

# ERDANELA MODEL STROKE PREVENTION SERVICE APPLICATION TO REDUCE RISK FACTORS AND IDENTIFICATION OF STROKE RISK LEVELS IN THE ELDERLY IN NURSING HOMES

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### Abstract

The absence of stroke prevention services in the nursing homes in the province of West Sumatra, Indonesia. The results of the initial survey the study found that 12.9 percent of the elderly in nursing homes were stroke survivors. The results of the screening found that 55.3% of the elderly in nursing homes were at high risk of stroke. This research aims to reduce risk factors and identify the level of stroke risk in the elderly in nursing homes through the stroke prevention services ERDANELA model. Stroke Prevention Services the ERDANELA model was developed using the Reorient Health Service and Personnel Skill strategy, through 4 stages referring to the Research & Development theory of the ADDIE model (Analysis and Design, Development, Implementation, Evaluation). The results of first stage of the study obtained the results of qualitative and quantitative analysis of the Elderly and Caregivers as well as the selected stroke risk stratification tool. Stage 2 produces the ERDANELA stroke prevention service profile, the Caregiver empowerment module book, the Erdanela stroke prevention service application on Android smartphones and the KIT bag for risk factor examination instruments. In stage 3 there is an increase in knowledge, attitudes, and skills of the Caregiver after empowerment. Stage 4 has provided stroke prevention services in every nursing home with 8 activities in it. The ERDANELA Model Stroke Prevention Service is the first known stroke prevention service to be developed specifically for the elderly in nursing homes and carried out by trained caregivers.

**Keywords:** ERDANELA model, Stroke prevent, Caregiver, Nursing home, Elderly

## 1. Introduction

In Indonesia, pre-stroke is a non-communicable disease that generally affects the elderly. Stroke is a cerebrovascular disease that threatens the life and health of patients. The stroke must be quickly evaluated, develop treatment strategies, predict clinical outcomes and reduce

stroke risks (Wu & Zhang, 2017). In a preliminary survey that we conducted in September 2021 at three nursing homes in the Province of West Sumatra, Indonesia it was found that 26 people (12.9 per mile) had an Elderly Post-stroke. This number increased rapidly compared to the results of basic health research reports, namely the Elderly with Stroke of 4.4 per mile (Risksdas Balitbangkes, 2018). The increase in stroke cases is a concern for the government and the community. Based on data from the 2016 Health Social Security Administration, the cost of the National Health Insurance for stroke in 2015 was Rp. 1.15 trillion and increased to Rp. 1.27 trillion in 2016 (Mazidah et al., 2019).

The Indonesian government's program to prevent stroke in the community is by a) discovery and control of stroke risk factors and b) early detection and early treatment of stroke sufferers. This program is implemented in a service called a pre-stroke service. Pre-Stroke services are carried out in several places, namely a) Non-Communicable Diseases in an integrated manner at the community health center (Puskesmas Pandu PTM), b) Health Clinics, and c) Integrated Non-Communicable Diseases Development Posts (Posbindu PTM). This activity is carried out by a) general practitioners, b) nurses, and c) health cadres (Direktorat P2PTM Kemenkes RI, 2013).

The lack of stroke prevention services for the elderly in nursing homes in West Sumatra is the unavailability of the PTM Pandu Health Center and PTM Posbindu in nursing homes that can be reached by the elderly. In addition, stroke prevention services for the elderly in nursing homes in West Sumatra Province do not allow bringing the elderly out of nursing homes. Nursing homes in West Sumatra Province need stroke prevention services that are elderly-friendly, namely stroke prevention services that are always available, sustainable, acceptable, effective, affordable, and of high quality. The solution that we provide for the above problems is the development of a stroke prevention service in the nursing home environment called the ERDANELA Stroke Prevention Service. Nowadays, technology is developing rapidly in daily life, especially in healthcare. Where the development of this technology provides convenience to its users (Khairunisa et al., 2021). This research aims to reduce risk factors and identify the level of stroke risk in the elderly in nursing homes through the stroke prevention services ERDANELA model. The ERDANELA Stroke Prevention Service is an Elderly-friendly mobile service carried out by trained Elderly Caregivers to examine risk factors and identify the level of Elderly Stroke risk (high risk or not). using the ERDANELA Stroke Prevention Service application on an Android smartphone. Android-based health care technology has become a trend in providing health information and services today.

