https://journal.ypidathu.or.id/index.php/humaniora
P - ISSN: 3062-7540
E - ISSN: 3048-3492

# Designing an Emergency Panic Buttons as A Safety Support System for Solitary Elder

**Muhammad Navis Mirza[1], Iqbal Faza[2], Iwan Prasetyo[3]**
[1,2,3]Politeknik Rukun Abdi Luhur, Indonesia

**ABSTRACT**

**Background**. According to Presidential Regulation No. 88 of 2021 on the National Strategy for the Elderly, elderly individuals are those aged 60 and above. Solitary elderly individuals face various complex issues, including limited social support, mobility restrictions, healthcare neglect, safety risks, and insufficient access to information and technology. In 2021, 6.75% of Kudus Regency's population was elderly, with a 0.72% increase from 2018 to 2021. Notably, two solitary elderly individuals were found deceased in 2023.
**Purpose**. This research focuses on designing an emergency panic button system to enhance the safety of solitary elderly individuals. The study aims to ensure their safety and security, particularly during health emergencies.
**Method**. The research involves developing a user-friendly panic button system, assessing its usability and reliability, and evaluating its impact on elderly safety.
**Results**. The results indicate that the emergency panic button significantly improves response times in emergencies, providing a crucial support system for solitary elderly individuals.
**Conclusion**. This innovation has broader implications for advancing health and safety technologies in Indonesia and could serve as a model for similar solutions in other countries facing comparable elderly care challenges

**KEYWORDS**
Elderly Care Technology, Health Emergencies, Emergency Panic Button, Elderly Safety, Solitary Elder

## INTRODUCTION

The According to Presidential Regulation number 88 of 2021 concerning the national strategy for aging, what is meant by elderly (elderly) is someone who has reached the age of 60 years or above (Republik Indonesia:2021). The results of the 2020 Population Census show that there are 9.93% of the elderly population in Indonesia. This figure has increased by 2.34% in the last 10 years (BPS:2020). The results of the March 2021 National Socio-Economic Survey (SUSENAS) conducted by BPS stated that there were 9.99% of elderly people living alone. If we look at gender, the percentage of elderly women who live alone is higher than elderly men (BPS:2021). In 2021, elderly men living alone will be 4.74%. Meanwhile, elderly women who live alone almost 4 times that number, namely 14.78% In Kudus Regency in 2021 there were 6.75% elderly residents, in the 20018-2021 period there period there was an increase in elderly people of 0.72% (BPS:2022).

**Citation:** Mirza, N, M., Faza, I., & Prasetyo, I. (2024). Designing an Emergency Panic Buttons as A Safety Support System for Solitary Elder. *Journal of Humanities Research Sustainability*, *1*(2), 107–117. https://doi.org/10.70177/jhrs.v1i2.1184

**Correspondence:**
Muhammad Navis Mirza,
Navismirza32@gmail.com

**Received:** July 26, 2024
**Accepted:** August 14, 2024
**Published:** November 14, 2024

In Kudus Regency in 2023, at least 2 cases of solitary elderly people were found dead, on Sunday, 12 May 2023, an elderly person with the initials R (63 years old), a resident of Getas Pejaten, Jati District, was found dead after more than a week (Sofiyanto:2023). Still in Jati sub-district, a resident of Tanjung Karang with the initials OKH (89 years old) was found dead in the bathroom on Monday, January 23 2023 at his residence (Akbar:2023), the two elderly people were solitary elderly people who did not monitor their condition every day.

Solitary elderly are elderly people who live alone without any family members or relatives living with them. The problems faced by solitary elderly people are very diverse and complex. Some of the problems often faced by solitary elderly include: Limited social support: To improve the quality of life of elderly people, social support is needed. This social support aims to help elderly people fulfill their daily needs (Sanroso:2019). Solitary elderly people often feel lonely and isolated because they do not have family or close friends who can provide social support. This condition can have a negative impact on the mental and physical well-being of the elderly. Limited mobility: The problem of limited mobility often occurs in the elderly. Caring for the elderly is not easy because it requires knowledge, skills, will, dedication and patience (Airiska,et al:2020).

