(Article)

Enhancing Clinical Governance: A Multi-Criteria Decision Support Approach for Physician Performance Evaluation

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Highlights

Implementing the SAW method provides objective, transparent, and measurable physician performance evaluations based on multi-criteria clinical indicators to enhance primary healthcare governance.

What are the main findings?

- By using SAW, Dr. LL and Dr. PP were found to be at the top of the list with a perfect score of 63.75. Other doctors were clearly ranked at different levels.
- Five major criteria were used by the study: diagnostic accuracy, participation in training, medication use efficiency, clinical skills, and mentoring ability.
- Simple Additive Weighting method effectively transformed qualitative notes into clear and precise data, providing a more proportional and transparent ranking compared to earlier methods.

What are the implications of the main findings?

- Improved Transparency and Fairness: Moving away from a single indicator and towards a multi-criteria system minimizes subjective perceptions of unfairness and increases long-term staff motivation.
- Personalized Staff Development: Knowing exactly what needs to be addressed (e.g., mentoring, medication efficiency) allows for targeted staff development programs.
- Strategic Governance for Primary Care: The study has provided a scalable and replicable DSS model for other primary healthcare facilities to adopt in order to improve their HR governance and reward systems.

Abstract

High-quality healthcare services require an objective and measurable performance evaluation systeam for medical personnel. Clinic and Laboratory X in Regency X, Central Java, has thus far assensed doctors' performance solely based on the number of patients treated, which may lead to subjectivity. This study aims to design and implement a Decision Support System (DSS) using the Simple Additive Weighting (SAW) method to determine the best-performing doctor in a more fair and transparent manner. The research methodology includes data collection through observation, interviews, and questionnaires, followed by the determination of criteria and alternatives, weighting, normalization, and ranking processes. Five evaluation criteria were employed: diagnostic accuracy, participation in training, efficiency in medication usage, clinical skills, and mentoring ability, with eight doctors serving as the alternatives. The calculation results indicate that Dr. LL and Dr. PP achieved the highest score of 63.75, followed by Dr. II, Dr. AA, and Dr. TT with a score of 57.5, while the lowest score of 45 was obtained by Dr. FF and Dr. KK. The implementation of the SAW method has proven effective in generating a more systematic, transparent, and measurable evaluation process, while also assisting management in identifying performance aspects that require improvement.

Keywords: Decision support system (DSS), doctor performance evaluation, healthcare services, multi-criteria, simple additive weighting (SAW).

1. Introduction

Health care services form a strategic sector which has a direct impact on improving the quality of life in the community. With respect to the development of the nation, the health sector has been geared not only towards the treatment of diseases but also to-wards promotive, preventive, curative, and rehabilitative services. Under these circum-stances, it has become imperative for the provision of healthcare services to be based on the principles of professionalism, accountability, effectiveness, and efficiency. Quality of service acts as a criterion for measuring the efficiency of healthcare institutions, which include hospitals, clinics, and primary healthcare facilities. Enhancement in service quality is not entirely dependent on the availability of facilities and infrastructural support; rather, it is also dependent on the quality of the human resource, i.e., medical staff who serve as primary service providers [1].

Physicians, being professional providers of healthcare services, play a significant role in the process of diagnosis, therapeutic decisions, and educating patients. Key competencies, which include clinical competence, communication skills, teamwork, and professional integrity, are significant in determining the quality of healthcare services. Therefore, optimal physician performance can result in increased patient satisfaction, institutional image, and trust. On the other hand, underperformance may result in compromised quality of services, which may have a negative impact on the institution's image. Therefore, physician performance evaluation is a significant part of healthcare quality management systems [2].

There are several national/international policies that emphasize the significance of objective/quantifiable performance evaluation systems in healthcare professionals. The Ministry of Health in the Republic of Indonesia, through its healthcare system transformation policies, has emphasized the significance of performance-based governance. In addition, the World Health Organization has emphasized the importance of implementing objective/transparent performance evaluation systems in healthcare quality improvement initiatives. Objective/transparent performance assessment capabilities not only function as managerial control tools, but they can also be used as motivational tools in developing medical professionalism [3].

