JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER

p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

Web-Based Expert System for Stroke Diagnosis Using Certainty Factor Method at Pondok Aren Hospital

Ria Ester[1*], Dede Handayani[2], Derysa Maulana Putra Setya[3], Salsa Sayida Bilqis[4]

[1,2,3,4]Fakultas Ilmu Komputer, Department of Informatics Engineering, Pamulang University, Tangerang Selatan, Indonesia
Email: [1*]dosen02665@unpam.ac.id, [2]dosen02411@unpam.ac.id, maulanaderisputra01@gmail.com, salsabilqis19@gmail.com
(*Email Corresponding Author: dosen02665@unpam.ac.id)
Received:25 Agustus 2026 | Revision: 31 Agustus 2026 | Accepted: 5 September 2026

Abstract

Stroke is a central nervous system disorder that ranks among the leading causes of disability and mortality worldwide, including in Indonesia. Early diagnosis plays a critical role in reducing the risk of severe complications. However, in practice, the initial diagnostic process is often hindered by uncertainty in symptom interpretation and the limited ability of medical personnel to provide objective assessments. To address this issue, this study developed a web-based expert system designed to assist in the early detection of stroke using the Certainty Factor (CF) method. This method was selected for its effectiveness in handling uncertainty by calculating confidence values based on a combination of MB (Measure of Belief) and MD (Measure of Disbelief), adjusted according to user input. The system was built using PHP programming language and MySQL database, allowing flexible access and multi-user support for both administrators and healthcare providers. Testing results indicate that the system can generate predictive diagnosis outcomes with a confidence limit 30%, in accordance with the internal policy of pondok aren regional hospital to ensure that the system functions solely as a screening tool. The system achieved an accuracy rate of 27% in testing, and all features operated as expected based on black-box testing, indicating thet it is suitable for use as an early diagnosis support tool. Therefore, this system is expected to assist healthcare professionals at pondok aren regional hospital in conducting initial stroke assessments digitally, quickly, and in a structured manner.

Keywords : Stroke, Expert System, Certainty Factor, Early Detection, Web-based System

1. INTRODUCTION

Early detection of stroke is essential to reduce disability and mortality rates. The initial diagnosis process requires a quick and precise physical and neurological examination. As a regional-level health service institution, regional general hospitals have a strategic role in detecting and handling stroke cases at an early stage. However, the limitation of medical personnel in conducting objective and rapid symptom assessments is a challenge that needs to be overcome, especially when it comes to providing confidence in uncertain symptoms.

In addition, a study by Achmad Affan Suprayogi (2022) on a web-based expert system for cat diseases using the Certainty Factor method also shows the potential of this method in handling uncertainty in the diagnosis process[1]. However, there is no similar system specifically applied for stroke at Pondok Aren Hospital.

One approach to address this problem is to build a web-based expert system that can mimic the way an expert works in diagnosing stroke more quickly, accurately, and objectively[2]. The expert system uses the concept of the Certainty Factor to measure the degree of confidence in a symptom, so that it is able to handle uncertainty in the decision-making process. With the support of web technology, the system can also be accessed anytime and anywhere by medical personnel[3].

Some recent research shows that the certainty factor method is used primarily as an aid to early diagnosis with varying levels of confidence, depending on the type of disease and the setting of the system. For example, the expert system for diagnosing stunting children using CF achieves an accuracy of up to about 98.74%[4], and the expert system for brain tumor diagnosis also uses CF with a confidence level of up to 98-99%[5]. Both cases make it clear that CF is capable of dealing with uncertainty as a preliminary estimate, not as a substitute for a definitive medical diagnosis[6].

Therefore, in the system designed at Pondok Aren Hospital, a maximum value of CF is limited to 30% based on internal policies agreed with medical personnel, so that the results of the system's diagnosis only serve as an initial estimate and users are still directed to maintain patient safety and ensure that the final diagnosis remains under the responsibility of a competent doctor, so that patients do not make their own medical decisions based on the results of this expert system[7].

For this reason, the development of a web-based expert system with the certainty factor method is the right solution to help the early detection process of stroke in a structured and objective manner, this system is designed as an early screening tool so that medical personnel can make faster and more appropriate decisions, while minimizing the risk of delays in patient treatment[2].

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

2. RESEARCH METHODOLOGY

System analysis is a research stage that focuses on evaluating the ongoing system, with the aim of identifying various existing problems[1]. At this stage, mapping of the current system is carried out, identification of obstacles that occur, and preparation of solutions through the design of new systems that are more effective.