Karangmalang's solitary elderly have limited mobility which makes it difficult for them to carry out daily activities, such as buying food, taking care of their health needs, or interacting with other people. Lack of health care: Caring for elderly people plays an important role in improving their quality of life and increasing their life expectancy. Chronic health problems in elderly people are increasing, so they require special attention from the community to increase the frequency of their visits to health services such as posyandu for the elderly. Therefore, it is necessary to carry out community-based health interventions to increase awareness of the importance of caring for elderly people (Sudaryanto et al:2023). Karangmalang's solitary elderly people pay less attention to their own health because no one else pays attention to their health condition.

This can cause disease or health conditions to become more severe because they are not treated immediately. Safety risks: Handling safety and security for Indonesian citizens, especially the elderly, is a complex issue caused by physical decline and age. Accidents such as falls while carrying out daily activities often occur and have fatal consequences if there are no supervisors around who can provide medical assistance quickly to prevent risks to health and life safety in the future (Sutedja:2019). Solitary elderly often experience accidents such as falling in the bathroom, because they live alone without supervision.

Lack of access to information and technology: access to information technology among the elderly tends to be low according to 2015 SUSENAS data showing that access to ICT in the potential elderly group is the highest, namely 46.5%, while for other elderly groups (active elderly, economically vulnerable, socially vulnerable) respectively were 29.81%, 22.01%, and 32.71% (Ginting:2019). Karangmalang's solitary elderly do not have access to information and technology that can help them overcome the problems they face, such as using emergency panic button technology to call for help in health emergency situations.

To overcome the problem of solitary elderly people, efforts are needed from various parties, including the government, community and family. Emergency panic button technology can help improve the safety and welfare of solitary elderly people. Apart from that, efforts should also be made to establish social networks and communities that can provide support and attention for solitary elderly people. In this research, there is an important aspect that is focused on, namely that the design of an emergency panic button will be a very important support system to ensure the safety and security of solitary elderly people, especially in health emergency situations.

Thus, the title of this research describes a clear research objective, namely improving the safety and welfare of solitary elderly people through designing an emergency panic button as a support system. It is hoped that with this tool, the community will be better prepared and able to deal with health emergencies in solitary elderly people more effectively and efficiently.

## RESEARCH METHODOLOGY

The research method used in this study is the prototype method. According to Sugiyono, prototyping is a methodology that is focused on developing design, functionality and user interaction [Sugiono:2016]. Mulyanto believes that this method is effective for eliminating misunderstandings that often occur between users and analysts because users often cannot state their needs clearly [Mulyanto:2009]. Meanwhile, the emergency warning system was developed using the waterfall method, which includes four main stages: analysis, system design, implementation, and testing [Jannah et al:2016].

### Analysis

The analysis stage involves identifying problems faced by the community in emergency situations through observations and interviews about challenges during handling emergency situations.

**Literature Study** Initial data collection was carried out through literature study, looking for relevant sources to understand the difficulties faced by solitary elderly people.

**Observations** Direct observations were carried out in several places for solitary elderly people to understand their condition and activities related to research.

**Interviews** Interviews were conducted with various related parties to find out more about the obstacles faced. The interviews also included dialogue with solitary elderly people to find out the specific difficulties they experienced during emergency situations.

### System planning

From the analysis that has been carried out, the next stage is to design an emergency notification tool that suits the user's needs, which can provide effective warnings and instructions for solitary elderly people.

### Implementation

The implementation phase includes assembly, programming, and casing creation for the emergency warning system.

### Testing

System System testing is carried out to ensure that the performance of the tool is in accordance with the planned design. These tests are divided into functional tests (checking program suitability and performance), non-functional tests (including power, connectivity and coverage tests), and simulations of use under normal conditions.

