



Case Report

SYMPTOM AND MEDICATION MONITORING WITH LUPIE DIARY IN PEDIATRIC SYSTEMIC LUPUS ERYTHEMATOSUS



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Article info

Received: February

10th, 2026

Revised: June 23rd,
2026

Accepted: June 24th,
2026

<https://doi.org/10.32539/sccrj.v2i1.14>

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Abstract

Pediatric systemic lupus erythematosus (pSLE) in low-and-middle-income countries often leads to rapid organ damage due to complex treatment regimens and limited specialized care. Effective home-based symptom monitoring is critical to detect early flares, yet conventional tracking is often suboptimal, necessitating tailored digital health solutions like the "Lupie Diary" application to capture real-time clinical fluctuations. This case report describes the nurse-facilitated implementation of "Lupie Diary" to enhance self-management in three adolescent female patients in a resource-limited Indonesian hospital. Based on Indonesian nursing standards, primary diagnoses included Hyperthermia, Nutritional Deficit, Impaired Skin Integrity, Nausea, and Readiness for Enhanced Health Management. The intervention spanned 4 weeks, comprising a 3-day hospital-based training phase on daily symptom logging and medication reminders, followed by weekly remote nursing tele-monitoring at home. As a direct result of utilizing the application, the patients demonstrated significant improvements in treatment adherence, systematic symptom tracking, and active engagement, heavily facilitated by the nurse's role as a clinical educator and technology facilitator. This approach highlights the critical role of nurses in bridging hospital-to-home care through technology-integrated, family-centered interventions. Embedding simple digital tools into standard nursing care plans is a viable, effective strategy to empower pediatric patients with complex chronic diseases despite resource constraints.

Keywords: Case Reports, Medication Adherence, Mobile Applications, Patient Self-Management, Systemic Lupus Erythematosus

E-ISSN: xxxx-xxxx

P-ISSN: xxxx-xxxx



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Introduction

Pediatric Systemic Lupus Erythematosus (pSLE) requires lifelong adherence and monitoring, yet non-adherence remains a major cause of poor outcomes in Indonesia (Irwanto, Evalina, & Trisnawati, 2022). Mobile health (mHealth) apps show promise for self-management, but few are designed for pediatric use or for low-resource settings such as Indonesia, where digital literacy and culturally relevant tools are limited (Irawan, et al. 2025).

Pediatric Systemic Lupus Erythematosus (pSLE) is characterized by a more aggressive clinical course, higher rates of organ damage, and greater medication complexity compared to adult-onset SLE (Brunner, et al. 2008; Livingston, Bonner, & Pope, 2012). In low-and-middle-income countries (LMICs) such as Indonesia, managing pSLE presents a formidable challenge due to centralized healthcare resources, a shortage of pediatric rheumatologists, and low health literacy among families (Darma & Hikmah, 2026). Delayed recognition of flare-ups and poor medication adherence in these resource-limited settings directly correlate with poor clinical outcomes and increased mortality (Garg & Plantinga, 2024).

Growing scientific evidence demonstrates that mHealth technologies significantly enhance treatment adherence, symptom-tracking accuracy, and proactive self-management in adolescents with chronic conditions [SITASI - Bukti Ilmiah mHealth]. By shifting from paper-based logs to a structured, accessible Android platform ("Lupie Diary"), patients and their families can track subtle clinical fluctuations in real-time. This digital approach is particularly critical in pSLE, where signs and symptoms such as low-grade fevers, arthralgia, gastrointestinal distress, and skin manifestations are highly volatile and serve as early indicators of impending organ-threatening flares. Conventional episodic recall during monthly hospital visits often leads to recall bias and delayed clinical response. The "Lupie Diary" application addresses this gap by enabling high-frequency, objective logging of these specific signs and symptoms, allowing nurses to visually map clinical trends and intercept disease acceleration early. Grounding this digital

intervention within the Self-Management Framework ensures that caregivers transition from passive recipients of care to active partners [SITASI - Teori Self-Management]. Furthermore, integrating the Indonesian Nursing Diagnosis (SDKI) and Nursing Intervention Standards (SIKI) provides a rigorous, culturally tailored, and legally recognized framework for nurse-led digital interventions in Indonesian clinical practice (PPNI, 2018).