## 2. Methods

This research was conducted in three nursing homes in West Sumatra, Indonesia. The model development is carried out through 4 stages referring to the Research and Development theory using the ADDIE Model, namely 1) Analysis and Design, 2) Development, 3) Implementation, and Evaluation.

## 2. 1. Analysis and Design

The analysis phase was conducted in 2 qualitative studies for the elderly and caregivers and 2 quantitative studies for the elderly and caregivers. The design stage is carried out by designing the concept and content of the ERDANELA Stroke Prevention Service (Figure 1). The design stages consist of formulating the objectives of the SMAR model (specific, measurable, applicable, and realistic). Determine the strategy for making the model, using the health promotion strategy of Reorient Health Service and Personnel Skills from the Ottawa Charter in 1996. The implementation of the Reorient Health Service strategy uses the analogy of developing PTM Posbindu services and research theory of ADDIE model development (Dick & Carey, 1996); (Mulyatiningsih, 2013); (Direktorat P2PTM Kemenkes RI, 2012).

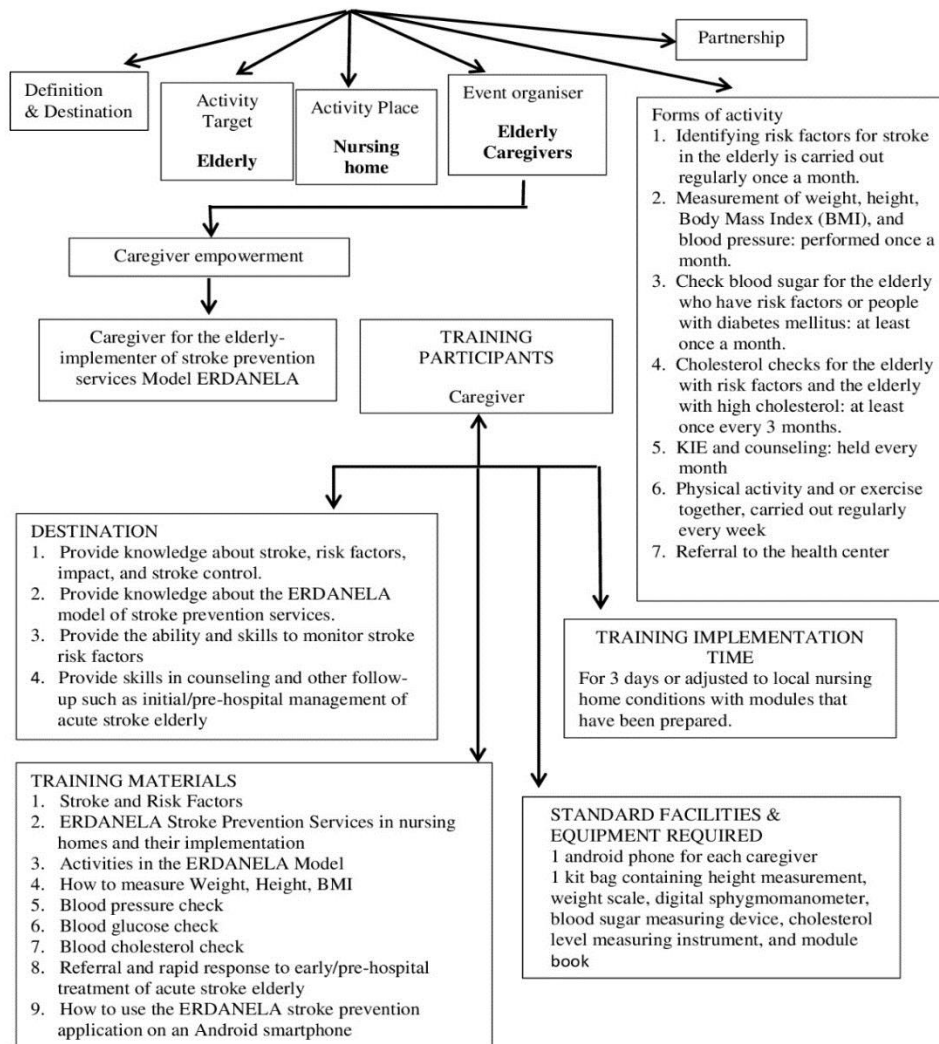


Figure 1: Design of ERDANELA model stroke prevention service development

## **2. 2. Development**

The development stage is an activity to realize the design of the model or create a prototype of the ERDANELA Stroke Prevention Service that is formatted into a smartphone and can be downloaded via the Google play store.