Based on the results of direct observation in the field of the system implemented at the Pondok Aren Regional Hospital, the author identified that until now there is no system that can help the diagnosis process of diseases of the central nervous system, especially stroke[2]. This condition causes the diagnosis process to still rely entirely on manual examinations by medical personnel, which can potentially take longer and are prone to inaccuracies. Therefore, an expert system is needed that can support medical personnel in diagnosing stroke more quickly and accurately, in order to improve the quality of health services in the hospital[3].

The description of the system mechanism that runs at the Pondok Aren Regional Hospital is as follows:

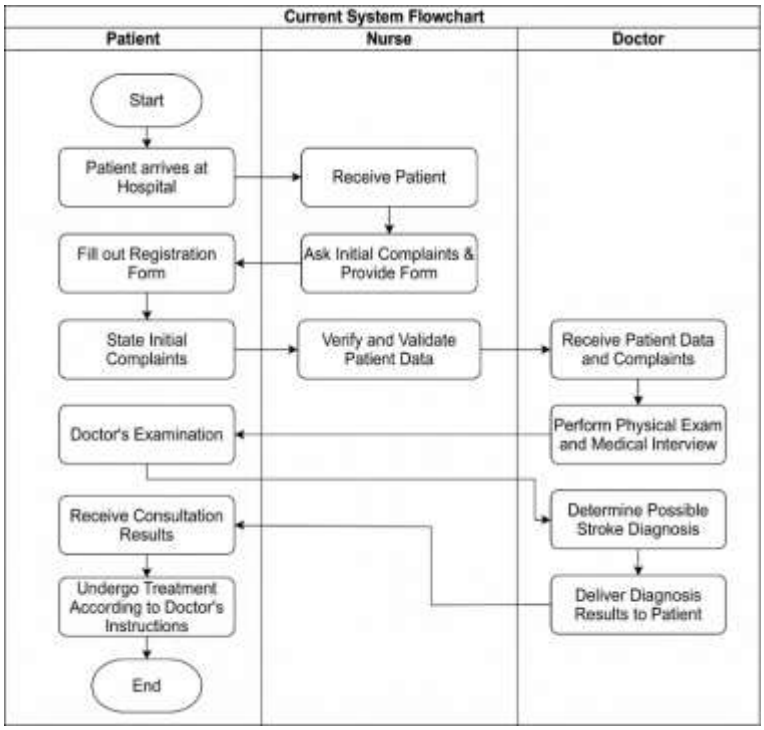

Figure 1. Running System Analysis

The image above is a flowchart of the running system that illustrates the process of patient service in the hospital from start to finish[4]. The process begins when the patient comes to the hospital. The patient was then directed to fill out the registration form after submitting the initial complaint[5]. On the other hand, nurses play a role in receiving patients' arrivals, asking initial complaints, and providing and verifying the forms that the patient fills out.

After the patient's data is verified, the information is provided to the doctor. The doctor then conducts a medical interview and physical examination to determine the possibility of stroke symptoms. If an indication is found, the doctor will provide the diagnosis results to the patient. Furthermore, the patient receives the results of the consultation and undergoes treatment based on the doctor's instructions. The process ends after the patient completes treatment or receives appropriate follow-up[6].

2.1 Proposal System Analysis

Based on the shortcomings found in the current system, in this study, an expert system based on the certainty factor method was designed to help the stroke diagnosis process. The system was built using the PHP (Hypertxt Preprocessor) programming language as a development tool, as well as MySQL as a data storage medium[7].

The application of the certainty factor method in this system aims to produce a calculation of the level of confidence in the possibility of a stroke diagnosis based on the symptoms experienced by the patient[8]. The proposed system workflow is described through the proposed system flowchart, which describes the process from the beginning of the user accessing the system until the system provides the results of the diagnosis. Visualization of the system's workflow can be seen in the proposed system flowchart image below[9].

