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## ORIGINAL ARTICLE

# Impact of a mobile application-based home care nursing program on patients' quality of life and family burden

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### KEYWORDS

Mobile application-based home care nursing; Quality of life; Healthy lifestyle; Family burden; Post-discharge

### Abstract

**Objective:** This study aims to identify the effectiveness of a mobile application-based home care nursing service in improving patient quality of life and healthy lifestyle and reducing the family burden.

**Methods:** This study was a clinical trial with a pre- and post-test control group design. The accessible population in this study was post-discharge patients from general hospitals in West Kalimantan and East Kalimantan, Indonesia, who required home care nursing. We allocated a selected sample of 40 people to the intervention group and 40 people to the control group using a randomized block design. We gave mobile application-based home care nursing to the intervention group and community health nursing care to the control group. This study was conducted in 10 months (January–October 2022). We measure the patient quality of life, healthy lifestyle, and family burden before and 3 months after the intervention.

**Results:** There was no significant difference in the post-test quality of life between the two groups ( $p = 0.187$ ), but there was a significant difference in the psychological ( $p = 0.014$ ) and environmental health ( $p = 0.021$ ) domain of quality of life. There was no significant difference in the post-test of a healthy lifestyle between the two groups ( $p = 0.083$ ). There was a significant difference in the post-test family burden between the two groups ( $p = 0.015$ ).

**Conclusion:** Mobile Application-Based Home Care Nursing is effective in improving patient quality of life in the psychological and environmental health domains and reducing the family burden for post-discharge patients.

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## PALABRAS CLAVE

Enfermería de atención domiciliaria basada en aplicaciones móviles; Calidad de vida; Estilo de vida saludable; Carga familiar; Post alta

## Impacto de un programa de enfermería de atención domiciliaria basado en aplicaciones móviles en la calidad de vida de los pacientes y la carga familiar

### Resumen

**Objetivo:** Este estudio tiene como objetivo identificar la efectividad de un servicio de enfermería de atención domiciliaria basado en una aplicación móvil para mejorar la calidad de vida y el estilo de vida saludable del paciente y reducir la carga familiar.

**Métodos:** Este estudio fue un ensayo clínico con un diseño de grupo de control antes y después de la prueba. La población accesible en este estudio eran pacientes después del alta de hospitales generales en West Kalimantan y East Kalimantan, Indonesia, que requerían cuidados de enfermería en el hogar. Asignamos una muestra seleccionada de 40 personas al grupo de intervención y 40 personas al grupo de control mediante un diseño de bloques aleatorios. Brindamos atención de enfermería domiciliaria basada en aplicaciones móviles al grupo de intervención y atención de enfermería de salud comunitaria al grupo de control. Medimos la calidad de vida del paciente, el estilo de vida saludable y la carga familiar antes y tres meses después de la intervención.

**Resultados:** No hubo diferencia significativa en la calidad de vida posterior a la prueba entre los dos grupos ( $p=0,187$ ), pero hubo una diferencia significativa en el dominio de calidad de vida psicológica ( $p=0,014$ ) y de salud ambiental ( $p=0,021$ ). No hubo diferencia significativa en el post-test de estilo de vida saludable entre los dos grupos ( $p=0,083$ ). Hubo una diferencia significativa en la carga familiar posterior a la prueba entre los dos grupos ( $p=0,015$ ).

**Conclusión:** La enfermería de atención domiciliaria basada en aplicaciones móviles es eficaz para mejorar la calidad de vida del paciente en los dominios de salud psicológica y ambiental y reducir la carga familiar para los pacientes después del alta.

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## What is known?

- Mobile application-based home care nursing can improve patient quality of life in the psychological and environmental domains and reduce the family burden.
- The use of mobile applications in home care nursing makes it easier for patients to order nursing services, facilitate communication among nurses, and document the nursing process.

## What it contributes?

Mobile application-based home care nursing is an alternative to post-hospital discharge follow-up care in cases of chronic illness and disability that require long-term care.

