. Theories

2.1 Definition of Nurse

Nursing is one of the essential professions because it helps others to take care of themselves and others. An individual who does this is called a nurse. On the other hand, the understanding of nurses has expanded during development. At this time, the definition of nurse refers to its position as part of a health worker who provides services to the community professionally [6], [7]. A Nurse's definition is stated in Rhode Island Legislation No. 23 of 1992 on Health, National Nurse Association Standards for Registered Nurses. A Nurse's definition is stated in Rhode Island Legislation No.23 of 1992 on Health, National Nurses Association.

According to ICN (International Council of Nursing) in 1965, a nurse has completed nursing education which meets the requirements and is authorized in the country concerned to provide nursing services responsible for improving health, disease prevention, and services for sick people. From the definitions of all the options below, it can be directly concluded that nurses have the ability, responsibility and authority to provide all types of care to patients with health problems.

2.2 Multi-Factor Evaluation Process (MFEP)

As a formal process, the Multi-Factor Evaluation Process (MFEP) is a decision-making process that involves multiple factors (time, cost, others) [8], [9]. An example of a process that uses a collective approach would be two or more people working together. The Multi-Factor Evaluation Process (MFEP) is relatively difficult to use when the problem to be solved a complex problem where many aspects or factors are taken into account. The multi-factor evaluation process is not to look at each criterion separately; instead, all factors are considered. While this is all subjective probabilities, this is often seen as a personal or subjectively based probability where the weight is based on the belief, belief, experience and background of the decision-maker. Thus, for a decision to be based on the correct information, the entered value will be invalid when the decision maker's knowledge is not inapplicable [10]–[12].

The use of the MFEP model can be realized with the following equation:

\[ WE = FW \times \sum WE = \sum (FW \star E) \]
Information:

\[
\begin{align*}
WE & = \text{Weighted Evaluation} \\
FW & = \text{Factor Weight} \\
E & = \text{Evaluation} \\
\Sigma WE & = \text{Total Weighted Evaluation}
\end{align*}
\]

The following are the steps for the calculation process using the MFEP method[11], [13], such as:

1. Since you are asked to determine the factor and factor weight where the total weighting must be equal to 1 (\(\Sigma\) weighting = 1), please give this information. In this study, the [ancestral] factors and their weights are family (0.30), interview (0.25) and practice (0.15) (0.45).

2. Based in the dataset, the application needs to input therefore indicates the need for inputting values for the relevant factors in the decision making, factors that are relevant and that are considered when making the decisions, are the objective factors through which the evaluative information is evaluated.

3. To calculate the weight evaluation with the sum of all factor weight evaluation results, the process is to calculate the weight evaluation between factor weight and factor evaluation and then add all of the weight evaluations to obtain the total weight evaluation total.

3. Methodology

Several steps must be taken in order to achieve the goals that are to be achieved. This research sets out to collect data from the nurses who work at the hospital, namely data on nurses who work at said hospital. The Nursing Faculty Expert System will process the entered data to find the best of nurses (and recommend them as such), and provide these recommendations to the hospital. The recommendation result is given as a comparison among many nurses based on the comparison of their criteria. Research is necessary to determine the best nurse. A primary research module should include one or more of the following stages of research:

1. Read some literature.
   Our literature study will be searching for resources by searching from resources dealing with nurses and the John F. Ehrenreich Method. Research can be accessed using resources such as books, journals, or the internet to find materials related to this method.

2. Applying a mechanism.
   The process of analysis can be used to find out the steps to solve problem formulation. The design is based on clinical studies that are conducted in hospitals. It is support from this study that will allow us to solve any research problems.

3. Data collected.
   A decision was made based on using the medical expert practitioner method by making calculations using the weighted interactive factor approach in considering the best nurse in the hospital. The results mean is determined within the framework of the criteria and preference weights determined in the series of trial testing to see if the results are promising.

4. Testing and then implementing.
   Implementation and testing are the application of the program results and the results of calculating with the statistical analysis decision support system to determine the best nurse in an organization.

3.1 Data Collection Method

A couple of good options for collecting data are given above. In this study, data and variables become the same. Every facet of data collection and evaluation must be done to support the best nurse in the hospital using the MFEP method to have the best nurses. When taking data from work focused work without correctly evaluating the validity of the evidence. It could result in inaccurate data. In this scientific study, the data collection method was done with three methods, namely:
1. A literature Survey
   The author conducted a literature review by collecting information, studying, reading, and searching for various references, making sure to provide adequate information and evidence from many different sources.