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

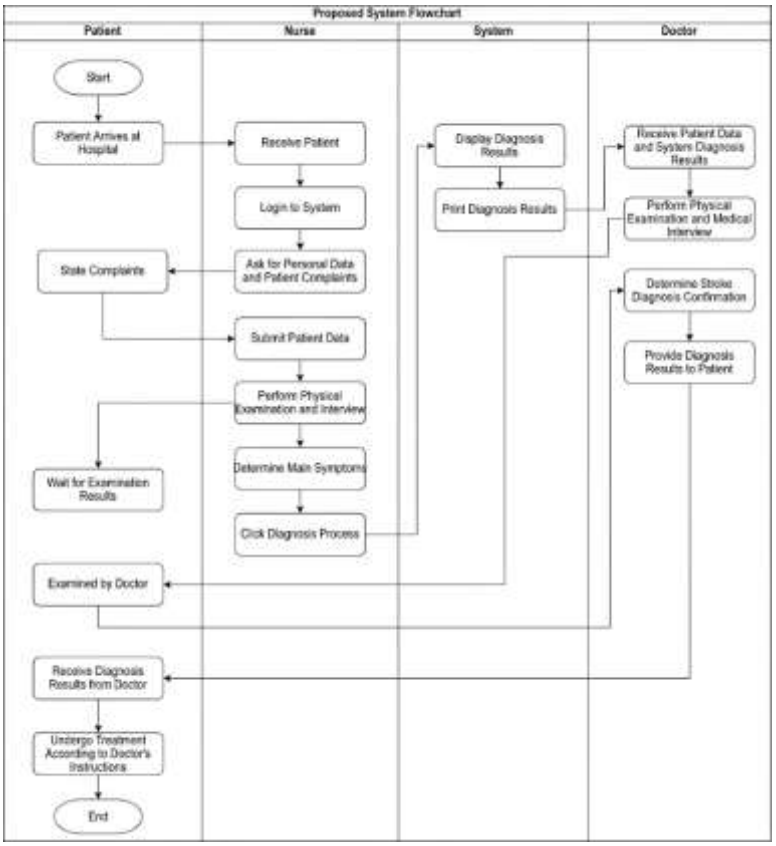

Figure 2. Proposal System Analysis

The image above shows the flowchart of the proposed system for the expert system-based stroke examination process[10]. The flow begins with patients coming to the hospital and submitting complaints. Next, the nurse receives the patient and performs the login process into the system[11]. After that, the nurse will input personal data and complaints from the patient into the system and proceed with physical examinations and interviews to identify the main symptoms[12].

Once the main symptoms are determined, the nurse clicks the diagnostic process button within the system[13]. The system will then display the results of the diagnostic analysis based on the data that has been entered and the results can be printed as documentation. The diagnostic data generated by the system will also be received by the doctor[14].

The doctor then conducts a follow-up examination of the patient and compares the results of the system with the patient's physical condition through a medical interview[15]. After this stage, the doctor will establish a diagnosis of stroke and provide the diagnosis to the patient. Furthermore, the patient receives the results of the diagnosis and undergoes treatment according to the doctor's instructions until the process is declared complete[16].
This system flow shows the integration between medical officers, expert systems, and doctors in order to speed up and facilitate the process of early diagnosis of stroke in a structured manner.

2.2 Stroke Symptoms Table

Every disease generally shows signs or symptoms as an indication of a health problem, as well as stroke. Here are some of the symptoms that are commonly felt by patients who have had a stroke[11]. The following are some of the symptoms that are commonly felt by patients who have had a stroke:

Table 1. Symptoms of Stroke

Code	Symptoms *of Stroke*
G1	Difficulty speaking
G2	Not understanding when asked
G3	Weakness in one part of the body (e.g., left hand only, left leg only, or the entire left side)
G4	Numbness in one part of the face

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

G5	Numbness in one part of the body (mass, left hand only, left leg only, or the entire left side)
G6	Loss of balance
G7	Dizzy
G8	Severe headache (vertigo, migraine, or unusual headache)
G9	Visual impairment in one or both eyes
G10	Duration of stroke

2.3 Stroke Symptoms Table

Decision Tree is a prediction model that is shaped like a tree structure or hierarchical structure. This model has the advantage of simplifying complex decision-making processes to be more structured and easy to understand. Thus, the selection of solutions to a problem can be done more efficiently. As for this study, the decision tree used can be seen in the following image:

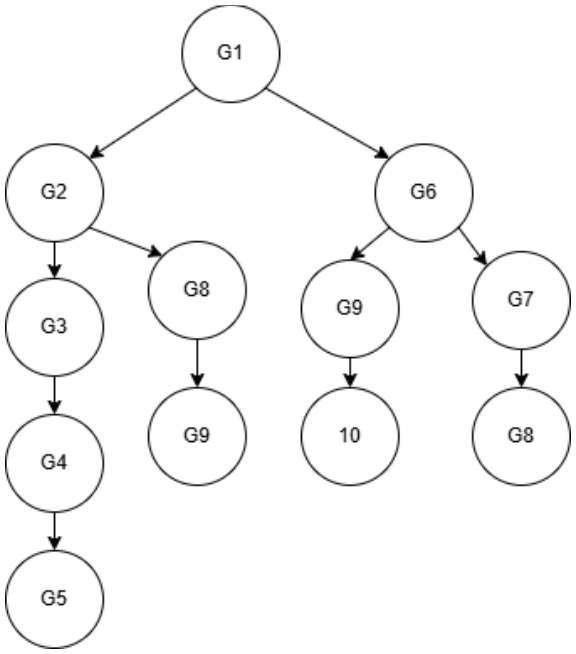

Figure 3. Decision Tree

2.4 Table Rule

Rules in the expert system are part of the knowledge base that serves to determine the final result that will be displayed by the system[12]. In the rule table, there are a number of conditions or logic that need to be explained further, including the following:

Table 2. Rule

Code	Rule
R1	IF G1 AND G2 AND G3 THEN P1 **(*Stroke*)**
R2	IF G3 AND G4 AND G5 THEN P1 **(*Stroke*)**
R3	IF G1 AND G6 AND G7 THEN P1 **(*Stroke*)**
R4	IF G2 AND G8 AMD G9 THEN P1 **(*Stroke*)**
R5	IF G1 AND G2 AND G8 THEN P1 **(*Stroke*)**
R6	IF G3 AND G6 AND G9 THEN P1 **(*Stroke*)**
R7	IF G4 AND G5 AND G8 THEN P1 **(*Stroke*)**
R8	IF G2 AND G3 AND G10 THEN P1 **(*Stroke*)**
R9	IF G1 AND G9 AND G10 THEN P1 **(*Stroke*)**
R10	IF G6 AND G7 AND G8 THEN P1 **(*Stroke*)**

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

2.5 The Value of Certainty and Uncertainty

The value of certainty and uncertainty in this system is obtained through consultation with medical personnel who are experienced in handling stroke cases at the Pondok Aren Regional Hospital[13]. The data is used as a reference in determining the level of confidence and doubt about each of the identified stroke symptoms. The following is a table of certainty (MB) and uncertainty (MD) values for each stroke symptom, obtained through consultation with medical personnel and used as a reference in the calculation process of the expert system:

Table 3. The Value of Certainty and Uncertainty

Code	Symptom	Disease *Stroke*	
		MB	MD
G1	Difficulty speaking	0.4	0.2
G2	Not understanding when asked	0.3	0.2
G3	Weakness in one part of the body (e.g., left hand only, left leg only, or the entire left side)	0.5	0.3
G4	Numbness in one part of the face	0.3	0.1
G5	Numbness in one part of the body (mass, left hand only, left leg only, or the entire left side)	0.3	0.2
G6	Loss of balance	0.4	0.3
G7	Dizzy	0.3	0.2
G8	Severe headache (vertigo, migraine, or unusual headache)	0.4	0.3
G9	Visual impairment in one or both eyes	0.3	0.2
G10	Duration of *stroke*	0.3	0.1

2.6 User Confidence Value

The following table shows the confidence value of the user towards the symptoms experienced, which will then be used in calculating the CF value of the user using the certainty factor method to diagnose the likelihood of a stroke.

Table 4. Confidence User

No	Information	Rating Weights
1	Very Confident	1
2	Sure	0.8
3	Pretty sure	0.6
4	Lack of confidence	0.4
5	Don't Know	0.2
6	No	0

2.7 Calculation Certainty Factor

a. Calculation of MB Value (*Measure of Belief*)

The MB value is a measure of an expert's level of confidence in the relationship between the patient's symptoms and the likelihood of suffering from stroke. This value reflects how much an expert believes that a symptom supports the hypothesis of the disease[14].

MB Formula:

MB = Level of confidence in the hypothesis (H) based on symptoms (E).

b. Calculation of MD Value (*Measure of Disbelief*)

The MD score is used to indicate the degree of a specialist's disbelief or doubt about a particular symptom in support of a stroke diagnosis. This value indicates the extent to which the symptoms are considered unrelated to the disease.

MD Formula:

MD = Level of disbelief in the hypothesis (H) based on symptoms (E).

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

c. Calculation of CF (*Certainty Factor*) Value

The certainty factor value is used to determine the level of certainty of a dignose based on existing evidence. CF describes a combination of belief and uncertainty about a hypothesis (stroke disease) that is influenced by the symptoms felt by the patient.

Basic formula for CF calculation:

$$CF(H,E) = MB(H,E) - MD(H,E) \quad (1)$$

If there is more than one symptom that supports the same hypothesis, then the CF values will be combined using the following formula:

Combination of two CF values:

$$CFcombine = CF_1 + CF_2 \times (1 - CF_1) \quad (2)$$

Combinations with the third CF value and so on:

$$CFcombine = CFprevious + CFn \times (1 - CFprevious) \quad (3)$$

To get the value in the form of a percentage, the final result is multiplied by 100%.

