

Developing a Digital-Based Frailty Screening for Community-Based Elderly Monitoring

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ABSTRACT

Background: Frailty is a new challenge in the aging population that is often not properly detected. There is Skringing Lansia Sederhana (SKILAS), screening instrument for elderly that conduct at Posyandu Lansia. But, SKILAS is paper based instrument and cadres must be accompanied by Puskesmas officers who are often absent during the Elderly Posyandu activities. **Objective:** The purpose of this study was to develop a digital-based frailty screening questionnaire. **Methods:** The research design is Research and Development (R&D) using a multi-stage approach which includes: collecting qualitative data and quantitative data. The research conducted at the Dahlia Mandiri Elderly *Posyandu* in Tegal Malohan, Buntalan, Klaten at January-April 2026, with 6 cadres as research subjects and 55 elderly as research objects. The sampling technique used is the total sampling method. The experts involved in this activity consist of 1 Geriatrician (a doctor) and 1 Health Information Systems Experts. Data analysis used in this study are phenomeno-logical analysis and I-CVI (Item-level Content Validity Index) combined with Universal Agreement (UA) calculations. The interface design includes: Page 1. Registration Page; Page 2. Questionnaire Page and Page 3. Results/Summary page. **Results:** The calculation results showed that the majority of items achieved a consistent relevance score (3 or 4) from both experts. The success of these items in achieving an I-CVI of 1.00 indicates that conceptually, the questions accurately represent the indicators of the variables they were intended to measure. **Conclusion:** Meanwhile, for item Depression 2, which received an I-CVI of 0.50 (rated relevant by only one expert), the researchers conducted revisions.

Keywords: community health care; digitalization; elderly; frailty; screening

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INTRODUCTION

The number of elderly people in Indonesia is 65.8 million people (20.5% of the total population) with the percentage of elderly people >60 years reaching 28.6 million people [1]. Elderly people >60 years are more vulnerable because of a significant decline in physical and muscle function (sarcopenia) can result in loss of independence. Central Java ranks third with a life expectancy of 74.62 years and the number of elderly people in 2030 is predicted to reach 60% of the total population, its mean 6 of 10 residents are elderly. Klaten Regency is one of the areas in Central Java that ranks second with life expectancy above the national average, namely 79.33 years for elderly women and 75.58 years for elderly men. The percentage of elderly people >60 years in Klaten reaches 17-18% (range 221,000-234,000 people) [2].

One of the main challenges facing the elderly is frailty, a condition decline in physiological conditions that makes them susceptible to falls, illness, and disability. Fried's frailty assessment encompasses five main components: unintentional weight loss, fatigue, low physical activity, weakness, and slowness. An elderly is considered frail if they meet three or more of these criteria [3]. Frailty does not result in adverse effects such as increased risk of falls, slower recovery, extreme fatigue, and the risk of sudden confusion. Long-term effects include permanent disability, hospitalization, decreased quality of life, and death. This condition also affects caregivers, such as physical exhaustion, disruption of routines,

communication strain, burnout, and financial burdens [4]. The clinical criteria for elderly status are divided into three, namely fit (healthy), pre-frail (pre-vulnerable), and frail (vulnerable). Elderly in the pre-frail stage are defined as those who meet 1-2 of Fried's criteria and if screening is carried out at this stage, there is a very high chance of returning to fit (reversible) [5]. Screening allows doctors to carry out pre-rehabilitation, provide walking aids or modify the home environment early to prevent fatal accidents such as hip fractures and save on health costs [6].

“Posyandu Lansia” is a community-based health service unit managed by, for, and from the community to provide preventive and promotive health services. “Posyandu Lansia” has the potential to be used as a fragility screening centre due to its sociocultural approach and potential for continuously monitoring [7]. Screening at Posyandu is much cheaper than paying for orthopaedic surgery or intensive care in a hospital.

Indonesia, through the “Posyandu Lansia” has a Skrining Lansia Sederhana (SKILAS) [8]. Based on an preliminary survey conducted by the research team at the Dahlia Mandiri Posyandu, Tegal Malohan Village, Buntalan, Klaten, was obtained 90% of cadres felt that the paper-based instrument was too complicated; 80% of cadres felt that the language used was too complex; 100% of cadres felt that filling it out took a long time. In addition, in its use, cadres must be accompanied by Puskesmas officers who are often absent during the “Posyandu Lansia”.