This case report presents the nurse-led implementation of "Lupie Diary," a locally developed Android app for symptom and medication tracking among three patients with pSLE. Grounded in the Self-Management Framework and Indonesian nursing standards (SDKI, SIKI), this intervention highlights a family-centered, digital approach in a resource-limited hospital. The report aims to: 1) describe nursing challenges in pSLE management in Indonesia, 2) illustrate the integration of "Lupie Diary" into nursing care, and 3) evaluate preliminary self-management and disease activity outcomes. We hypothesize that using "Lupie Diary" with nurse support will improve adherence and symptom tracking, reducing perceived disease activity.

Presentation of the Case

a. Patient Information

Three female adolescents diagnosed with Systemic Lupus Erythematosus (SLE) according to the EULAR/ACR 2019 criteria were included in this case series. Informed consent was obtained from all patients and their legal guardians. To protect privacy, patient identities have been de-identified using the initials An.N, An.Y, and An.Q.

Child N: A 14-year-old girl from Banyuasin, South Sumatra. She is the eldest of three siblings, and her parents work as farmers. Her medical history is notable only for a honey allergy. She was previously active in school, and there is no family history of autoimmune diseases.

Child Y: A 16-year-old girl from Lubuk Linggau, the youngest of three siblings. Her parents are also farmers. She underwent an exploratory laparotomy with adhesiolysis in March 2025. She has no known drug allergies and her immunization status is complete.

Child Q: A 15-year-old girl from Musi Rawas, an only child. Both parents have completed high school education. She has no prior

surgical history, and her immunizations are incomplete. There is a maternal family history of heart disease.

Table 1

Clinical Findings at Initial Assessment

Parameter	Patient Child N (14 years old)	Patient Child Y (16 years old)	Patient Child Q (15 years old)
General Condition	Weak, pale, responsive, easily fatigued	Weak, pale, cooperative, bedridden	Weak, pale, nauseated, cooperative
Vital Signs	Temp: 38.3°C (Hyperthermia)	Temp: 36.7°C	Temp: 36.7°C
	HR: 117 bpm (Tachycardia)	HR: 109 bpm	HR: 98 bpm
	BP: 98/72 mmHg	BP: 110/88 mmHg	BP: 110/70 mmHg
	RR: 20 bpm	RR: 20 bpm	RR: 21 bpm
Nutritional Status	Weight: 34 kg, Height: 150 cm BMI: 15.1 (Thin)	Weight: 17 kg, Height: 145 cm BMI: 8.09 (Severely Underweight)	Weight: 50 kg, Height: 160 cm BMI: 19.5 (Normal)
Skin & Mucosa	Warm skin, pale mucosa, conjunctival pallor	Dry skin, pallor, conjunctival pallor. Abscess in the left retroperitoneal area (post-DJ stent).	Hyperpigmented reddish-to-blackish macules on the body, hands, feet, and palms; pruritic and painful; pale oral mucosa.
Systemic Findings	Heart sounds (S1-S2) are normal; breath sounds are vesicular.	Heart sounds (S1-S2) are normal; breath sounds are vesicular.	Heart sounds (S1-S2) are normal; breath sounds are vesicular.
Key Lab Results	Hb: 10.3 g/dL (Mild anaemia)	Hb: 10.2 g/dL (Mild anaemia)	Hb: 13.9 g/dL (Normal)
	Leukocytes: 21.2 x10 ³ /μL (Leucocytosis)	Erythrocytes: 28% (Low)	Leukocytes: 12.6 x10 ³ /μL (Elevated)
	ESR: 34 mm/hr (Increased)	Albumin: 3.9 g/dL	Albumin: 3.4 g/dL (Low normal)
	Albumin: 2.9 g/dL (Hypoalbuminemia)	Potassium: 2.3 mEq/L (Hypokalaemia)	Urea: 94 mg/dL, Creatinine: 1.13 mg/dL (Mild renal impairment)
Primary Concern	Fever with a history of seizures, significant weight loss, and decreased appetite.	Severe malnutrition, abdominal abscess, and generalized weakness requiring assistance.	Chest X-ray: Cardiomegaly with normal lungs. Widespread skin lesions, nausea/vomiting, decreased appetite, and laboratory signs of mild renal impairment.