Final formula:

$$CFpersentase = CFcombine \times 100\% \quad (4)$$

Here are examples of symptoms selected for the diagnosis process of stroke in specialist systems

Table 5. Examples of Symptoms

Code	Symptoms of *Stroke*
G1	Difficulty Speaking
G2	Don't understand when asked
G3	Drowning in one part of the body

The following is an example of the calculation of the certainty factor (CF) method based on the selected symptoms in the stroke expert system:

Table 6. Calculation of the Certainty Factor Method

Symptom 1				
Code	**Symptoms of *Stroke***	**MB**	**MD**	**CF Value**
G1	Difficulty Speaking	0.4	0.2	0.2
CF Pakar	MB-MD			
CF User	Pretty sure			0.6
CF 1	0.2*0.6			0.12
Symptom 2				
Code	**Symptoms of *Stroke***	**MB**	**MD**	**CF Value**
G1	Don't understand when asked	0.3	0.2	0.1
CF Pakar	MB-MD			
CF User	Pretty sure			0.6
CF 2	0.1*0.6			0.06
CF Kombinasi 1,2	CF1 + CF2 * (1-CF1) 0.12 + 0.06 * (1-0.12)			0.1728
Symptom 3				
Code	**Symptoms of *Stroke***	**MB**	**MD**	

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

				CF Value
G1	Drowning in one part of the body	0.5	0.3	0.2
CF Pakar	MB-MD			
CF User	Pretty sure			0.6
CF 3	0.2*0.6			0.12
CF Kombinasi 1,2,3	CFpre + CF3* (1-CFpre) 0.1728 + 0.12 * (1-0.1728)			0.2721
CF Value Results		CFpre1*100% 0.2721*100%		**27%**

3. RESULTS AND DISCUSSION

3.1 Prediction Results of Diagnosis Based on Rules

The following are some of the results of the system's experiment in predicting the type of stroke based on predetermined rules and the level of confidence given by users to each symptom experienced.

Table 7. Rule-based diagnostic prediction results

No	Code	Symptom Name	Information	Diagnosis Results
1	G1	Difficulty speaking	Sure	*Stroke* 22%
	G2	Not understanding when asked	Sure	
2	G3	Drowning in one part of the body	Pretty sure	*Stroke* 17%
	G6	Loss of balance	Pretty sure	
3	G5	Numbness in one part of the body	Lack of confidence	*Stroke* 7%
	G9	Visual impairment in one or both eyes	Lack of confidence	
4	G7	Dizzy	Sure	*Stroke* 11%
	G8	Severe headache	Lack of confidence	
5	G1	Difficulty speaking	Pretty sure	*Stroke* 26%
	G4	Numbness in one part of the face	Sure	
6	G10	Stroke Duration	Sure	*Stroke* 22%
	G3	Drowning in one part of the body	Lack of confidence	
7	G2	Not understanding when asked	Sure	*Stroke* 13%
	G6	Loss of balance	Pretty sure	

3.2 Patient Page View

The image above shows the patient data page interface on the system. It contains a list of patient data that includes information such as the patient's name, nik, gender, date of birth, age, address, and phone number. There is also an Action

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

button to manage data such as editing, deleting and entering patient symptom data, as well as a search feature to make it easier to quickly search for patient data.