## RESULT AND DISCUSSION

### Results

### Analysis

In Indonesia, there is Law Number 24 of 2007 concerning Disaster Management which aims to protect every citizen from the threat of natural disasters. However, when a disaster occurs, it is important to note that not everyone can save themselves easily, such as children, pregnant women, the elderly, and people with disabilities. They are included in the vulnerable group. (Mirza:2023). Protection for vulnerable groups (Article 48 Letter e) which includes Persons with Disabilities is carried out by giving priority to vulnerable groups in the form of rescue, evacuation, and

evacuation. security, health services, and psychosocial (Article 55). However, until now there are still few programs aimed at groups with special needs in disasters, especially rescue and evacuation (Mirza:2024).

According to the results of initial observations and analysis, it can be concluded that there are 5 priority problems experienced by solitary elderly, namely limited mobility, lack of access to information and technology, safety risks, lack of health attention, limited social support. From the 5 problems above, the research team concluded that there were 2 main problems. The first main problem is that elderly people have safety risks, lack of health attention and lack of access to information and technology. These three problems are related because lack of access to technology increases safety risks if an accident occurs, for example a fall, because solitary elderly people will find it difficult to seek help when safety problems occur. and health. Then this is exacerbated by the second problem, namely limited mobility and limited social support. As an elderly person, of course he has difficulty in mobility even though he does not suffer from a disability, and with solitary living conditions, the elderly person does not have assistance in daily mobility, especially in emergency situations.

The research team concluded that the priority problems for solitary elderly people are:

**Lack** of information technology facilities that support the safety and health of the elderly.

**Lack** of social support and mobility, especially to support the safety and health of the elderly.

The conclusion from the priority problems in solitary elderly above is that it is very appropriate for the research team to see this health problem as the focus of research. Based on law number 13 of 1998 concerning the welfare of the elderly, this research is in accordance with efforts to improve social welfare, including health services, convenience services in using public facilities and social support. Research results and products produced by lecturers can be used and provide direct benefits to the community.

**System planning**

| Problem | Solution | Outcome Target | Achievement indicators |
|---|---|---|---|
| Lack of information technology facilities that support the safety and health of the elderly | *Emergency panic button* design to support the safety and health of solitary elderly people | *Emergency panic button* can send *a push message* to responders | 100% *of responders* received *the push message* |
| | | *Push messages* convey complete & accurate data | 100% *Complete push message* data (name, address, health condition/disability) & accurate |

**Table 1.** Problems, Solutions, Output Targets, Achievement Indicators

**Technical specifications:**

The emergency panic button system is designed with the following features:

**Emergency Button:** Large, easy-to-reach buttons that seniors can press in an emergency.

**Network Connection:** Uses cellular or Wi-Fi connection to send emergency signals.

**Automatic Notification:** Sends automatic notification to *First responders* when the emergency button is pressed.

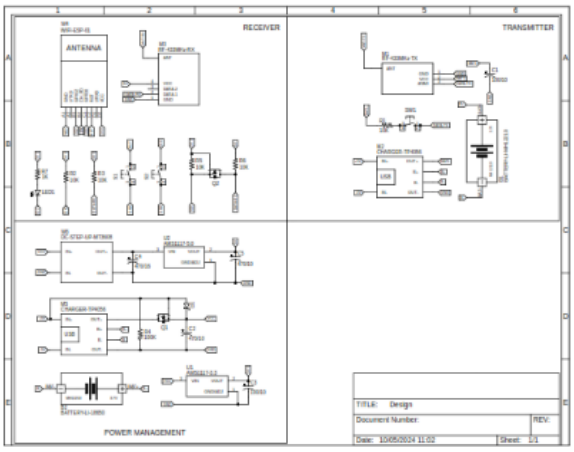


**Figure 1.** Schematic

## Implementation

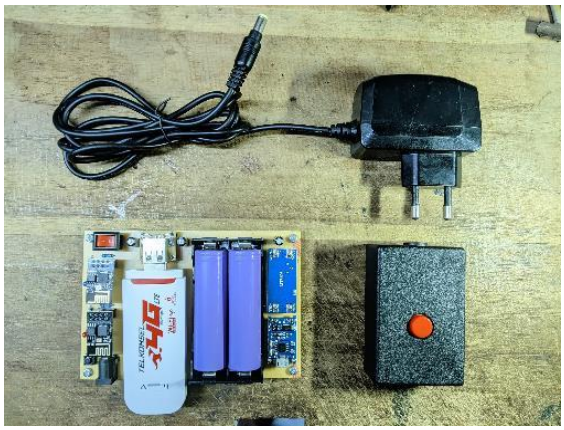

**Figure 2.** Solitary Elderly EPB *Prototype*

The implementation in this research was successfully carried out by assembling a prototype EPB for a solitary elderly person with obstacles in making a compact casing so that the modem had to be placed outside the casing.