## **2. 3. Implementation**

The implementation stage of the ERDANELA Model for Stroke Prevention Services with an intervention model for the Elderly Caregiver using education and training (empowerment) methods. Empowerment is carried out in the form of training for 3 days in each nursing home. The success of empowerment is known from the behavior analysis of elderly caregivers using a quasi-experimental, using One Group Pretest-post-test Design. To determine whether there is an influence of empowerment on the elderly, a Paired T-test was conducted. Then the Wilcoxon test was performed if the data were not normally distributed. The N-Gain or Normalized Gain test is to determine the effectiveness of the ERDANELA Model of Stroke Prevention Service empowerment given to caregivers of the Elderly Nursing Home.

## **2. 4. Evaluation**

The evaluation stage of the ERDANELA Stroke Prevention Service profile and the ERDANELA Stroke Prevention Service training using the Kirkpatrick model.

## **3. Results**

### **3. 1. Analysis and Design**

The number of elderly living in the three nursing homes is 190 people and the average age is 72 years. Eight stroke risk factors were tested using the Stroke Risk Scorecard tool and the results showed that most of the elderly living in three nursing homes were at high risk (55.3%) for stroke. Researchers conducted a Chi-square statistical test to determine the relationship between the high level of stroke risk in the elderly with eight-stroke risk factors. The result is that the eight risk factors (Stroke prone profile) of Elderly Nursing Homes affect the high-risk level of Elderly Stroke.

Caregiver skills in stroke prevention services in nursing homes are lacking or not good. The empowerment of Elderly Caregivers through the Stroke Prevention Service ERDANELA model is a good solution to prevent the elderly at high risk of stroke in nursing homes. The bivariate analysis of the factors that influence the behavior of caregivers for the ERDANELA model of stroke prevention services in nursing homes is knowledge, attitudes, and skills, while age, gender, education, income/month, length of work in the nursing home, and training do not affect caregiver behavior. The descriptive analysis that has been carried out shows that there are still many caregivers who do not have the potential to care for the elderly through stroke prevention services. The results of the multivariate analysis showed that there was a strong relationship between skills, attitudes, and knowledge with the behavior of stroke prevention services in nursing homes. The results of the T-test showed that knowledge and behavior had a very significant effect, while attitudes and skills had no partial effect on Caregiver behavior.

At the design stage, the researcher makes a use case diagram where each use case describes the functions performed by the user so that they can achieve the desired goals. Use a case diagram that visually describes the user and system interactions (Figure 2). Furthermore, an Android-based display is designed, with a User Interface as shown in Figure 3.

### 3. 2. Develop

At the development stage, validation tests of the ERDANELA Model Stroke Prevention Service application were also carried out by validators who have expertise in the field of Information Technology. The aspects that will be assessed are the quality of the content, the quality of the display, the usability aspect, the integration aspect, the user feedback aspect, the balance aspect, the form aspect, and the language aspect. Furthermore, this application is included in the Google Playstore and named Erdanela Prevent Stroke. This application is interesting because it is a simple way of working so that it is easily understood by the Elderly Caregiver.

### 3. 3. Implementation of the ERDANELA Application to Prevent Stroke

The implementation of the ERDANELA Prevent Stroke application is carried out by empowering Elderly Caregivers in Nursing Homes through training. Based on the exclusion criteria, the number of Caregivers who participated in the study was 52 caregivers.

### 3. 4. Evaluation

The evaluation was carried out on the profile of the ERDANELA Stroke Prevention Service and an evaluation of the ERDANELA Stroke Prevention Service training.

#### 3. 4. 1. Evaluation of the Profile of ERDANELA'S Model Stroke Prevention Service

This application is carried out by trained Elderly Caregivers who can follow up early on the risk factors found with risk factor management education or refer to the nearest Puskesmas (Figure 4). The purpose of this service is to prevent stroke in the elderly living in nursing homes, by examining and controlling risk factors and identifying the level of stroke risk in the elderly (high-risk, low-risk seniors).