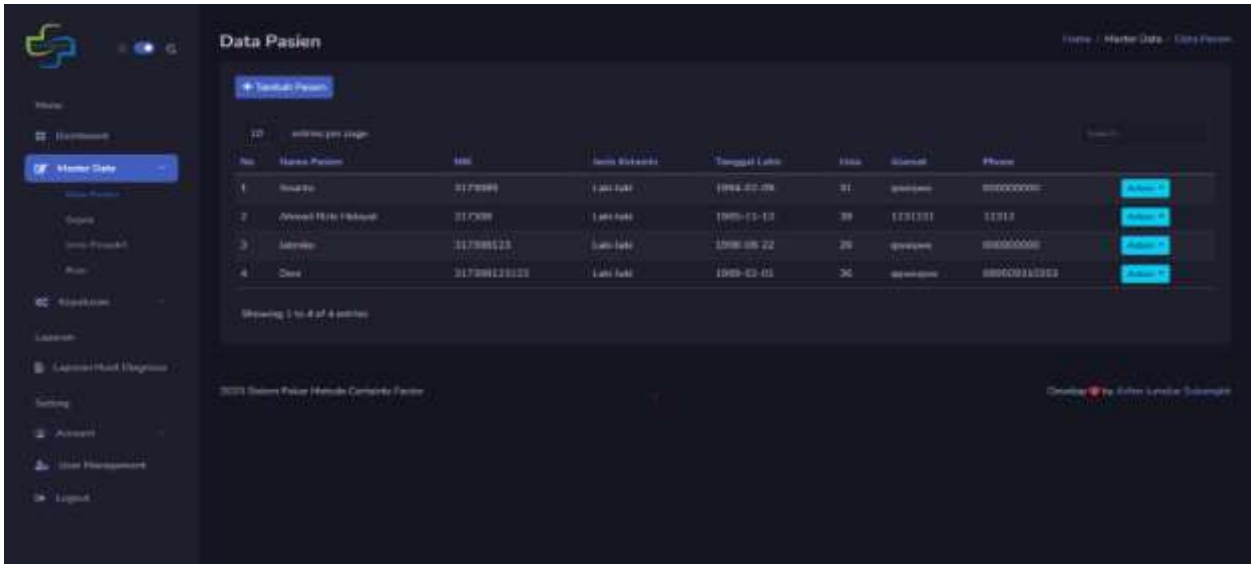

Figure 4. Patient Page

3.3 Symptom Page Display

The image above shows the symptom data page interface on the system. It contains a list of symptom data that includes information such as symptom codes, and symptom names. There is also an action button to manage data such as edit and delete, as well as a search feature to make it easier to quickly find symptom data.

Figure 5. Symptoms Page

3.4 Diagnostic Process Page View

The image above shows the diagnostic process page in the expert system. On this page there is a list of patients registered in the system, each of which is crossed with an action button to view patient data. There is also a diagnostic

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

process button that functions to start the process of calculating the diagnosis for all patients in the list. This view is designed to make it easier for nurses or admins to carry out diagnostic procedures based on the certainty factor method.

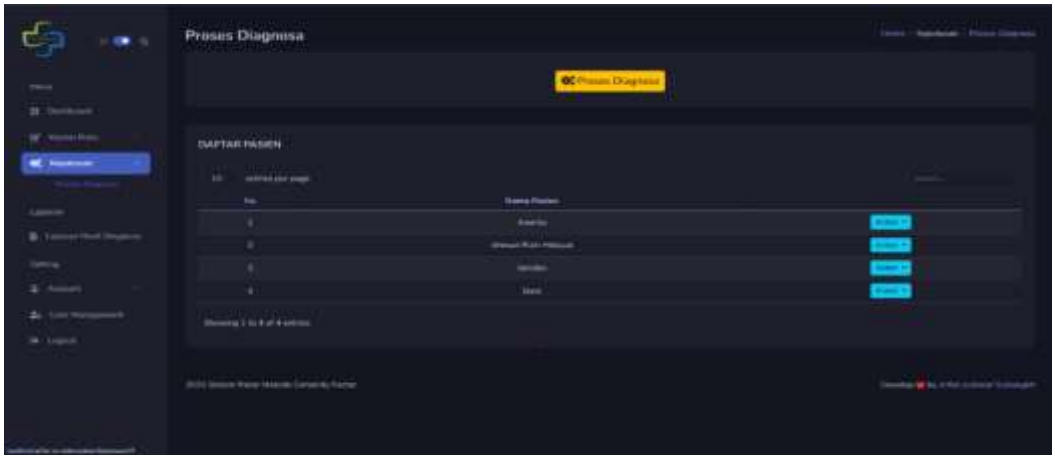

Figure 6. Diagnostic Process Page

3.5 Diagnostic Results Page View

The image above shows the diagnostic report page of the expert system. At the top there is a filter search feature that allows users to filter data based on the date of diagnosis, the name of the staff or nurse, as well as the NIK and name of the patient. Search results are displayed in the form of a table, which contains information such as nurse name, patient name and date of diagnosis. Each row also features an action button that allows users to view details or print patient diagnostic reports.