In practice, however, many healthcare facilities still apply simplistic and subjective performance evaluation systems. Assessments are often based on a single indicator, such as the number of patients treated or attendance rate. Such an approach fails to comprehensively represent physician performance, as it does not adequately incorporate service quality aspects, diagnostic accuracy, therapeutic efficiency, mentoring ability, and participation in professional development. Unstructured evaluation systems may lead to perceived unfairness, internal conflicts, and decreased long-term work motivation among medical personnel [4].

With the advancement of information technology, the management of medical personnel performance can be supported by computer-based systems capable of processing data systematically and measurably. A Decision Support System (DSS) is one approach that can assist management in selecting the best alternative based on predefined criteria. DSSs are designed to support semi-structured and structured decision-making processes through the utilization of mathematical models and quantitative data. Through the implementation of a DSS, the evaluation process becomes more transparent, objective, and accountable.

In the context of multi-criteria decision-making, one of the most widely used methods is the Simple Additive Weighting (SAW) method. SAW is a weighted summation technique that calculates the preference value of each alternative based on assigned criterion weights. The fundamental principle involves normalizing the decision matrix, multiplying the normalized values by their respective criterion weights, and summing the results to obtain a final score. The option that achieves the highest score is considered the optimal solution. The advantages of the Simple Additive Weighting (SAW) method include its simplicity, ease of implementation, and its ability to produce rational and consistent rankings.

The SAW method is largely used in performance evaluation systems, covering a wide range of industries, education, and services. However, its use is still limited in the performance evaluation of physicians at the primary clinics level. Considering that clinics represent the primary level of healthcare services, offering direct services to communities, the use of multi-criteria decision-making methods in physician performance evaluation is considered relevant and strategic with regard to improving service quality [5].

In modern management contexts, performance evaluation systems are no longer conducted subjectively but are supported by information system-based approaches and multi-criteria decision-making methods. A Decision Support System enables policy-makers to determine the best alternative based on systematically defined and measurable criteria. One of the most commonly applied methods within DSS frameworks is Simple Additive Weighting (SAW), which is recognized for its effectiveness in weighting and ranking alternatives based on benefit and cost criteria.

The method is considered simple, computationally efficient, and capable of delivering rational and transparent evaluation outcomes [6].

Clinic and Laboratory X is a healthcare facility located in Regency X, Central Java. The clinic provides various services, including 2D ultrasound (USG), electrocardiography (EKG), immunization, prenatal examinations, dental care, laboratory services, home wound care, BeautyCare services, health education services, first aid (P3K) services, circumcision, baby spa, ear therapy, physiotherapy, nebulizer treatment, and wound care services. Given the diversity of services offered, the role of physicians is highly strategic in maintaining service quality and patient satisfaction.

As a form of appreciation and motivation, the management of Clinic and Laboratory X provides monthly bonuses to the best-performing doctor. However, the current evaluation system lacks clearly defined and measurable criteria. Performance assessment has primarily been based on the number of patients treated, which may lead to subjectivity and unfairness. Although no direct complaints have been reported, such a system poses risks to work motivation and may create perceptions of non-transparency within the organization. Based on these issues, there is a need for a Decision Support System capable of accommodating multiple physician performance criteria in an objective and structured manner. The implementation of the SAW method within a DSS framework is expected to produce a more transparent, fair, and accurate evaluation process in determining the best-performing doctor. Furthermore, the system serves not only as a basis for awarding bonuses but also as a managerial evaluation tool to identify areas requiring improvement through training or professional development.

The contribution of the current study is that it uses the Simple Additive Weighting (SAW) method within a Decision Support System to assess physician performance in a clinic and laboratory environment that lacked a multi-criteria evaluation process. Furthermore, the study contributes a model that can be replicated in a similar environment, specifically within a primary clinic level.

While several studies have explored the application of Multi-Criteria Decision Making (MCDM) in large-scale hospital management, there remains a significant research gap in its application within primary healthcare facilities and independent laboratories. Most existing research tends to focus on complex clinical settings with automated data systems, often overlooking the unique challenges of smaller clinics where performance evaluation remains largely manual and prone to high subjectivity. This study addresses this gap by implementing a SAW-based Decision Support System specifically tailored for the operational scale of a primary clinic. By transforming qualitative observations into a structured quantitative framework, this research provides a practical and scalable model that bridges the gap between sophisticated MCDM theory and the immediate needs of primary healthcare governance.