Figure 3: User Interface of the ERDANELA Model Stroke Prevention

Service application







Caregivers & application	KIT	Stroke prevention
		
Elderly High-risk/ low-risk	Risk factor	Early detection
		

Figure 4: Profile of the ERDANELA Model Stroke Prevention Service

3. 4. 1. Evaluation of the ERDANELA Model Stroke Prevention Service Training

The elderly who are at low risk are given attention so as not to enter into high risk. The flow of stroke prevention services carried out by caregivers for the elderly is 1) Identifying the level of risk in the elderly using the ERDANELA Prevent Stroke application on Android smartphones. 2) Check blood pressure. 3) Check blood sugar. 4) Check cholesterol. 5) Measure obesity, weight, height, and body mass index. 6) Conduct KIE and counseling as well as to conduct risk factor management education, especially for high-risk elderly. 7) Organizing physical activities and/or gymnastics with the elderly. 8) Make a referral to a hospital if needed (Figure 5).

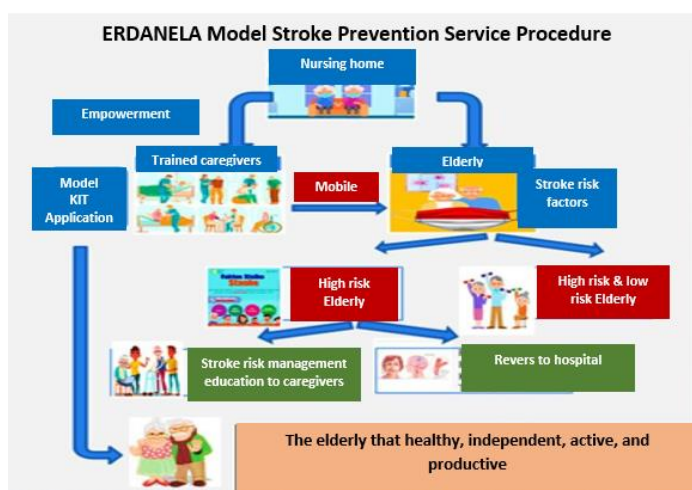


Figure 5: ERDANELA Model Stroke Prevention Service procedure

This service is carried out in nursing homes at least once a month to be integrated with other programs in nursing homes. The training evaluation was carried out using the Kirkpatrick model which consisted of 4 levels:

1. Positive evaluations are given on all (6) scales, namely:
  - a) attractiveness (mean 1.5)
  - b) perspicuity (mean 1.5)
  - c) efficiency (mean 1.6)
  - d) dependability (mean 1.5)
  - e) stimulation (mean 1,4)
  - f) novelty (mean 1,6)
2. Positive evaluation is given to all (3) aspects (scale group), namely:
  - a) attractiveness (mean 1.5)
  - b) pragmatic quality (mean 1.5)
  - c) hedonic quality (mean 1.5)
3. Benchmark value
  - a) Excellent is given on 1 scale, namely novelty
  - b) Good is given on 3 scales, namely efficiency, dependability, and stimulation
  - c) Above average is given on 2 scales, namely attractiveness, and perspicuity.

All Caregivers gave a positive assessment of the ERDANELA Prevent Stroke Application. Applications relative quality scores (Benchmarks), some give very good, good, and above-average scores. On 6 user experience scales, the average value is above 0.8, meaning that the ERDANELA Prevent Stroke application is at the positive evaluation level for all scales. An evaluation of the relative quality of the application is carried out based on the comparison of the value of this research data against the Benchmark dataset. The comparison obtained with Benchmark data aims at the relative quality of using the ERDANELA Prevent Stroke Application compared to other products.

The results of the evaluation at level 2 indicate that the empowerment of Elderly Caregivers in Nursing Homes has succeeded in increasing the knowledge, attitudes, skills, and behaviors of Caregivers towards the implementation of ERDANELA Prevent Stroke, with moderate training effectiveness.

The results of the evaluation at level 3 can be seen that there has been a change in Caregiver's work behavior before and after participating in the training program for the better. The results of the evaluation at level 4 are a decrease in the number of high-risk Elderly in nursing homes and no increase in the number of elderly strokes in nursing homes for 3 months of evaluation.