**Figure 3.** Constraints of the Solitary Elderly EPB *Prototype Casing*

*Software* for filling in data for solitary elderly people and *responder data* is made as simple as possible so that it does not require special skills in changing data.


**Figure 4.** Data entry *interface*

**Testing**

Testing aims to test the prototype to obtain initial feedback, focusing on the system's ease of use, reliability, and response in emergency situations.

**Functional testing**

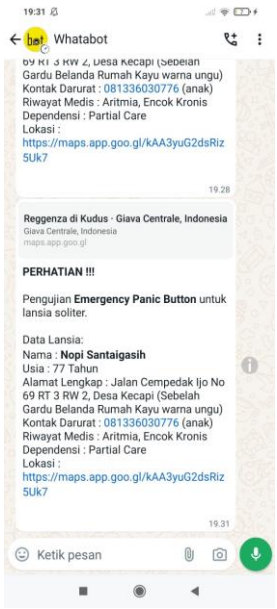


**Figure 5.** *Emergency Notification*

Functional testing shows success in sending *emergency notifications.*

**Non-functional testing**

Non-functional testing consists of power, connectivity and range testing.

**Power Supply Testing**

This device is powered by a 5V 1 ampere adapter, so as long as there is electricity supply from the home electrical installation, the device will always be ready to use. In case of a power outage, this device is equipped with 2 18650 batteries with a capacity of 3.7V and 2200mAh. This battery can provide a power supply for more than 24 hours, ensuring the device remains ready for use even in the event of a power outage with sufficient backup time.

**Connectivity and coverage testing**

This device is equipped with a 4G LTE connection from Telkomsel, which ensures fast and reliable connectivity. In addition, connectivity coverage has been tested with various other

providers, including IM3, Smartfren, and Three. The test results show that this device has coverage that matches the coverage of the internet provider used, both for the device itself and for the responder cellphone. Thus, this device is able to work well in various network conditions and with various mobile operators, ensuring that connectivity is maintained and the device is always ready to use anytime and anywhere.

**User interface durability testing under normal use**

This device has undergone user interface durability testing to ensure ease of use in everyday conditions. Following are some of the aspects tested:

The red button visibility is designed to be easily seen in normal lighting situations. Its striking color ensures that users can quickly find and press the button when needed, increasing responsiveness in emergency situations.

the black device casing is designed to contrast with the background of the house walls which are generally white. This makes it easier for users to find the device quickly, even if it is placed in various locations in the house.

Ease of use Software for filling in data for solitary elderly people and responder data is designed with an intuitive and user-friendly interface. Users with minimum computer or mobile skills can operate this software easily. Using this software does not require special skills in programming, so each family member can quickly learn and use this device without difficulty.

With these features, this device ensures that its use remains easy and efficient in everyday situations, providing peace of mind and security for its users.

**Simulation Steps**

**Device Preparation**

The device is connected to a 5V 1 ampere adapter and the power from the home electrical installation is installed properly. The 18650 battery functions optimally as a power backup.

**Filling in Dummy Data**

Elderly data includes name, age, complete address, emergency contacts, medical history, elderly dependency level and device coordinates.

Responder Data for respondent data is filled in with the WhatsApp number and the WhatsApp number's API key

**The red button is pressed** in an emergency simulation situation, and the results are as follows:

All responders received emergency notifications via WhatsApp successfully.

**Verify Range and Connectivity**

The device is well connected to Telkomsel's 4G LTE network. Connectivity testing with other providers (IM3, Smartfren, Three) showed satisfactory results, with notifications being well received.