Accordingly, this study aims to design and implement a SAW-based Decision Support System to objectively and measurably determine the best-performing doctor at Clinic and Laboratory X. It is expected that this system will enhance physician motivation, support managerial decision-making, and contribute to the continuous improvement of healthcare service quality.

2. Materials and Methods

The research process was divided into several stages: data collection, determination of criteria and alternatives, assignment of criterion weights, construction of the decision matrix, matrix normalization, and ranking.

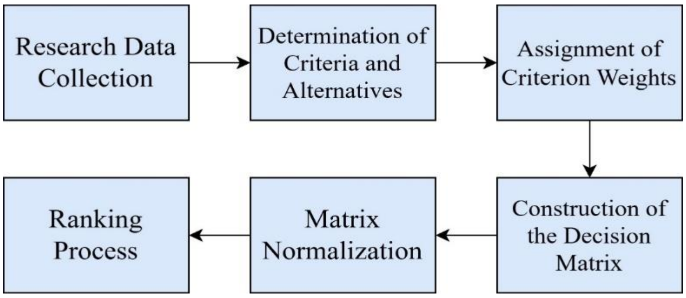

Fig. 1. Research Stages.

2.1. Data Collection

At this stage, data were collected through observations and interviews conducted directly with the head of the clinic and laboratory to document physicians' activities and performance behaviors. In addition, questionnaires were distributed to patients, the clinic owner, nurses, medical record officers, and pharmacists. The collected data were subsequently processed to generate structured and usable research data.

2.2. Determination of Criteria and Alternatives

This stage aimed to define the criteria serving as the basis for decision-making and to determine the list of alternatives (options) to be evaluated. The determination of criteria and alternatives was conducted in coordination with the clinic and laboratory management, as all information related to physician performance assessment was obtained from these parties. In the SAW method, criteria are symbolized as C_j, while alternatives are denoted as A_i.

2.3. Assignment of Criterion Weights

Each criterion was assigned a weight value (W) according to its level of importance. The total weight of all criteria must equal 1 (or 100%) [7]. The weighting process involved consultation with the clinic and laboratory management to ensure alignment between the researcher's framework and institutional priorities.

$$W = [W1\ W2\ W3\ W4] \tag{1}$$

where W represents the vector of criterion weights.

2.4. Construction of the Decision Matrix

At this stage, suitability ratings were assigned to each alternative for every criterion and arranged in matrix form [8]. The decision matrix (X) was constructed from the suitability ratings of each alternative A_i , against each criterion C_j, where i=1, 2, ..., m and j=1, 2, ..., n.

$$X = [r_{11} . r_{ij} \dots r_{i1} . r_{ij}] \tag{2}$$

where r_{ij} represents the matrix element in row i and column j.

2.5. Matrix Normalization

The decision matrix (X) was normalized to a comparable scale using two formulas based on attribute type [9]:

a. Benefit Criterion **(**the highest value is preferred):

$$r_{ij} = \frac{r_{ij}}{\max(x_{ij})} \quad (3)$$

b. Cost Criterion (the lowest value is preferred):

$$r_{ij} = \frac{\min(x_{ij})}{x_{ij}} \quad (4)$$

2.6. Ranking

The final score was obtained by multiplying the normalized matrix (R) by the preference weights (W) and summing the results [10]:

$$V_i = \sum_{j=1}^{n} W_j r_{ij} \quad (5)$$

The alternative with the highest V_i value was selected as the optimal solution.

3. Results

3.1. Data Collection Results

Data were obtained through the distribution of questionnaires specifically designed for each physician performance assessment criterion. Each criterion was evaluated by relevant stakeholders, such as patients for service satisfaction, the clinic owner for diagnostic accuracy and clinical skills, nurses for teamwork contribution, and others accordingly. This approach was intended to enhance objectivity, as each party assessed only the aspects within their direct knowledge and experience.