A common challenge reported across all cases was persistent difficulty in monitoring symptoms and maintaining consistent medication adherence. Furthermore, the families reported limited understanding of effective SLE self-management strategies, highlighting a key area for nursing intervention

b. Clinical Findings

The significant physical examination and clinical findings for the three patients at initial presentation are summarized in the table 1. Key common findings included generalized weakness, pallor, and varied nutritional deficits. Each patient presented with distinct SLE manifestations, including hyperthermia, severe underweight status

with an abdominal abscess, and widespread hyperpigmented skin lesions with renal involvement.

c. Timeline

The chronological milestone of this episode of care is organized into a structured combination of hospital-based and home-based phases. The total duration of the monitored intervention for each patient spanned a 4-week period, which was initiated during their inpatient stay at Hospital in Palembang, and subsequently extended into a remote home-based phase.

As detailed in Table 2, each patient followed a specific clinical trajectory. Child N was admitted to the hospital on March 28, 2025, due to acute fever and seizures. Following

stabilization, a preliminary needs assessment interview was conducted from April 4–6, 2025. The intensive digital health intervention began on April 7, 2025, with the initial nursing assessment and the formal introduction of the "Lupie Diary" application. Over a 3-day hospital-based phase (April 7–10, 2025), structured nursing interventions and hands-on application training were conducted. On April 10, 2025, a post-intervention evaluation was performed using the Q-SLAQ instrument and medication adherence tracking, prior to her hospital discharge.

Child Y was admitted earlier on February 12, 2025, presenting with SLE complicated by an abdominal abscess, which required a laparotomy and adhesiolysis surgical intervention on March 3, 2025. Once the patient achieved post-surgical stability, the initial nursing assessment and "Lupie Diary" introduction were initiated on April 6, 2025. The 3-day intensive inpatient intervention and app training took place from April 6–9,

2025, culminating in a post-intervention evaluation (Q-SLAQ and wound assessment) on April 9, 2025, ahead of discharge.

Child Q was admitted on July 2, 2025, presenting with severe skin lesions and nausea. The initial nursing assessment and digital app introduction were executed on July 10, 2025. The 3-day in-hospital care and structured application training were provided from July 10–13, 2025, with the post-intervention evaluation completed on July 13, 2025.

For all three patients, the initial 3-day hospital-based training served as the foundation for a continuing home-based phase. Following their respective discharge dates, the nursing team conducted weekly remote tele-monitoring and application-engagement evaluations for the remainder of the 4-week intervention period to ensure sustainable self-management and long-term treatment adherence.

Table 2

Clinical Timeline of Patient Care

Patient	Date	Event / Intervention
Child N	Mar 28, 2025	Hospital admission (fever, seizure)
	Apr 4–6, 2025	Preliminary interview (needs assessment)
	Apr 7, 2025	Initial nursing assessment; Lupie Diary introduction
	Apr 7–10, 2025	3-Day Intensive Phase: Inpatient nursing interventions & Lupie Diary training
	Apr 10, 2025	Post-intervention evaluation (Q-SLAQ, adherence check) & Hospital Discharge
	Apr 11 – May 8, 2025	4-Week Extended Phase: Remote home-based tele-monitoring and app-engagement follow-up
Child Y	Feb 12, 2025	Hospital admission (SLE with abscess)
	Mar 3, 2025	Surgical intervention (Laparotomy + adhesiolysis)
	Apr 6, 2025	Initial nursing assessment; Lupie Diary introduction
	Apr 6–9, 2025	3-Day Intensive Phase: Inpatient nursing interventions & Lupie Diary training
	Apr 9, 2025	Post-intervention evaluation (Q-SLAQ, wound assessment) & Hospital Discharge
	Apr 10 – May 7, 2025	4-Week Extended Phase: Remote home-based tele-monitoring and app-engagement follow-up
Child Q	Jul 2, 2025	Hospital admission (skin lesions, nausea)
	Jul 10, 2025	Initial nursing assessment; Lupie Diary introduction
	Jul 10–13, 2025	3-Day Intensive Phase: Inpatient nursing interventions & Lupie Diary training
	Jul 13, 2025	Post-intervention evaluation (Q-SLAQ, symptom review) & Hospital Discharge
	Jul 14 – Aug 11, 2025	4-Week Extended Phase: Remote home-based tele-monitoring and app-engagement follow-up

d. Diagnostic Assessment

A comprehensive evaluation was conducted for each patient, integrating physical examination findings, clinical history, and symptom reports. The final nursing diagnoses were formulated using the Indonesian Nursing Diagnosis Standards (SDKI, 2017) and are presented below.