**Battery Life Testing**

A power outage is simulated by unplugging the power adapter. The device remained operational for more than 24 hours on battery, demonstrating durability that meets specifications.

**Analysis**

**All** emergency notifications were received by responders quickly.

**The** response time of each responder varies, but in general it is quite fast and adequate.

**The** device's connectivity and battery life were proven to be reliable according to the simulation results.

## Discussion

### Connectivity

In a network context, compared to WiFi, LoRa actually provides the lowest delay or least energy consumption, which can be used to select communication protocols adaptively to optimize network performance (Klimiashvili:2020). However, researchers chose WiFi as a communication technology for an elderly emergency response system that is more practical than LoRa, especially considering the needs of *first responders* who often use applications such as WhatsApp for daily communication. WiFi offers high speed and efficiency in data transfer and integrates easily into existing infrastructure, making it a more suitable choice for areas with stable access to electricity and networks. Despite its limited range and dependence on electricity, these advantages are more relevant for situations where speed and accessibility of information in an emergency are priorities.

### Emergency Button Function and Visibility

The existing emergency button functions well and has adequate visibility under normal lighting conditions. Users can easily identify and use it without any difficulty. While the buttons are effective in normal lighting conditions, there is room for improvement in dim lighting conditions. The use of buttons equipped with LED lights, so that the buttons can light up in the dark, makes it easier for users to find and use the emergency button in low light conditions. One proposed strategy to enable rapid identification and activation of the emergency call system is to install a red vertical painted line on the wall from the ceiling to the activation button (Marshall:2024).

### Additional Placement for Buttons

Currently, the device is equipped with one emergency button. Considering the importance of accessibility in an emergency, it is highly recommended to add additional buttons in strategic locations in the home, such as in the bedroom and bathroom. This addition will ensure that users can quickly access the emergency button from various areas of the home, increasing the system's responsiveness and effectiveness in emergency situations. This is in accordance with I toilet research which states that panic buttons can be used by toilet users to trigger an alarm in emergency situations (Panek:2017). Emergency buttons are also commonly used in hospital inpatient settings. A hospital must have a nurse call system device or what is usually called *a nurse call* . This device is located in the patient's inpatient room. The function of this device is to call the nurse at the nurse's post if a patient needs help. Call buttons are located next to the patient's bed and in the bathroom (Nursanto:2021).

### Casing Design and Visibility

The black casing of the device is quite clearly visible against the light colored wall background. To improve the visibility of the device against various backgrounds, including dark walls, further adjustments to the casing design were required. Consideration could be given to using more striking colors or materials or using reflective strips that can reflect light, making the device easier to find in a variety of lighting conditions and background colors (Marshal:2024).

However, the problem that is still faced is that the modem still sticks out at the back (not in the casing), apart from making installation difficult, this also poses the risk of it falling and other risks that can cause the connection to break.

### Discussion of Program Sustainability

The program relies heavily on data packets to ensure continuous 4G LTE connectivity, allowing devices to communicate efficiently. It is important for policy makers to consider replenishing data packages periodically and automatically. This strategy will ensure that there is no failure in the communication system due to running out of data packets. Furthermore, obtaining data

packages at corporate prices or government subsidies can be an effective way to reduce operational costs.

**Integration with Free Wifi for the Community**

This program currently uses a 4G LTE modem for connectivity. Considering the costs associated with mobile data, integration with a community free Wifi network could be a more cost-effective solution. If there is existing Wifi infrastructure or government plans for such a network, devices can be adapted to use Wifi *receivers* , reducing dependence on mobile data plans. This not only reduces operational costs but also extends the reach and reliability of connectivity.

**Spare Part Replacement and Maintenance**

Routine maintenance, such as changing batteries, adapters, and buttons, is essential to maintain device reliability and effectiveness. Establishing a regular maintenance schedule to inspect and replace worn or damaged components is highly recommended. Providing service packages or annual maintenance contracts with vendors can help in managing this with more controlled costs and faster service.