The questionnaire consisted of 50 items divided into 10 main criteria, each comprising five questions. Each question employed a Likert scale ranging from 1 to 5, which was subsequently converted into a quantitative score range (70–100) and accompanied by assessment guidelines. All questionnaire results were compiled into numerical scores and converted into a final scale ready for further analysis. The research instrument summarized in the questionnaire is presented in Table I.

TABLE I

Questionnaire Assessment Criteria.

Criterion	Description	Score
Diagnostic Accuracy	None	0
	Low	1
	Moderate	2
	Fairly High	3
	High	4
Training Participation	No	0
	Participating	1
Medication Use Efficiency	Not Efficient	0
	Efficient	1

Criterion	Description	Score
Clinical Skills	Low	0
	Moderate	1
	High	2
Mentoring Ability	Low	0
	Moderate	1
	High	2

Table I presents the conversion scheme for converting qualitative data into quantitative data, which is used in the data processing stage of the Simple Additive Weighting (SAW) method.

1. Under the first criterion, diagnostic accuracy, a scale of 0-4 was used. A 0 corresponds to no accuracy, while a 4 corresponds to very high accuracy. This scale of 0-4 was chosen because diagnostic accuracy is considered a primary measure of the quality of medical services.
2. Under the second criterion, training participation, a scale of 0 and 1 was used, where 0 corresponds to non-participation and 1 corresponds to participation in training.
3. Under the third criterion, medication use efficiency, was based on a two-point scale, with 0 indicating not efficient and 1 indicating efficient. This includes treatment rationality, prescription, and cost-effectiveness.
4. Under the fourth criterion, clinical skills, was based on a three-point scale, with 0, 1, and 2 indicating low, medium, and high levels of clinical and technical skills, respectively.
5. Under the fifth criterion, mentoring skills, was based on a three-point scale, with 0, 1, and 2 indicating low, medium, and high levels of mentoring skills, respectively. This is with respect to mentoring other healthcare staff, like nurses or junior medical staff.

Overall, it can be noted that the score value based on the scales, as presented in Table I, was developed based on the characteristics of each performance indicator in a proportional manner. The scales have been adjusted according to the nature of each criterion, i.e., measurement-based, in order to reflect the results in a manner that they accurately represent the real condition.

3.2. Results of Criteria and Alternative Determination

The determination of criteria weights in this study was conducted using the SAW method. SAW is a multi-criteria decision-making method capable of transforming qualitative assessments into quantitative values. As a weighted summation technique, SAW identifies the optimal alternative through matrix normalization and ranking based on predetermined criterion weights.

In this study, SAW was used to determine the evaluation criteria and alternatives for physician performance based on comparisons established directly by the clinic owner.

3.2.1. Criteria Determination

The criteria were established based on interviews and discussions with management to ensure their relevance.

TABLE II

Determination of Criteria.

Code	Criterion
C1	Diagnostic Accuracy
C2	Training Participation

Code	Criterion
C3	Medication Use Efficiency
C4	Clinical Skills
C5	Mentoring Ability

3.2.2. *Alternative Determination*

All physicians were required to participate as alternatives.

TABLE III

Determination of Alternatives.

Code	Alternative
A1	dr. II
A2	dr. LL
A3	dr. YY
A4	dr. AA
A5	dr. PP
A6	dr. FF
A7	dr. KK
A8	dr. TT

3.3. Results of Criterion Weight Determination

Weights were determined based on observations and interviews with clinic management.

TABLE IV

Criterion Weights.

Code	Criterion	Attribute	Weight (%)
C1	Diagnostic Accuracy	Benefit	25
C2	Training Participation	Cost	10
C3	Medication Use Efficiency	Benefit	15
C4	Clinical Skills	Benefit	25
C5	Mentoring Ability	Benefit	25

All criteria were categorized as benefit attributes because they positively contribute to physician and institutional performance. However, training participation (C2) was classified as a cost attribute because it involves time and financial considerations borne by the physician.

3.4. Decision Matrix Results

The decision matrix values were obtained from evaluations conducted by patients, nurses, management, medical record staff, and pharmacists.