Patient Child N (14-year-old female)

1. Hyperthermia related to the disease process, as evidenced by fever (38.3°C), tachycardia (117 bpm), warm skin, and reported weakness.
2. Nutritional deficit related to inadequate intake, as evidenced by significant weight loss (39 kg to 34 kg), low BMI (15.1), decreased appetite, and pallor.
3. Readiness for Enhanced Health Management as evidenced by expressed motivation to learn self-management and openness to using digital tools like the Lupie Diary application.

Patient Child Y (16-year-old female)

Nutritional Deficit related to inadequate intake, as evidenced by severe underweight status (BMI 8.09), minimal food consumption, and generalized weakness.

1. Impaired Skin Integrity related to an infectious process, as evidenced by a gauze-covered abscess in the left retroperitoneal area.
2. Activity Intolerance related to generalized weakness, as evidenced by fatigue, dependency on caregivers, and a notable increase in pulse (95 to 115 bpm) with minimal activity.
3. Readiness for Enhanced Health Management as evidenced by patient and family interest in using the Lupie Diary app for medication reminders and health tracking.

Patient Child Q (15-year-old female)

1. Nausea related to pharmacological effects and gastric irritation, as evidenced by frequent nausea/vomiting, loss of appetite, and associated weakness.
2. Impaired Skin Integrity related to inflammatory process, as evidenced by the presence of widespread reddish-to-blackish hyperpigmented macules on the body and extremities, accompanied by itching.

3. Readiness for Enhanced Health Management as evidenced by patient's existing disease knowledge and active interest in learning to use the Lupie Diary application for better symptom and medication management.

e. Therapeutic Interventions

The clinical management of the three pediatric patients integrated conventional medical therapies with standard nursing care and digital health technology. Medical and surgical therapies were tailored to each patient's clinical presentation, while nurse-led care systematically focused on symptom management, education, and the structured implementation of the "Lupie Diary" application.

To address the clinical complexities comprehensively, the holistic care provided over the 3-day intensive hospital phase is categorized into three major dimensions: (1) Medical and Surgical Therapeutics, (2) Preventive Measures and Support, and (3) Standardized Nursing Interventions integrated with mHealth training.

1. Medical and Surgical Therapeutics

Pharmacologic interventions were tightly tailored to individual disease activity, encompassing systemic immunosuppressants, targeted antibiotics, antiemetics, and supportive medications. The complete pharmacologic profiles for all three patients are detailed in Table 3 below. Additionally, specific surgical intervention was required only for Patient Child Y, who underwent a laparotomy and adhesiolysis to resolve an abdominal abscess secondary to pSLE complications, as documented in the baseline clinical history.

2. Preventive Measures and Nutritional Support

Preventive strategies were vital to mitigate the risk of severe infections and flare-ups. These measures included reverse isolation for immunosuppressed states, strict infection prevention protocols, tailored nutritional support to manage deficits, and the strict avoidance of known environmental triggers (such as direct UV exposure).

Table 3

Pharmacologic management was tailored to each patient's clinical presentation

Patient	Medication Category	Specific Medication & Dosage	Route	Frequency	Duration	Indication/Rationale
Child N	Analgesic/Antipyretic	Paracetamol 510 mg	Oral	Every 8 hours	3 days	Reduce fever and discomfort
	Immunosuppressant	Methylprednisolone*	IV/Oral*	As prescribed	Ongoing	Control SLE inflammation
	Antibiotics	Cefazolin, Gentamicin*	IV*	As prescribed	As indicated	Prevent/treat infection
Child Y	Nutritional Support	Albumin 25%	IV	Daily	3 days	Correct hypoalbuminemia
	Electrolyte Replacement	Potassium Chloride (KCl)	IV	As needed	3 days	Correct hypokalemia (2.3 mEq/L)
	Immunosuppressant	Methylprednisolone*	IV/Oral*	As prescribed	Ongoing	SLE disease control
Child Q	Antiemetic	Ondansetron 8 mg	IV	Every 8 hours	3 days	Control nausea/vomiting
	Topical Corticosteroid	Mometasone cream 0.01%	Topical	Every 12 hours	3 days	Reduce skin inflammation
	Antibiotic	Ampicillin sodium, Metronidazole*	IV*	As prescribed	As indicated	Infection prophylaxis

*Based on hospital medication records; specific doses not documented in nursing notes.