Several frailty screening instruments for the elderly that have been used include the phenotype model, the deficit accumulation model, and the bio-psycho-social model. The phenotype model and the deficit accumulation model can only be used by geriatricians [3][9], while the bio-psycho-social model can be used by cadres. The research not only digitizes old forms, but also simplifying biopsychosocial indicators into a digital format that can be run by cadres without Puskesmas officers but not reducing the screening accuracy. Instrument digitization is carried out by standardizing scoring, speeding up data processing and making it easier for cadres to monitor the health status of the elderly continuously [8][10]. The novelty of this research is the creation of an instrument that focuses on digital-based frailty screening; applicable to cadres; and integrated the SKILAS result to the elderly's families by Whatsapp. This research is in line with the WHO program on healthy aging with a focus on digitizing frailty screening instruments to solve the problem of fragmentation of national health data and weak interoperability. In addition, this research is in line with the 3rd Sustainable Development Goal (SDGs) [11].

METHODS

The research design is Research and Development (R&D) using a multi-stage approach (*Mixed Methods*), which includes: collecting qualitative data (interviews regarding the needs of *posyandu* cadres) and quantitative data (results of expert judgment). The research conducted at the Dahlia Mandiri Elderly *Posyandu* in Tegal Malohan, Buntalan, Klaten at January-April 2026, with 6 cadres as research subjects and 55 elderly as research objects. The sampling technique used is the total sampling method. The experts involved in this activity consist of 1 Geriatrician (a doctor) and 1 Health Information Systems Experts.

Data analysis used in this study are phenomenological analysis and I-CVI (Item-level Content Validity Index) combined with Universal Agreement (UA) calculations. Phenomenological analysis are used to data result from interviews regarding the needs of health cadres/posyandu cadres. Then, validity from expert judgment Because the number of experts used was only 2, the validity test was using I-CVI (Item-level Content Validity Index) combined with Universal Agreement (UA) calculations [12]. The I-CVI and UA calculations are performed by considering the following:

1. Item Graduation Standards (Relevance Criteria)
Score of 1 or 2: Categorized as Irrelevant (Weight = 0)
Score of 3 or 4: Categorized as Relevant (Weight = 1)
2. I-CVI Formula for 2 Experts
Because there are only 2 experts, there are only three possible I-CVI values for each item:
Both experts score 1 or 2 = 0.00 (Item Discarded)
Only 1 expert scores 3 or 4 = 0.50 (Item Revised/Discarded)
Both experts score 3 or 4 = 1.00 (Item Accepted)
The formula for calculated I-CVI:

$$I - CVI = \frac{\text{Total expert that give 3 or 4 score}}{\text{Total expert}}$$

3. S-CVI Standard: An S-CVI/Avg value ≥ 0.90 is a good standard to indicate that your overall questionnaire instrument has high content validity. The formula for calculated I-CVI:

$$S - CVI/Avg = \frac{\text{Total I - CVI Score}}{\text{Total questionnaire item}}$$



Figure 1. Research procedures

RESULTS

1. Characteristic of Cadres and Elderly

Table 1 shows that all of Posyandu Cadres are female. The oldest caders is 58 years old, and the youngest is 29 years. The average tenure as a cader is 15 years, with the longest 20 years. The majority of the elderly participants attending the Posyandu in Kampung Tegal Malohan, Buntalan, Klaten are “Pralansia” category (aged 45–59). The data indicate that the numbers of male and female elderly participants are nearly equal (see Table 2).

Table 1. Characteristics of the Cadres at the Elderly Posyandu, Tegal Malohan Village

Gender	Age (Min-Max)	Time became Cadres (Min-Max)
Female = 6 (100%)	33,50 (29,00 – 58,00)	15,00 (5,00 – 20,00)
Male = 0 (0%)	-	-

Table 2. Characteristics of the Elderly at the Elderly Posyandu, Tegal Malohan Village

	Gender		Total
	Male (n)	Female (n)	
Pralansia (45-59 y.o)	12	18	30
Lansia Muda (60-69 y.o)	12	5	17
Lansia Madya (70-79 y.o)	2	6	8
Total	26	29	55

2. Cadres Need

Cadres stated that despite the SKILAS program, it is currently not implemented because it requires assistance from Puskesmas officers. Cadres and the elderly are enthusiastic about screening for elderly conditions because it can identify conditions early before vulnerabilities become more severe. Cadres need a tool that is easy to use, with immediate results, and allows for connection with caregivers. This last component is crucial because many elderly people live alone in villages and their children live outside the city.