2. Conversation.
   To perform the research, the author included a couple of interviews with people who are obliged to hold and process data in public hospitals and interviewed people who understand decision support systems, especially the MFEP method.

3. Observation
   The author also made many observations in regional hospitals about how nurses work, and the nurses' duties to get the right criteria for the hospital. By observing how nurses do their jobs at the regional public hospitals, significant improvements can be made.

3.2 Design of Criteria

The criteria of a good nurse include variables such as skill, experience, and personality. The criteria used for program review will be considered from several factors that consider several changes in the criminal justice system. There are five fundamental criteria used. The criteria are determined based on five categories taken from the ordinal scale model. Please follow these steps to provide the complete criteria and their values you are going to use.

| Table 1. Performance               | Weight |
|-----------------------------------|--------|
| Performance                      |        |
| Bad                              | 1      |
| Enough                           | 2      |
| Moderate                         | 3      |
| Good                             | 4      |
| Very good                        | 5      |

Performance criteria will determine how well a nurse will perform. Appearance is important in serving patients. The nurse performance model is one of the vital things to assess how well a nurse will perform in different scenarios where he/she has to make a decision.

| Table 2. Hospitality              | Weight |
|-----------------------------------|--------|
| Hospitality                      |        |
| Bad                              | 1      |
| Enough                           | 2      |
| Moderate                         | 3      |
| Good                             | 4      |
| Very good                        | 5      |

Hospitality is a necessary requirement for every nurse. When nurses are serving patients in their care; they need to maintain a feeling of happiness and act so that the patients are comfortable and feel at ease.
Table 3. Discipline

| Discipline  | Weight |
|------------|--------|
| Bad        | 1      |
| Enough     | 2      |
| Moderate   | 3      |
| Good       | 4      |
| Very good  | 5      |

The discipline is also called nurse self-control and regular implementation in showing nurses' level of seriousness in a hospital. Nurses who do not comply with the rules will get sanctioned.

Table 4. Knowledge

| Knowledge  | Weight |
|------------|--------|
| Bad        | 1      |
| Enough     | 2      |
| Moderate   | 3      |
| Good       | 4      |
| Very good  | 5      |

Based on the study results, the leading cause of misunderstanding in-hospital data is communication. In other respects, the nurse's insight greatly influences patient safety because a good nurse's insight will be in line with useful application in the hospital.

Table 5. Patient Assessment

| Patient Assessment | Weight |
|--------------------|--------|
| Bad                | 1      |
| Enough             | 2      |
| Moderate           | 3      |
| Good               | 4      |
| Very good          | 5      |

Patient satisfaction is the aim of healthcare services, which we aim to improve upon. The quality of patient care will improve with the enhanced abilities of nurses. Nurses who are proficient in their job will have the opportunity to interact with patients in the long term.

Table 6. Criterion Weights

| Criteria              | Weight | Normalized | Percent |
|-----------------------|--------|------------|---------|
| C1 (Performance)      | 5      | 0.2941     | 29%     |
| C2 (Hospitality)      | 3      | 0.1765     | 18%     |
| C3 (Discipline)       | 3      | 0.1765     | 18%     |
| C4 (Knowledge)        | 4      | 0.2353     | 24%     |
| C5 (Patient Assessment)| 2     | 0.1176     | 12%     |

17 1 100%
Table 6 shows the criterion weights. Priorities are determined using this system, along with the patient's weights for each component. Each criterion has a different complementary weight. A result of the numerical calculation of the product of the circles will be presented to determine the multiplication factor of the alternative value.

4. Result and Discussion

Results and discussion are steps for implementing and testing application programs that are made based on the designs that have been carried out in the previous chapter. This section will explain the complete calculation of the processed nurse data to rank each alternative. This study used ten pieces of nurse data which were sample data. Nurse data can be seen in Table 7.

| Code | Candidate | Performance | Discipline | Hospitality | Knowledge | Assessment |
|------|-----------|-------------|------------|-------------|-----------|------------|
| A1   | Nurse 1   | Good        | Enough     | Enough      | Very Good | Enough     |
| A2   | Nurse 2   | Enough      | Bad        | Enough      | Good      | Bad        |
| A3   | Nurse 3   | Very Good   | Moderate   | Good        | Very Good | Moderate   |
| A4   | Nurse 4   | Enough      | Bad        | Enough      | Very Good | Bad        |
| A5   | Nurse 5   | Good        | Moderate   | Very Good   | Very Good | Moderate   |
| A6   | Nurse 6   | Very Good   | Moderate   | Good        | Very Good | Moderate   |
| A7   | Nurse 7   | Good        | Enough     | Moderate    | Very Good | Enough     |
| A8   | Nurse 8   | Good        | Moderate   | Good        | Enough    |            |
| A9   | Nurse 9   | Good        | Moderate   | Moderate    | Very Good | Moderate   |
| A10  | Nurse 10  | Very Good   | Moderate   | Good        | Very Good | Moderate   |