TABLE V

Decision Matrix.

Alternative/Criterion	C1	C2	C3	C4	C5
A1	4	1	1	2	1
A2	4	1	1	2	2
A3	3	1	1	2	1
A4	4	1	1	2	1

Alternative/Criterion	C1	C2	C3	C4	C5
A5	4	1	1	2	2
A6	3	1	1	1	1
A7	3	1	1	1	1
A8	4	1	1	2	1

3.5. Matrix Normalization Results

Normalization was performed using benefit and cost formulas based on the weights established in Table VI.

TABLE VI

Normalized Matrix.

Alternative/Criterion	C1	C2	C3	C4	C5
A1	1	1	0.25	0.5	0.25
A2	1	1	0.25	0.5	0.5
A3	0.75	1	0.25	0.5	0.25
A4	1	1	0.25	0.5	0.25
A5	1	1	0.25	0.5	0.5
A6	0.75	1	0.25	0.25	0.25
A7	0.75	1	0.25	0.25	0.25
A8	1	1	0.25	0.5	0.25

For C1, C3, C4, and C5, the benefit formula was applied. For C2, the cost formula was used.

3.6. Ranking Results

The ranking was derived from the normalized matrix.

TABLE VII

Ranking Results.

Alternative	Physician	Score	Rank
A1	dr. II	57.5	2
A2	dr. LL	63.75	**1**
A3	dr. YY	51.25	3
A4	dr. AA	57.5	2
A5	dr. PP	63.75	**1**
A6	dr. FF	45	4
A7	dr. KK	45	4
A8	dr. TT	57.5	2

Table VII presents the final results of the SAW calculation in determining physician performance rankings. The “Score” column represents the preference value (Vi), calculated as the weighted sum of normalized criterion values.

Dr. LL (A2) and Dr. PP (A5) achieved the highest preference score (63.75), ranking first. Dr. II (A1), Dr. AA (A4), and Dr. TT (A8) ranked second (57.5). Dr. YY (A3) ranked third (51.25), while Dr. FF (A6) and Dr. KK (A7) obtained the lowest score (45).

These results demonstrate that the SAW method effectively differentiates physician performance quantitatively and proportionally based on weighted criteria. The developed system provides an objective foundation for managerial decision-making, including incentive allocation, periodic evaluation, and professional development planning. Overall, the multi-criteria SAW approach produces results that are more transparent, measurable, and accountable compared to the previous single-indicator evaluation system.

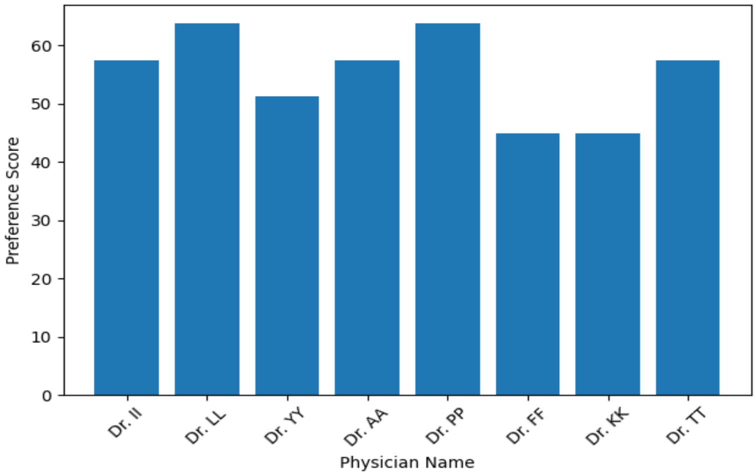

Fig. 2. Ranking Results

Fig. 2. illustrates the physician performance ranking results based on the Simple Additive Weighting (SAW) method. The horizontal axis represents the evaluated physicians, while the vertical axis indicates the final preference scores obtained from the weighted aggregation process.

The results show that Dr. LL and Dr. PP achieved the highest preference scores (63.75), indicating superior overall performance according to the defined criteria. Dr. II, Dr. AA, and Dr. TT obtained moderate scores (57.5), reflecting satisfactory performance levels. Dr. YY achieved a score of 51.25, positioning in the intermediate category. Meanwhile, Dr. FF and Dr. KK recorded the lowest scores (45), suggesting areas that require further improvement and professional development.