Figure 2. Group photo of cadres and midwives to identify cadres' needs for SKILAS

3. Validity Expert

The calculation results showed (see Table 3) that the majority of items achieved a consistent relevance score (3 or 4) from both experts. The success of these items in achieving an I-CVI of 1.00 indicates that conceptually, the questions accurately represent the indicators of the variables they were intended to measure. Meanwhile, for item Depression 2, which received an I-CVI of 0.50 (rated relevant by only one expert), the researchers conducted revisions. This disagreement between experts was triggered by bias in language interpretation or overlapping sub-indicator coverage.

Table 3. Expert Validity Results

No.	No.Item	Expert 1	Expert 2	Expert 1 Recap (≥ 3)	Expert 2 Recap (≥ 3)	I-CVI	Status Item	Universal Agreement (UA) Value
1	Cognitif 1	4	4	1	1	1,00	Valid	1,00
2	Cognitif 2	4	4	1	1	1,00	Valid	1,00
3	Mobility 1	4	4	1	1	1,00	Valid	1,00
4	Malnutrition 1	4	3	1	1	1,00	Valid	1,00
5	Malnutrition 2	4	4	1	1	1,00	Valid	1,00
6	Malnutrition 3	4	4	1	1	1,00	Valid	1,00
7	Vision	3	3	1	1	1,00	Valid	1,00
8	Hearing	3	3	1	1	1,00	Valid	1,00
9	Depresion 1	3	3	1	1	1,00	Valid	1,00
10	Depresion 2	2	3	0	1	0,50	Revised	0,00
S-CVI/Avg								0,90

4. Design Interface

The interface design includes:

Page 1. Registration Page – A comprehensive form for patient details, including name, age, gender, address, phone number, and the WhatsApp contact of a family member to receive screening result feedback.

Page 2. Questionnaire Page – Divided into six sections:

- Cognitive decline (word recall and orientation tests)
- Limited mobility (chair sit-to-stand test)
- Malnutrition status (measurements of body weight, appetite, and Mid-Upper Arm Circumference/MUAC)
- Visual impairment
- Hearing impairment
- Symptoms of depression

Page 3. Results/Summary page – Displays:

- Patient data
- Assessment results
- General conclusion PDF download
- Button "Send to WhatsApp"
- Button to start a new screening



Figure 3. Page 1 of the elderly registration form, containing personal details and the contact information of the family member who will receive feedback

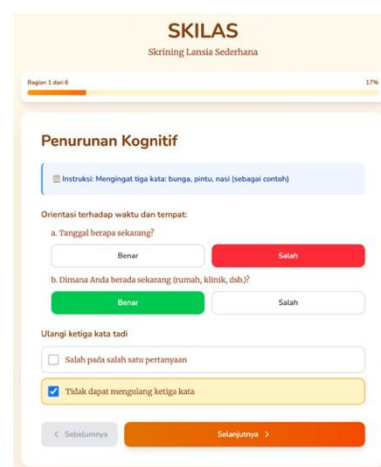


Figure 4. Page 2 - Assessment of cognitive decline using two memory-related questions

SKILAS
Skrining Lansia Sederhana

Bagian 2 dari 6 33%

Keterbatasan Mobilisasi

Tes berdiri dari kursi: Berdiri dari kursi lima kali tanpa menggunakan tangan.