Table 8. Weighting Process

| Code | Candidate | Performance | Discipline | Hospitality | Knowledge | Assessment |
|------|-----------|-------------|------------|-------------|-----------|------------|
| A1   | Nurse 1   | 4           | 2          | 2           | 5         | 2          |
| A2   | Nurse 2   | 2           | 1          | 2           | 4         | 1          |
| A3   | Nurse 3   | 5           | 3          | 4           | 5         | 3          |
| A4   | Nurse 4   | 2           | 1          | 2           | 5         | 1          |
| A5   | Nurse 5   | 4           | 3          | 5           | 5         | 3          |
| A6   | Nurse 6   | 5           | 3          | 4           | 5         | 3          |
| A7   | Nurse 7   | 4           | 2          | 3           | 5         | 2          |
| A8   | Nurse 8   | 4           | 3          | 3           | 4         | 2          |
| A9   | Nurse 9   | 4           | 3          | 3           | 5         | 3          |
| A10  | Nurse 10  | 5           | 3          | 4           | 5         | 3          |

Table 9. Normalization

| Code | Candidate | Performance | Discipline | Hospitality | Knowledge | Assessment |
|------|-----------|-------------|------------|-------------|-----------|------------|
| A1   | Nurse 1   | 1,1764     | 0,353      | 0,353       | 1,1765    | 0,2352     |
| A2   | Nurse 2   | 0,5882     | 0,1765     | 0,353       | 0,9412    | 0,1176     |
| A3   | Nurse 3   | 1,4705     | 0,5295     | 0,706       | 1,1765    | 0,3528     |
| A4   | Nurse 4   | 0,5882     | 0,1765     | 0,353       | 1,1765    | 0,1176     |
| A5   | Nurse 5   | 1,1764     | 0,5295     | 0,8825      | 1,1765    | 0,3528     |
| A6   | Nurse 6   | 1,4705     | 0,5295     | 0,706       | 1,1765    | 0,3528     |
| A7   | Nurse 7   | 1,1764     | 0,353      | 0,5295      | 1,1765    | 0,2352     |
| A8   | Nurse 8   | 1,1764     | 0,5295     | 0,5295      | 0,9412    | 0,2352     |
| A9   | Nurse 9   | 1,1764     | 0,5295     | 0,5295      | 1,1765    | 0,3528     |
| A10  | Nurse 10  | 1,4705     | 0,5295     | 0,706       | 1,1765    | 0,3528     |
Table 10. Ranking

| Code | Candidate | Rank   |
|------|-----------|--------|
| A1   | Nurse 1   | 3,2941 |
| A2   | Nurse 2   | 2,1765 |
| A3   | Nurse 3   | 4,2353 |
| A4   | Nurse 4   | 2,4118 |
| A5   | Nurse 5   | 4,1177 |
| A6   | Nurse 6   | 4,2353 |
| A7   | Nurse 7   | 3,4706 |
| A8   | Nurse 8   | 3,4118 |
| A9   | Nurse 9   | 3,7647 |
| A10  | Nurse 10  | 4,2353 |

Table 10 describes the ranking results from the calculation of the decision support system using the MFEP method. The results obtained are each criterion to get a weighted value. These results can be sorted so that you get ordered results as in Table 11.

Table 11. Ranking

| Code | Candidate | Rank   |
|------|-----------|--------|
| A3   | Nurse 3   | 4,2353 |
| A6   | Nurse 6   | 4,2353 |
| A10  | Nurse 10  | 4,2353 |
| A5   | Nurse 5   | 4,1177 |
| A9   | Nurse 9   | 3,7647 |
| A7   | Nurse 7   | 3,4706 |
| A8   | Nurse 8   | 3,4118 |
| A1   | Nurse 1   | 3,2941 |
| A4   | Nurse 4   | 2,4118 |
| A2   | Nurse 2   | 2,1765 |

5. Conclusion

As a result of discussing the MFEP Method in determining the best nurse in regional public hospitals, several compelling conclusions can be made based on the results of the study. The MFEP method is an excellent rubber glove method used to separate the best nurses from non-best nurses. Policies that may be more popular may produce different results. The MFEP used to assess nurses’ job performance is an essential tool and has shown good accuracy in assessing nursing skills.

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