3. Chronological 3-Day Nursing Sequence and "Lupie Diary" Integration

To clarify the operational role of the "Lupie Diary" application, it is critical to note that the mobile application itself does not contain clinical menus for surgical or advanced pharmacologic prescriptions. Rather, the application features an interface specifically designed for daily symptom logging (fever, pain, skin lesions) and medication adherence reminders.

During the 3-day inpatient training phase, nurses did not use the application to input hospital charts; instead, patients and their families utilized the app under direct nursing supervision. Nurses reviewed the digital notes daily to validate the family's data-logging accuracy and to map clinical trends. The systematic nurse-led intervention from Day 1 to Day 3 was executed through the following sequential structure:

Day 1: Initial Assessment and Application Orientation

Nurses conducted the baseline physical and diagnostic evaluations using the Indonesian

Nursing Diagnosis Standards (SDKI). Following the clinical assessment, the "Lupie Diary" application was formally introduced to the patient and primary caregiver. The nurse assisted with installation, established user profiles, and pre-programmed the medication schedules into the app's reminder system based on the regimens in Table 3.

Day 2: Guided Symptom Logging and Clinical Interventions

While nurses delivered targeted clinical nursing care (such as hyperthermia management, nausea control, and sterile wound care for Child Y's surgical site), they concurrently guided the patients in tracking these exact signs and symptoms within the app. Families practiced real-time logging of pain levels, low-grade fevers, and fluid intake to overcome digital literacy barriers.

Day 3: Independent Trial, Competency Evaluation, and Discharge Planning

Patients and caregivers performed independent symptom logging and acknowledged medication alerts without active prompting. Nurses evaluated the family's engagement and logging accuracy against the hospital's hardcopy charts. Prior to discharge, a post-intervention evaluation

was finalized using the Q-SLAQ instrument to establish baseline self-management scores.

The comprehensive overview of nursing diagnoses according to SIKI (2018) is summarized in Table 4. The specific, step-by-step nursing interventions mapped directly to the "Lupie Diary" implementation

features are detailed in Table 5. Clinical modifications, rationales, and therapeutic adjustments based on the logged trends are outlined in Table 6.

Finally, the pre-and-post clinical progression, including the documented changes in Q-SLAQ scores and overall disease activity assessment across the 4-week study, are detailed in Table 7.

Table 4

Nursing Interventions Implementation Summary

Patient	Priority Interventions	Key Activities
Child N	1. Hyperthermia Management 2. Nutritional Support 3. Digital Health Education	• Temp monitoring q4h • Oral fluid ≥ 2000 mL/day • Small frequent meals (6x/day) • Lupie Diary training
Child Y	1. Wound Care 2. Nutritional Rehabilitation 3. Activity Management 4. Digital Literacy	• Sterile dressing changes • Weight monitoring daily • Graduated activity plan • Family-shared app training
Child Q	1. Nausea Control 2. Skin Integrity Care 3. Self-Management Education	• Ondansetron 8 mg IV q8h • Mometasone cream application • Symptom tracking training • Meal positioning education

Table 5

Lupie Diary-Specific Nursing Interventions

App Feature	Nursing Intervention	Evaluation Method
Symptom Tracker	Teach daily logging using VAS	Patient completes 3 consecutive daily logs
Medication Reminder	Set up alarm schedule	Patient demonstrates alarm response
Medical Records	Document lab results & visits	Patient retrieves stored information
Flare Alert	Educate on warning signs	Patient identifies when to seek help
Data Sharing	Set up family access	Family member sends test report

Table 6

Intervention Modifications and Rationale

Day	Patient	Modified Intervention	Previous Protocol	Rationale
2	Child N	Oral fluid target: 2500 mL/day	2000 mL/day	Persistent fever (38.0°C) and tachypnea indicated increased fluid needs
2	Child Y	Activity plan: Reduced sitting time from 30 to 20 minutes	30 minutes continuous	Fatigue score 7/10 on the Borg scale after 20 minutes
3	Child Q	Ondansetron timing: 30 minutes before meals	As scheduled (q8h)	Persistent nausea reported 30-60 minutes post-meal
3	Child Y	Dressing change: Twice daily	Once daily	Increased serous drainage noted on day 2 assessment
3	All	Lupie Diary training: Added family practice session	Patient-only training	Family requested hands-on practice for home care

Table 7.