The graphical representation clearly demonstrates score differentiation among physicians, confirming that the SAW method effectively provides a structured and objective ranking mechanism. By integrating multiple performance criteria into a single preference value, the system supports transparent and data-driven decision-making in determining physician performance evaluation.

4. Discussion

The findings of this study indicate that the implementation of the Simple Additive Weighting (SAW) method in a decision support system for physician performance evaluation provides a more objective, structured, and measurable assessment process. The SAW method operates by normalizing each evaluation criterion and multiplying the normalized values by predetermined weights, thereby generating a final preference score that serves as the basis for ranking.

Based on system testing results, physicians who achieved the highest preference scores were those who consistently demonstrated strong performance in criteria with the greatest weights.

This finding highlights the significant role of weighting in determining the final ranking outcome. Therefore, the process of assigning criterion weights must be conducted carefully and aligned with hospital or clinic management policies to ensure that the evaluation results accurately reflect institutional priorities.

From an implementation perspective, the SAW-based decision support system developed in this study reduces subjectivity in the evaluation process, which was previously conducted manually. Manual assessments are often influenced by individual perceptions or non-technical factors, whereas a quantitative method-based system ensures transparency in calculations and facilitates auditing processes.

Nevertheless, this study has several limitations. First, the SAW method assumes that each criterion is independent and has a linear relationship with the final outcome. In practice, certain aspects of physician performance may be interrelated, such as attendance rates and patient satisfaction. Second, this study did not compare the SAW method with other Multi-Criteria Decision Making (MCDM) approaches, such as the Weighted Product (WP) or the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Consequently, it cannot be concluded whether SAW represents the most optimal method for this specific case.

Overall, however, the results demonstrate that the SAW method is effective as an approach for a physician performance evaluation decision support system. The resulting system can serve as a foundation for hospital or clinic management in determining policies related to incentives, promotions, awards, and periodic evaluations of medical personnel.

For future research, it is recommended to incorporate a weighting method based on the Analytical Hierarchy Process (AHP) to obtain more objective criterion weights. Additionally, integrating the system with the hospital database in real time could further improve the accuracy and efficiency of the evaluation process.

5. Conclusions

This study successfully designed and implemented a Decision Support System (DSS) based on the Simple Additive Weighting (SAW) method for evaluating physician performance at Clinic and Laboratory X. Based on the final preference value calculations, Dr. LL and Dr. PP achieved the highest ranking with a score of 63.75. The second rank was attained by Dr. II, Dr. AA, and Dr. TT with a score of 57.5, while Dr. YY ranked third with a score of 51.25. The lowest score, 45, was obtained by Dr. FF and Dr. KK, placing them in fourth position.

These results demonstrate that the SAW method is capable of providing an objective and measurable ranking of physician performance based on five primary criteria: diagnostic accuracy, training participation, medication use efficiency, clinical skills, and mentoring ability. The variation in scores reflects the proportional contribution of each criterion according to the assigned weights, thereby ensuring that decision-making processes are transparent and accountable.

Beyond identifying the top-performing physicians, the system also provides strategic information for clinic management regarding performance aspects that require improvement. The analysis indicates that common weaknesses were observed in medication use efficiency, clinical skills, and mentoring ability. This suggests the need for competency development programs, such as advanced clinical training, therapeutic rationality workshops, and enhanced mentoring capacity for other healthcare personnel.

With the implementation of this system, the selection of the best-performing physician is no longer solely based on the number of patients treated but instead considers multiple aspects of service quality comprehensively. The implementation of this SAW-based DSS is expected to enhance physician work motivation, strengthen a performance-based work culture, and support fairer and more objective managerial decision-making.

Overall, this study confirms that the application of the SAW method in physician performance evaluation can serve as an effective solution to improve human resource governance in clinic-level healthcare facilities. In the future, the system may be further developed by incorporating more comprehensive criteria and integrating it with the clinic management information system to support continuous healthcare quality improvement.

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