In increasing the effectiveness of emergency response programs, it is important to implement mitigation strategies that include both passive and active elements. Passively, the program has integrated an emergency notification facility that allows solitary elderly people to send signals for help in emergency situations. As part of an active mitigation strategy, it is important to form and train a team of first responders in Basic Trauma Cardiac Life Saving (BTCLS) or Accident First Aid (P3K). This training should involve more volunteers and health professionals and be held regularly to sharpen their skills and responsiveness.

Furthermore, solitary elderly people need to receive more intensive socialization on how to use emergency response devices correctly. Through more structured and frequent training sessions, live demonstrations, and distribution of easy-to-understand guidance materials, we can ensure that they not only understand how the device works but also feel comfortable using it.

On the advocacy side, it is important to continue to support policy makers with up-to-date and relevant information about the need for and benefits of emergency response programs. Involving them in field visits and presenting data from real situations can help reinforce the urgent need for this program. Collaboration with health and social organizations can also strengthen this advocacy, creating a strong push for greater prioritization and support for the needs of solitary older people in the face of emergencies.

## CONCLUSION

In order to design an effective emergency response system for the elderly, various aspects of technology and infrastructure must be considered to maximize function and accessibility. The use of a 5V 1 Ampere adapter for the power supply and 18650 battery ensures that the device remains operational for more than 24 hours in a power outage. With a 4G LTE connection and potential WiFi integration, this device is compatible in urban environments where connection speed and stability are crucial, especially for emergency communications via applications such as WhatsApp used by first responders. Design aspects, such as button visibility and clarity of the case, as well as a user interface that is friendly for elderly users, are also essential to ensure easy and effective use of the device. Finally, consideration of ongoing development, including infrastructure maintenance, familiarization of use, and training of first responders, is key to ensuring that these systems can be relied upon to provide rapid and effective responses in emergency situations. The development of the emergency panic button will not only provide direct benefits for solitary elderly people, but also have broad implications in the development of health and safety technology in Indonesia. This

innovation could serve as a model for similar solutions in other countries facing similar challenges in elderly care.

Apart from developing emergency panic button technology, this research also emphasizes the importance of first responder training for communities around solitary elderly people. With the integration of technology and training, it is hoped that this can be a trigger for creating a comprehensive support system for the safety and welfare of solitary elderly people. It is hoped that this research can increase public awareness about the conditions and challenges faced by solitary elderly people, as well as motivate them to provide further support. It is hoped that the findings from this research can become the basis for developing better public policies to support the welfare of solitary elderly people, both in terms of health services, technology and social support.

## AUTHORS' CONTRIBUTION

*Look this example below:*

Author 1: Conceptualization; Writing - review and editing.

Author 2: Project administration; Investigation.

Author 3: Supervision; Other contribution.

## REFERENCES

Airiska, M., Winarni, L. M., & Ratnasari, F. (2020). Hubungan pengetahuan kesehatan terhadap peran keluarga dalam perawatan lansia dengan gangguan mobilitas fisik di Ruang Perawatan RSUD Pakuhaji Kabupaten Tangerang. *Menara Medika*, *3*(1).

Akbar, D. R. (2023, January 23). *Lansia Tionghoa di Kudus ditemukan meninggal di rumahnya hidup sebatang kara*. Tribun Muria. Retrieved from https://muria.tribunnews.com/2023/01/23/lansia-tionghoa-di-kudus-ditemukan-meninggal-dirumahnya-hidup-sebatang-kara

Badan Pusat Statistik Indonesia. (27 Desember 2022). *Statistik Penduduk Lanjut Usia 2022*. accessed on 17 Juli 2024, Retrieved from https://www.bps.go.id/id/publication/2022/12/27/3752f1d1d9b41aa69be4c65c/statistik-penduduk-lanjut-usia-2022.html

Badan Pusat Statistik Indonesia. (27 Januari 2023). *Hasil Long Form Sensus Penduduk 2020*. accessed on 17 Juli 2024, Retrieved from https://www.bps.go.id/id/publication/2023/01/27/ffb5939b4393e5b1146a9b91/hasil-long-form-sensus-penduduk-2020.html