1. Apakah orang tersebut dapat berdiri di kursi sebanyak 5 kali dalam 14 detik?

☐ Ya ☒ Tidak

[< Sebelumnya](#) [Selanjutnya >](#)

Figure 5. Page 2 – Assessment of mobility limitations in the elderly using the sit-to-stand test

SKILAS
Skrining Lansia Sederhana

Bagian 3 dari 6 50%

Malnutrisi

1. Apakah berat badan Anda berkurang >3 kg dalam 3 bulan terakhir atau pakaian menjadi lebih longgar?

☐ Ya ☒ Tidak

2. Apakah Anda hilang nafsu makan?

☒ Ya ☐ Tidak

3. Apakah ukuran lingkaran lengan atas (LILA) <21 cm?

☐ Ya ☒ Tidak

[< Sebelumnya](#) [Selanjutnya >](#)

Figure 6. Page 2 - Malnutrition status (measurements of body weight, appetite, and Mid-Upper Arm Circumference/MUAC)

SKILAS
Skrining Lansia Sederhana

Bagian 4 dari 6 67%

Gangguan Penglihatan

1. Apakah Anda mengalami masalah pada mata: kesulitan melihat jauh, membaca, penyakit mata, atau sedang dalam pengobatan medis (diabetes, tekanan darah tinggi)?

Jika tidak, klikkan **TIDAK**

☒ Ya ☐ Tidak

[< Sebelumnya](#) [Selanjutnya >](#)

Figure 7. Page 2 – Assessment of visual condition

SKILAS
Skrining Lansia Sederhana

Bagian 6 dari 6 100%

Gejala Depresi

Selama dua minggu terakhir, apakah Anda merasa terganggu oleh:

1. Perasaan sedih, tertekan, atau putus asa

☐ Ya ☒ Tidak

2. Sedikit minat atau kesenangan dalam melakukan sesuatu

☒ Ya ☐ Tidak

[< Sebelumnya](#) [Lihat Hasil >](#)

Figure 8. Page 2 – Assessment of depression status

SKILAS
Skrining Lansia Sederhana

Hasil Skrining

Skor Total: 5 dari 6

Segera rujuk ke Fasilitas Kesehatan

Data Pasien

Nama: SKRINING
Usia: 60 tahun
Jenis Kelamin: Perempuan
Tanggal Skrining: 20 Juni 2026

Indikator Skor (Cut-off Point = 5)

1. Penurunan Kognitif: Perlu Perhatian

2. Keterbatasan Mobilisasi: Perlu Perhatian

3. Malnutrisi: Perlu Perhatian

4. Gangguan Penglihatan: Perlu Perhatian

5. Gangguan Pendengaran: Normal

6. Gejala Depresi: Perlu Perhatian

PERLU RUKUKAN KE FASKES

Skor 5 < 5 (Cut-off Point)

Pasien memerlukan rujukan SGERA ke fasilitas kesehatan untuk pemeriksaan komprehensif dan penanganan lebih lanjut. Terlepas beberapa aspek kesehatan yang memerlukan intervensi medis profesional.

Rekomendasi Tindak Lanjut:

- Rujuk segera ke Puskesmas atau Rumah Sakit terdekat
- Rujuk ke dokter spesialis geriatri
- Berikan dukungan psikologis dan sosial
- Lakukan pemeriksaan kesehatan secara berkala

[Unduh PDF](#) [Kirim ke WhatsApp](#)

[Skrining Baru](#)

Figure 9. Page 3. Results/ summary page – displays

HASIL SKRINING LANSIA Sederhana (SKILAS) Nama: Sri Maryanti Usia: 60 tahun Tanggal: 11/6/2026

TOTAL: 4/6 Cut-off: ≥5

DETAIL

HASIL SKRINING: ♦ Penurunan Kognitif Status: Perlu Perhatian Terdapat indikasi penurunan fungsi kognitif. Disarankan untuk pemeriksaan lebih lanjut. ♦ Keterbatasan Mobilisasi Status: Normal Mobilitas dalam kondisi baik. ♦ Malnutrisi Status: Perlu Perhatian Terdapat 1 indikator malnutrisi. Konsultasi dengan ahli gizi disarankan. ♦ Gangguan Penglihatan Status: Perlu Perhatian Terdapat masalah penglihatan....