The pragmatic value means that it is simple, practical, and clear the application of ERDANELA Prevent Stroke for Caregivers to check the level of stroke risk in the elderly. The hedonic value means how evocative and stimulating the Caregiver's interaction with the ERDANELA Prevent Stroke application. The results of the UEQ instrument analysis showed that 1) the ERDANELA Prevent Stroke application received positive ratings from elderly caregivers on all scales, namely attractiveness, sharpness, efficiency, dependence, stimulation, and novelty. In all scale groups (attractiveness, pragmatic quality, and hedonic quality). 2) The ERDANELA Prevent Stroke application got very good benchmark scores for the novelty aspect, got good benchmark scores for efficiency, dependability, and stimulation aspects, and got above average benchmark scores for attractiveness and sharpness aspects.

#### 4. Discussion

In this study, stroke prevention was carried out by controlling the risk factors most relevant to the elderly population in nursing homes. Based on the results of bivariate analysis, it has been proven that the 8 risk factors in the Stroke Risk Scorecard instrument from the National Stroke Association are related to the level of stroke risk in the elderly in nursing homes. This means that this instrument is suitable to be used to construct the ERDANELA Model Stroke Prevention Service in making android applications. In another study using the Stroke Risk Scorecard tool in Klungkung Hospital, Bali, Indonesia, respondents were at high risk (78.5%), and in West Sumatra, Indonesia 20.5% of respondents were at high risk (Setiawati, 2021); (Ranta, 2013). People with all levels of risk (not just high) should be motivated and taught by their healthcare professionals to control modifiable risk factors and reduce stroke risk to the lowest possible level (Muljo et al., 2019).

Education and working time affect the caregiver's knowledge and skills. Pre-employment training affects the value of a caring attitude. Education and working time affect the caregiver's knowledge and skills. Pre-employment training affects the value of a caring attitude. Caregiver knowledge and attitudes in caring for the elderly affect the skills of the caregiver caring for the elderly (Zeng et al., 2019). The results of the analysis above, to change caregiver behavior in stroke prevention services is to increase caregiver knowledge by providing training (empowerment).

Rapid technological developments can be seen in the field of computer-based technology which affects the social, banking, military, entrepreneurship, and health services ((Irawan, 2021). The ERDANELA Model Stroke Prevention Service application is an Android-based health service using a smartphone. The ERDANELA Model Stroke Prevention Service application does not use an internet connection at the time of operation only when downloading requires an internet connection. The size of the Smartphone is 6 inches and is made attractive, using everyday language, the way it works is simple so it is easy to understand because the target audience is Caregivers who on average have a high school education background. This application is interesting because it is a simple way of working so that it is easily understood by the Elderly Caregiver.



According to (Hassenzahl, 2010), the characteristics of a good interactive application are utility, usability, stimulation, communication, and beauty. Research on health services has been carried out by (Nikbakht-Nasrabadi & Shabany-Hamedan, 2016). Stroke Risk Assessment and Emergency Mobile Application in a Hospital in Thailand (Engström et al., 2010). Empowerment-focused interventions can enhance the role of professional elderly caregivers working in general nursing homes (WHO, 2021). Counseling is arranged in a planned manner to increase the knowledge and competence of caregivers.

WHO recommends the use of digital technology to improve health facilities. The use of digital and mobile health facilities to achieve better levels of health, and to be able to access health services and longer-lived well-being (Opoku et al., 2017). According to (Nichols et al., 2017), an application product is assessed for its pragmatic and hedonic values. Mobile-based health interventions (m-Health) for the management of non-communicable diseases are very beneficial (Sunjaya, 2019). A sensitive and effective hypertension control program in a timely and sustainable manner, using mobile health technology (m-Health) is a promising approach at present (Opoku et al., 2017).

ATmega328P-based X-ray machine exposure time measurement device with an android interface (Widadi et al., 2020). The use of technology in the digital era is based on computerization and android in both research, industry, and health service. The basic use of technology is that it must increase the productivity of human resources and the efficiency of products, and health service (Kunal et al., 2020). A New Robotic Application for COVID-19 Specimen Collection Process (Deniz & Gokmen, 2022). The Design of Digital Heart Rate Meter Using Microcontroller (Tunggal et al., 2020).

## **Conclusion**

The ERDANELA Model Stroke Prevention Service has been successfully developed and can reduce risk factors and identify the level of stroke risk in the elderly in nursing homes in West Sumatra, Indonesia.

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## **Conflict of interest**

No conflict of interest

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