Q-SLAQ Score Changes and Disease Activity Assessment

Patient	Day 1 (Pre)	Activity	Day 3 (Post)	Activity	Δ Score	Remarks
Child N	4	Mild	2	Very Mild	↓ 2	Improved self-management post-app education
Child Y	16	Mod–Sev	5	Very Mild	↓ 11	Best responder; app-enhanced symptom control
Child Q	14	Moderate	5	Very Mild	↓ 9	Independent app use for tracking & reminders

Note: Q-SLAQ scores were assessed using the Quick Systemic Lupus Activity Questionnaire; a decrease in score indicates improvement in disease activity.

f. Follow-up and Outcomes

Patient and Family Evaluated Outcomes

Patients and families completed a nursing care satisfaction survey and digital health usability assessment. Satisfaction scores averaged 4.6/5 across all nursing domains, with particular appreciation for the Lupie Diary training and family involvement strategies. Families reported increased confidence in managing SLE symptoms at home and valued the structured approach to medication reminders and symptom tracking.

Clinical Outcomes and App Effectiveness

The attending physician and clinical nurse specialist conducted independent evaluations using standardized nursing outcome criteria (SLKI). All patients met or

exceeded expected short-term outcomes for their respective nursing diagnoses. Specifically, the integration of the "Lupie Diary" digital health tool proved highly effective in promoting self-management and enhancing both treatment adherence and patient engagement.

To evaluate the clinical outcomes that the authors initially expected from this digital implementation, progress was measured across three parameters: symptom tracking consistency, medication adherence rate, and perceived disease activity via the Quick Systemic Lupus Activity Questionnaire (Q-SLAQ). The empirical results demonstrating the direct impact of the "Lupie Diary" application over the evaluation period are systematically outlined in Table 8.

Table 8

Q-SLAQ Score Changes, Adherence Rates, and Disease Activity Assessment

Patient	Baseline (Day 1)	Expected Outcome (Author's Goal)	Post-Intervention (Week 4)	Medication Adherence Rate	Clinical Remarks & App Impact
Child N	Q-SLAQ: 4 <i>(Mild Activity)</i>	• Q-SLAQ 3 • Adherence 80%	Q-SLAQ: 2 <i>(Very Mild Activity)</i>	92.8% <i>(High Adherence)</i>	Successfully mastered daily fever and seizure logging; alarms eliminated forgotten oral doses.
Child Y	Q-SLAQ: 16 <i>(Mod–Sev Activity)</i>	• Q-SLAQ 10 • Adherence 80%	Q-SLAQ: 5 <i>(Very Mild Activity)</i>	96.4% <i>(High Adherence)</i>	Exceptional engagement; used the app to track post-laparotomy wound pain and fluid intake.

Patient	Baseline (Day 1)	Expected Outcome (Author's Goal)	Post-Intervention (Week 4)	Medication Adherence Rate	Clinical Remarks & App Impact
Child Q	Q-SLAQ: 14 (Moderate Activity)	• Q-SLAQ 8 • Adherence 80%	Q-SLAQ: 5 (Very Mild Activity)	89.2% (High Adherence)	Independent app navigation; effectively logged nausea triggers and timed mometasone application.

Note: Q-SLAQ scores range from 0 to 30; a decrease in score indicates a reduction in perceived disease activity. Adherence rate was calculated based on logged medication confirmations against prescribed doses.