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HASIL SKRINING LANSIA Sederhana (SKILAS)

DATA PASIEN

Nama: Sri Maryanti
Usia: 60 tahun
Jenis Kelamin: Perempuan
Tanggal Skrining: 11/6/2026

SKILAS_Sri_Maryanti_1781154364235.pdf
2 pages • 8 KB • pdf

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Figure 10. WhatsApp message containing screening results forwarded to the elderly person's family

DISCUSSION

The SKILAS program represents the Indonesian government's adoption of the WHO guidelines on integrated care for older people [13]. However, this initiative lacks practical feasibility if implemented solely by community health volunteers. This situation echoes the challenges associated with community-based health programs and the reliance on medical personnel to run Posyandu (integrated health posts). These findings align with previous research, which highlight structural barriers to elderly care in rural areas, a shortage of competent human resources, and the heavy workloads borne by Puskesmas staff [14], [15].

Economic, social, and cultural have created the "**empty-nest syndrome = fenomena sarang kosong**" phenomenon and increased the vulnerability of the elderly ([16]. With the advancement of psychology and sociology, the term evolved into "Empty Nest Syndrome" in the 1970s to identify a cluster of clinical symptoms (such as depression, anxiety, and profound loneliness) experienced by parents due to the loss of their primary caregiving role [17]. The consequences of this situation include depression and anxiety stemming from the loss of the primary caregiving role, which triggers feelings of no longer being needed. The sudden quietness of the home fosters a sense of social isolation [18]. This psychological disturbance increases the risk of physical ailments; the resulting mental strain and psychological anxiety disrupt sleep cycles and lower the body's immunity. It raises cortisol levels, which triggers a rise in blood pressure (hypertension). Furthermore, a lack of social interaction at home accelerates brain aging and increases the risk of dementia [19], [20].

Many elderly individuals live alone while facing declining physical capabilities, so sharing screening results with family members or caregivers serves as a strategy to prevent that situation getting worse. Through a specific feature in this interface design, families can monitor the elderly's health status based on assessments conducted by Posyandu. The digitalization of Posyandu (integrated health posts) is indeed an urgent necessity for establishing an inclusive support system for the elderly in rural area [21], [22]. Thus tools used to support elderly who living alone that also shown in previous research shows that intervention can improved self-care, safer mobility, and automated emergency routing. In addition, it has positive impact on the mental health of elderly [22].

The findings of this study demonstrate that the developed instrument possesses strong content validity, as evidenced by the majority of items achieving an Item Content Validity Index (I-CVI) of 1.00. A high CVI score confirms that the construct definition has been successfully translated into tangible, measurable questionnaire items, reducing construct-irrelevant variance [23], [24]. However, the evaluation process also highlighted critical areas for instrument refinement, specifically concerning the 'Depression 2' item, which received an I-CVI of 0.50. This low index stemmed from expert disagreement, which was primarily triggered by semantic ambiguity and overlapping sub-indicator coverage. Content validation often uncovers these subtle yet impactful flaws in language and structure. Ambiguous wording or double-barreled questions can lead to severe misinterpretation by the respondents, which in turn compromises the ultimate reliability and structural validity of the tool [25]. Revising the item based on expert consensus was a necessary and rigorous step to ensure psychometric purity. Modifying items with lower CVI scores ensures that the finalized instrument remains highly targeted, culturally sensitive, and optimized for practical field use by community health workers or cadres.

CONCLUSION

Cadres need a tool that is easy to use, with immediate results, and allows for connection with caregivers. This last component is crucial because many elderly people live alone in villages and their children live outside the city. Validity of expert judgment shown that the majority of items achieved a consistent relevance score (3 or 4) from both experts.

Meanwhile, for item Depression 2, which received an I-CVI of 0.50 (rated relevant by only one expert), the researchers conducted revisions.

Based on findings and discussion, the following recommendations are: it is highly recommended to expand the expert panel to a minimum of 5–6 judges during instrument development. Furthermore, deploying empirical validity testing (such as construct validity) across a more heterogeneous elderly population is essential to reinforce field reliability. In addition, it is necessary to conduct sensitivity and specificity tests to determine whether cadres can truly carry out screening correctly according to the condition of the elderly. There is an urgent need to design and develop mobile health (*mHealth*) screening applications tailored for community health cadres. The digital tool should feature a user-friendly interface, deliver instantaneous health status readouts, and integrate an automated remote dashboard or notification system directly accessible by long-distance family caregiver. Puskesmas should reorient the execution strategy of the SKILAS program by implementing structured task-shifting models. Providing cadres with certified training will mitigate operational bottlenecks caused by an absolute reliance on the physical presence Puskesmas Officers.

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