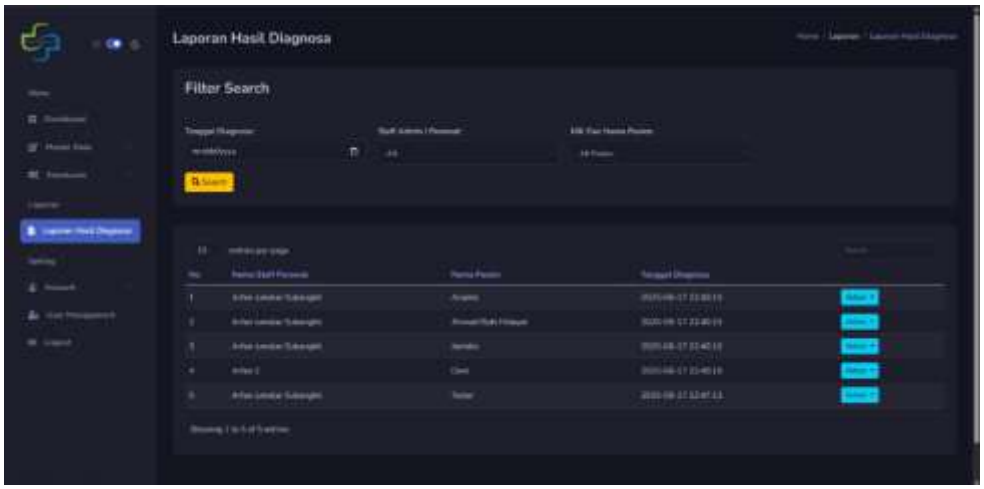

Figure 7. Diagnostic Results Page

4. CONCLUSION

Based on the research objectives that have been formulated in the Introductory Chapter, all stages of development and analysis presented in the Results and Discussion Chapter show that this research has succeeded in achieving the goals that have been set. The web-based expert system developed using the Certainty Factor method is able to help the early detection process of central nervous system diseases (stroke), provide more structured decision support, and improve the efficiency of the symptom identification process by medical personnel. All core features designed at the beginning of the research from the design of the knowledge base, the implementation of CF calculations, to functional testing through black-box testing have been well implemented and provide results according to the expectations described in the Introduction. In addition, the results of the study also provide a clear picture of the potential for development to the next stage. Findings related to accuracy, limited maximum confidence value of 30%, and the need for further validation from experts open up opportunities for further research to improve system performance. Development prospects can be directed towards the integration of more adaptive inference methods, the expansion of the classification of diseases of the central

JURNAL KOMPUTER TEKNOLOGI INFORMASI SISTEM KOMPUTER
p-ISSN: 2962-3022 | e-ISSN: 2963-7104
Volume 5 No 2 September 2026
Page: 2176-2185
http://ejurnal.lkpkaryaprima.id/index.php/juktisi
DOI: https://doi.org/10.62712/juktisi.v5i2.1583

nervous system, the improvement of the quality of symptom data, as well as the application of hybrid models to improve screening accuracy. In addition, the application of this system has the potential to be implemented on a wider scale, not only as an initial screening tool in hospitals, but also as part of telemedicine services, digital triage, or integrated health information systems.Thus, this research not only fulfills the objectives set in the Introductory Chapter, but also provides a strong foundation for further development, both in terms of academics and practical applications in the world of health services.

REFERENCES

[1] A. Mulyani, D. Kurniadi, and S. I. Multajam, "Penerapan Metode Certainty Factor pada Sistem Pakar Diagnosis Penyakit Difteri Berbasis Web," *Teknika*, vol. 12, no. 3, pp. 205–211, Oct. 2023, doi: https://doi.org/10.34148/teknika.v12i3.686.

[2] M. Afdhal and Rita, "Sistem Pakar Diagnosa Penyakit Hiperlipidemia Menggunakan Metode Certainty Factor Berbasis Web," *J. KomtekInfo*, pp. 133–139, Dec. 2022, doi: https://doi.org/10.35134/komtekinfo.v9i4.321.

[3] P. et al. Balasundaram, "Study on Public Awareness of Stroke Risk Factors, Symptoms, Treatment and Rehabilitation," *J. Med. Sci.*, pp. 878–887, 2024.

[4] Z. Ahmed, F. Chaudhary, and D. K. Agrawal, "Epidemiology, Pathophysiology, and Current Treatment Strategies in Stroke," *Cardiol. Cardiovasc. Med.*, vol. 8, no. 4, pp. 389–404, 2024, doi: https://doi.org/10.26502/fccm.92920399.

[5] S. Narulita, A. Nugroho, and M. Z. Abdillah, "Diagram Unified Modelling Language (UML) untuk Perancangan Sistem," *J. Sist. Inf. dan Telekomun.*, pp. 244–256, 2024.

[6] M. Aldjawad, S. Andryana, and Andrianingsih, "Penerapan Metode Perbandingan Dempster-Shafer dengan Certainty Factor pada Sistem Deteksi Dini Penyakit Alzheimer Berbasis Web," *J. JTIK*, pp. 145–152, 2021.