Badan Pusat Statistik Indonesia. (30 November 2022). *Profil Migran Hasil Survei Sosial Ekonomi Nasional 2021*. accessed on 17 Juli 2024, Retrieved from https://www.bps.go.id/id/publication/2022/11/30/a8783422ec76253c5d735a7e/profil-migran-hasil-survei-sosial-ekonomi-nasional-2021.html

Ginting, L. A. U., Mulyani, R. W. P., & Muta'ali, L. (2019). Pemetaan Lansia di Indonesia Ditinjau dari Karakteristik Sosial, Ekonomi, dan Status Kesehatan.(Mapping of Elderly in Indonesia, Observed from Social, Economic, and Health Status Characteristics.) Jakarta: Ministry of Social Affairs.

Jannah, E. N., & Hidayah, A. (2016). Sistem Terintegrasi Berbasis Web untuk Pencarian dan Pemesanan Kelompok Seni Pertunjukan. *Jurnal Nasional Teknik Elektro dan Teknologi Informasi*, *5*(4), 245-251.

Klimiashvili, G., Tapparello, C., & Heinzelman, W. (2020). LoRa vs. WiFi ad hoc: A performance analysis and comparison. In *2020 International Conference on Computing, Networking and Communications (ICNC)* (pp. 654-660). IEEE.

Marshall, S. D., et al. (2024). Reducing the time to activation of the emergency call system in operating theatres: Effect of installing vertical red line indicators. *British Journal of Anaesthesia*.

Mirza, M. N. (2023). Analysis of Implementation of Government Regulations Related to Early Warning Systems for Persons with Disabilities. *Menara Journal of Health Science*, *2*(2), 255-264.

Mirza, M. N., Lourinx, E., Nugroho, R. A., & Syaifudin, A. (2024). Perancangan Sistem Peringatan Darurat Bagi Penyandang Gangguan PendenGARAN. *JKM (Jurnal Kesehatan Masyarakat) Cendekia Utama*, *12*(1), 90-106.

Mulyanto, A. (2009). *Sistem informasi konsep dan aplikasi*. Yogjakarta: Pustaka Belajar.

Nursanto, D., Sukamto, P., & Wicaksono, A. E. (2021). Rancang bangun perangkat sistem panggil perawat (nurse call) berbasis mikrokontroler Atmega8535 dengan fitur komunikasi. *INFOTECH: Jurnal Informatika & Teknologi*, *2*(1), 10-24.

Panek, P., et al. (2017). On the prototyping of an ICT-enhanced toilet system for assisting older persons living independently and safely at home. In *eHealth* (pp. 176-183).

Republik Indonesia. (2021). *Peraturan Presiden Republik Indonesia Nomor 88 Tahun 2021 Tentang Strategi Nasional Kelanjutusiaan*.

Santoso, M. D. Y. (2019). Dukungan Sosial Meningkatkan Kualitas Hidup Lansia. *Jurnal Kesehatan Mesencephalon*, *5*(1).

Sofiyanto, A. (2023, April 3). *Lansia warga Getas Pejaten Kudus ditemukan meninggal, begini kronologinya*. Retrieved from https://isknews.com/lansiawarga-getas-pejaten-kudus-ditemukan-meninggal-begini-kronologinya/

Sudaryanto, W. T., Herawati, I., Wahyuni, W., Ayuningrum, I. Y., Murti, B., Setiawan, R., & Putri, N. D. (2023). Skrining Kesehatan Pada Lansia Di Surakarta. *Jurnal Penelitian Dan Pengabdian Kepada Masyarakat Unsiq*, *10*(1), 78-85.

Sugiyono. (2016). *Metode penelitian pendidikan & pengembangan: Research & development*. Bandung: Alfabeta.

Sutedja, I., Bahana, R., & Manuaba, I. B. K. (2019). Perancangan Aplikasi Mobile Pertolongan Pertama Untuk Keamanan Dan Keselamatan Lansia. *Sebatik*, *23*(2), 568-573.