Descriptive Result Narrative

The descriptive data from the 4-week application tracking revealed significant improvements that aligned with the authors' clinical expectations. Prior to the intervention, families reported frequent anxiety regarding medication complexities and often missed subtle flare warning signs. By transitioning to the "Lupie Diary" platform, the concrete results achieved are as follows:

1. Symptom Tracking and Disease Activity
As shown in Table 7, all three patients exhibited a clinical down-trending in their Q-SLAQ scores. Child Y demonstrated the most remarkable response, with her score dropping from 16 to 5, indicating a shift from moderate-severe activity to very mild, well-controlled status. This drop directly correlates with the family's ability to log post-surgical complications and symptom flares in real-time, allowing for rapid nursing tele-consultation.
2. Medication Adherence
The target adherence rate expected by the authors was set at a minimum of 80%. Post-intervention data showed that all patients exceeded this benchmark, with adherence rates reaching 92.8% (Child N), 96.4% (Child Y), and 89.2% (Child Q). The automated push-notification reminders effectively eliminated "forgetfulness"—the primary barrier to compliance identified during the initial Day 1 assessment.
3. Patient and Family Engagement
Narratively, the application transformed the caregivers from passive recipients of instructions into active health managers. The family data-sharing feature allowed parents to stay informed, ensuring a collaborative family-centered care environment at home.

Unforeseen Events in Nursing Care

No serious adverse events related to nursing interventions occurred. Child Y experienced mild discomfort during position changes on day 2, which was addressed with additional padding and slower transition techniques. Child Q reported initial difficulty navigating the Lupie Diary interface, resolved through additional one-on-one training sessions. These minor challenges were documented and addressed through care plan adjustments.

Documentation and Continuity of Care

Complete nursing documentation was maintained using SOAP format, with all interventions, responses, and modifications recorded. Discharge nursing summaries included specific recommendations for continued self-management using Lupie Diary, follow-up care requirements, and emergency contact information. The nursing handover process incorporated digital health competency assessment to ensure continuity of care.

Nursing Implications

The implementation of "Lupie Diary" provides two critical implications for health service delivery:

Interdisciplinary Integration: Although implemented as a nurse-led tool, the application serves as a data bridge connecting nurses, pediatric rheumatologists, and pharmacists. The objective daily symptom logs and adherence rates eliminate patient recall bias during outpatient check-ups, enabling the interdisciplinary medical team to make rapid, data-driven treatment adjustments.

Home Care and Health Service Continuity: The application is highly applicable for home-based care. By utilizing the family data-sharing and automated flare alert features, families can actively track symptoms at home, bridging the geographical gap between home-centered care and tertiary hospital services. This

creates a continuous, integrated health network essential for long-term pSLE management in low-resource settings.

Discussion

1. Integration of Findings within the Broader Research Framework

This case series demonstrates the successful integration of the mobile health application Lupie Diary into nursing care for pediatric patients with SLE in a resource-limited hospital in Indonesia. The findings align with the growing body of evidence supporting digital health interventions for chronic disease management and highlight the critical role of nurse-led education and family engagement. The significant reduction in Q-SLAQ scores across all three patients provides quantitative evidence that structured self-management support, combined with digital tools, can improve disease control even during short intervention periods. These outcomes are consistent with the Self-Management Framework for Chronic Illness, which emphasizes patient empowerment, education, and technological enablement as key components for improving health outcomes in chronic conditions.

2. Accuracy, Validity, and Uniqueness of the Case

The accuracy of this case report is supported by systematic data collection using standardized nursing tools (SDKI, SLKI, SIKI), validated instruments (Q-SLAQ), and real-time documentation via the Lupie Diary application. The temporal relationship between intervention implementation and clinical improvement was carefully documented, with daily assessments showing progressive positive changes. The uniqueness of this case lies in its context-specific approach: it is among the first documented implementations of a locally developed mHealth application for paediatric SLE in Indonesia, where digital health adoption remains limited despite high mobile penetration. Furthermore, integrating digital literacy training into standard nursing care represents an innovative approach to addressing the digital divide in low-resource settings.

3. Critical Assessment of Literature Alignment

The findings strongly align with international research on mHealth for SLE management. Bell et al. (2022) demonstrated that electronic

patient-reported outcome tools improve adherence and data reliability in SLE patients, findings that parallel our findings of improved medication-tracking consistency. Similarly, Canal-Pérez et al. (2024) systematically reviewed e-Health interventions for SLE and found consistent improvements in disease management and quality of life, supporting our observed clinical improvements. However, our case adds the important dimension of pediatric- and family-centered care, which is underrepresented in the existing literature, which predominantly focuses on adult populations.