[7] V. Arinal and N. I. Simarmata, "Sistem Pakar untuk Mendiagnosis Tumor Otak Menggunakan Metode Certainty Factor," *Publ. Tek. Inform. dan Jar.*, pp. 1–7, 2025.

[8] A. Zalukhu, S. Purba, and D. Darma, "Perangkat Lunak Aplikasi Pembelajaran Flowchart," *J. Teknol. Inf. dan Ind.*, pp. 61–70, 2023.

[9] V. V Laku, P. Hasan, and E. Pawan, "Expert System for Stunting Diagnosis in Children Using Certainty Factor Method," *Int. J. Appl. Res. Sustain. Sci.*, pp. 315–328, 2024.

[10] F. Karim, G. W. Nurcahyo, and Sumijan, "Sistem Pakar Identifikasi Gejala Stroke Menggunakan Metode Naive Bayes," *J. Sist. Inf. dan Teknol.*, pp. 221–226, 2021.

[11] C. Aysegul and U. Y. Oznur, "Awareness among Stroke Survivors about Stroke Risk Factors," *Int. J. Caring Sci.*, pp. 451–456, 2023.

[12] R. Akbar, "Perancangan Sistem Pakar Diagnosa Potensi Serangan Stroke Berbasis Java," *J. Perencanaan, Sains, Teknol. dan Komput.*, pp. 213–231, 2021.

[13] K. Dewi, E. Kurniawan, and S. Sudarmin, "Design Of Expert System Based On Certainty Factor Algorithm In Diagnosis Of Cholesterol Level In Adolescents," *J. Tek. Inform.*, vol. 3, no. 6, pp. 1557–1564, Dec. 2022, doi: https://doi.org/10.20884/1.jutif.2022.3.6.387.

[14] K. M. Sukiakhy, Z. Zulfan, and O. Aulia, "Penerapan Metode Certainty Factor Pada Sistem Pakar Diagnosa Gangguan Mental Pada Anak Berbasis Web," *Cybersp. J. Pendidik. Teknol. Inf.*, vol. 6, no. 2, p. 119, Oct. 2022, doi: https://doi.org/10.22373/cj.v6i2.14195.

[15] D. Yolanda, D. Derisma, and D. Yendri, "Penerapan Metode Certainty Factor Dalam Sistem Pendeteksi Risiko Hipertensi Berbasis Smartphone," *J. Telekomun. dan Komput.*, vol. 11, no. 1, p. 37, Apr. 2021, doi: https://doi.org/10.22441/incomtech.v11i1.9969.

[16] A. A. A. Karim and H. Fernandy, "Sistem Pakar Diagnosa Penyakit Ayam Kampung Menggunakan Metode Forward Chaining," *Inf. Syst. Educ. Prof. J. Inf. Syst.*, vol. 7, no. 2, p. 149, Jun. 2023, doi: https://doi.org/10.51211/isbi.v7i2.2031.

[17] A. Iskandar, "Perbandingan Metode Dempster Shafer, Case-Based Reasoning dan Certainty Factor dalam Diagnosis Penyakit Craniopharyngioma," *J. Inf. Syst. Res.*, vol. 4, no. 4, pp. 1354–1363, Jul. 2023, doi: https://doi.org/10.47065/josh.v4i4.3554.

[18] F. Karim, G. W. Nurcahyo, and S. Sumijan, "Sistem Pakar dalam Mengidentifikasi Gejala Stroke Menggunakan Metode Naive Bayes," *J. Sistim Inf. dan Teknol.*, pp. 221–226, Aug. 2021, doi: https://doi.org/10.37034/jsisfotek.v3i4.69.

[19] S. Narulita, A. Nugroho, and M. Z. Abdillah, "Diagram Unified Modelling Language (UML) untuk Perancangan Sistem Informasi Manajemen Penelitian dan Pengabdian Masyarakat," *Bridg. J. Publ. Sist. Inf. dan Telekomun.*, vol. 2, no. 3, pp. 244–256, Aug. 2024, doi: https://doi.org/10.62951/bridge.v2i3.174.

[20] A. Mohamad Aldjawad, Septi Andryana, "Penerapan Metode Perbandingan Dempster-Shafer dengan Certainty Factor pada Aplikasi Sistem Pakar Deteksi Dini Penyakit Alzheimer pada Lansia Berbasis Web Mohamad," *J. JTIK (Jurnal Teknol. Inf. dan Komunikasi)*, vol. 5, no. `21, pp. 144–152, 2021, doi: https://doi.org/10.35870/jtik.v5i2.206.