The local Indonesian context presents both challenges and opportunities that are not fully addressed in the international literature. While Sheba et al. (2018) identified barriers to medication adherence among Indonesian SLE patients, our case demonstrates how technology, when combined with culturally appropriate nursing support, can address these barriers. The SWOT analysis by Hutapea & Marulitua (2025) accurately predicted the infrastructure and literacy challenges we encountered, but our successful implementation suggests these barriers can be overcome with targeted strategies.

4. Case Limitations and Their Implications

Several limitations must be acknowledged:

- a) Short Follow-up Period:** The 3-day intervention period, while showing significant improvement, is insufficient to assess long-term sustainability of behavior change or clinical outcomes.
- b) Small Sample Size:** Three cases provide valuable insights but limit generalizability and statistical power.
- c) Selection Bias:** Patients and families willing to participate in digital health interventions may be more motivated or technologically literate than the general paediatric SLE population.
- d) Resource Limitations:** The study was conducted in a single center with specific resource constraints that may not represent all Indonesian healthcare settings.
- e) Measurement Limitations:** While Q-SLAQ is validated for SLE activity assessment, additional objective measures (laboratory markers, physician assessments) would strengthen the findings.

5. Special Contributions and Recommendations.

a) Special Contributions:

1. This study demonstrates a feasible nurse-led mHealth integration model in a resource-limited paediatric setting in Indonesia.
2. It provides a structured framework for digital literacy training and family engagement led by nurses.
3. It offers evidence that culturally adapted, locally developed applications like Lupie Diary can enhance self-management in paediatric SLE.
4. It shows that even brief, intensive digital health interventions can yield measurable improvements in adherence and symptom tracking.

b) Recommendations:

1. Integrate Lupie Diary or similar mHealth applications into standard pediatric SLE care protocols in Indonesian hospitals.
2. Incorporate digital health literacy training into nursing education curricula to prepare nurses for technology-integrated care.
3. Prioritize family-centered design and offline functionality in future mHealth development for low-connectivity settings.
4. Develop hybrid care models that combine digital tools with regular in-person nursing follow-up for sustainable chronic disease management.

Patient perspective

All three patients and their families reported positive experiences using the Lupie Diary application. Patients appreciated the medication reminders and symptom-tracking features, which helped them feel more organized and in control of their SLE management. Child.N stated, "I no longer worry about forgetting my medicine."

Family members noted improved communication and reduced anxiety. The mother of Child.Y shared, "The app helps us stay on track without constant reminders." All users felt more confident after nurse-led training and reported no significant difficulties using the application.

Informed Consent

Written informed consent was obtained from all patients and their guardians before implementing the Lupie Diary intervention and publishing this case. Consent forms were

provided in Bahasa Indonesia, explaining the purpose, procedures, and confidentiality measures. Patients were assured of their right to withdraw at any time without affecting care. All data were anonymized to protect privacy. This study adhered to the ethical principles outlined in the Declaration of Helsinki and the Indonesian Nursing Code of Ethics.

Conclusion

This case report demonstrates that the nurse-facilitated integration of the mobile health application "Lupie Diary" can support self-management and improve medication adherence in pediatric patients with Systemic Lupus Erythematosus in a resource-limited setting. The intervention was associated with reduced disease activity scores, increased family engagement, and enhanced patient confidence in managing a complex chronic condition. While these findings are promising, they are derived from a small case series and should be interpreted with caution. Further research with larger samples and controlled designs is needed to establish efficacy. Nonetheless, this experience suggests that nurses can play a pivotal role in implementing digital health tools within family-centered care models. Clinicians should consider incorporating structured mHealth training into pediatric chronic disease management, with attention to digital literacy, cultural relevance, and sustainable support. The knowledge gained reinforces the importance of innovation in nursing practice to bridge gaps in continuity of care for children with long-term health needs.

Consent for publication

Written informed consent was obtained from the patient's legal guardian for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor in Chief of this journal.

Declarations

Ethics approval and consent to participate

The authors confirm that all appropriate patient consent forms have been attained. The patient and his guardians consented to the publication of images and other de-identified clinical information. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed. The patient and his guardians completed and signed an

informed consent. The ethical standards outlined in the Declaration of Helsinki were upheld.

Funding

There was no funding for this case study.

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