## Introduction

Hospital-based services, through a tiered referral system, are adequate to provide health services in the acute, sub-acute, and rehabilitation phases in hospitals in Indonesia. Likewise, post-hospital care programs and return referrals from the hospital to the public health center (PHC) have

been well programmed. The problem that arises is that many patients and their families do not return to the hospital for rehabilitation and re-control. A study showed only 23.6% of stroke patients adhered to routine hospital checks after discharge.<sup>1</sup> Various reasons are disability problems making it difficult to visit hospitals, cost problems, lack of information about the types of services, and fear of contracting COVID-19 in hospitals. As a result, post-hospital services are often neglected, which prolongs the rehabilitation and recovery process, patient productivity and quality of life do not reach optimal levels, and the family burden increases. On the other hand, the number of cases of non-communicable diseases is increasing, followed by re-emerging diseases such as COVID-19, which is endemic at this time, so it is necessary to expand post-discharge services.

Health practice regulations in Indonesia authorize home care by health professionals such as doctors and nurses. Home care is currently a part of service that cannot be separated from clinic or hospital services. Unfortunately, the information received by the community so far is still focused on hospital services, while home care services remain limited. For this reason, adequate information on home care nursing services is needed so that people can easily access them. We have not found a home care nursing model that is carried out by professional nurses, led by a case manager and collaborating with other health professionals, that uses applications for online service ordering, online nursing care documentation, and online patient progress information. Home care nursing services are still carried out conventionally and manually in Indonesia today. Patients and families

who need home care services such as post-surgical care, wound care, and elderly care at home seek through various media to get home care nursing services. If they are new residents in the area, it will be very difficult to get information about the availability of home care nursing services. In addition, home care services are not well organized in terms of service management, service procedures, and documentation. Documentation of nursing care for home care services so far has not been properly carried out, including in medical records and patient care histories.

The development of home care began in 1974 in Indonesia, focusing on providing nutritious food to the elderly by health workers. However, the use of case managers in home care nursing services began at Home Care Practice Cahaya Husada East Kalimantan in 2008. The case manager is part of the home care nursing management whose role is to assess patient health problems, develop nursing care plans, decide on patient care, and make agreements regarding the services that received by the patient and family. The agreement includes the type of service, type of equipment, and length of service provision. Case managers also coordinate the implementation of nursing care and carry out nursing evaluations.

An integrative literature review shows that there are 64 types of home care-based services that have been carried out worldwide (2009–2019 publications).<sup>2</sup> Most home care services are provided by nurses (73.4%), the most prevalent types of services are telepharmacy and drug delivery to patients' homes (35.9%), and 40% of interventions are in the form of a specific treatment or medical device assistance.<sup>2</sup> In this study, we developed an intervention called e-home care nursing (e-HCN), which is a model of health care carried out by professional nurses, led by a case manager, given to post-discharge patients for chronic disease, disabilities, postoperative, and chronic wounds, and for those who need assistance in daily activities. This intervention model delivery is in the form of promotive, preventive, and rehabilitative, supported by online applications, which connect service providers, professional nurses, and patients/families to order services, consult, follow-up, and evaluate. Ordering services online will increase patient and family access to health services, as they are able to get professional nurse services quickly. The use of online applications in documenting nursing care makes it easy for case managers to monitor patient progress and expedite nursing orders. Likewise, the use of online applications in home care nursing makes it easier for nurses to communicate with case managers or colleagues regarding patient condition. They do not have to be in direct contact to report patient condition to the case manager or his colleagues. This study aims to identify the effectiveness of the e-HCN service model on patient quality of life, healthy lifestyle, and family burden.

## Methods

### Design

This research is a clinical trial with a pre- and post-test control group design. We conducted a pre-test to measure patient quality of life, healthy lifestyle, and family burden in both groups before intervention. We then treated both

groups according to the intervention protocol. The post-test was conducted 3 months after the intervention to measure the same variables as the pre-test.

### Setting and data collection

We use the single-blind principle in the measurement, in which the observers are not involved in providing the intervention and do not know to which group the sample is allocated. The instruments used in the research include:

- World Health Organization Quality of Life (WHOQoL-BREF) to measure patient quality of life, which consists of 26 questions and four domains, including physical (7 items), psychological (6 items), social (3 items), environmental (8 items), and 2 additional items related to the patient's view of the quality of life and satisfaction with their current health. Each item is given a score of 1–5, then the final score in each domain is converted into a score of 0–100. The physical domain includes mobility, activities of daily living, functional capacity, energy, pain, and sleep. The psychological domain includes self-image, negative thoughts, positive attitudes, self-esteem, mentality, learning ability, concentration, memory, religiosity, and mental status. The social domain includes personal relationships, social support, and sexual behavior. The psychometric test of this questionnaire shows excellent internal consistency and goodness of fit, so it is appropriate to be used for clinical trials to assess patient quality of life.<sup>3–5</sup> Internal consistency in the physical domain shows a Cronbach alpha coefficient of 0.79, the psychological domain is 0.82, the social domain is 0.81, and the environmental domain is 0.83. Good concurrent validity is indicated by the low QoL value in patients with chronic disease conditions compared to patients without chronic conditions.<sup>3</sup>
- The Simple Lifestyle Indicator Questionnaire (SLIQ) was used to measure patient healthy lifestyle, which consisted of 12 items related to dietary behavior, physical activity, alcohol consumption habits, smoking habits, and stress. Test-retest reliability on the 12 items resulted in a score between 0.63–0.97, and the correlation coefficient of participant healthy lifestyles compared to blinded raters was 0.77.<sup>6</sup>
- The Caregiver Burden Scale (CBS) was used to measure the family burden in caring for patients at home. The CBS psychometric test showed good internal consistency and convergent validity. The overall Cronbach alpha coefficient is 0.92, while the subscale is between 0.69–0.87.<sup>7</sup> The test-retest reliability of each subscale of this questionnaire shows a score between 0.745–0.900.<sup>8</sup>

### Sample

We developed a mobile application-based home care nursing model in January–December 2021. We conducted a study to determine the effectiveness of this intervention from January–October 2022. The sample in this study was post-discharge patients from two government general hospitals in Pontianak City (West Kalimantan Province), and Samarinda City (East Kalimantan Province), Indonesia, with

eligibility criteria: a) 30–60 years old, b) requiring follow-up care at home, including post-digestive surgery nursing care, chronic diseases nursing care (diabetes mellitus, heart failure, kidney failure), diabetic wound care, or post-stroke with disabilities, and c) requiring basic self-care assistance in the minimal or partial dependency category. We used Barthel's index to measure the level of dependence on basic self-care.

We used a consecutive sampling method to select the sample in this study. Post-discharge patients who met the eligibility criteria were used as respondents. The total respondents in this study were 80 people, consisting of four categories, including 20 diabetic ulcer patients, 20 post-digestive surgery patients, 20 chronic disease patients (diabetes mellitus, heart failure, or kidney failure), and 20 post-stroke patients with disabilities. To maintain equality of cases between groups, we randomly assigned the selected respondents to the intervention group (A) and control (B) using a randomized block design with two block sequences for each type of case (10 patients per category per group). Based on the random number table, if random numbers 0–4 appeared, the order of sample allocation was A-B (intervention-control), while for numbers 5–9, the order of sample allocation was B-A (control-intervention).<sup>9</sup>

We used the sample size formula to test the hypothesis for the difference between two independent population means:<sup>10</sup>

$$n1 = n2 = \frac{2\sigma^2(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{(\mu_1 - \mu_2)^2} = \frac{2(10.4)^2(1.96 + 0.84)^2}{(43.8 - 37.1)^2} = 38$$

Based on the alpha ( $\alpha$ ) value of 5% ( $z = 1.96$ ), power of test by 80% ( $z = 0.84$ ), the mean value ( $\mu_2$ ) of quality of life in the control group from previous studies was 37.1, standard deviation ( $\sigma$ ) of quality of life from previous studies was 10.4, the predicted mean quality of life for the intervention group ( $\mu_1$ ) was 43.8, and the number of samples obtained was 38 people per group (total 76 samples). We corrected the sample size by 5% to anticipate sample drop out or loss of follow-up, bringing the total number of samples to 80 people (40 samples per group).

## Procedure

### Intervention

Mobile application-based home care nursing (e-HCN) is a home care service carried out by professional nurses, led by a case manager, which is provided to patients and their families who need nursing services in cases of chronic illness, disability, post-surgery, and acute/chronic injuries, in the form of health promotion, secondary prevention, rehabilitation, and fulfillment of basic needs, using an electronic online application that connects providers, professional nurses, and patients/families. The online application is used by patients and their families to order services, and by case managers/nurses to document nursing care and track patient progress in real-time. The e-HCN application consists of various types of service options, including post-surgical care, wound care, chronic disease care, and care for patients with disabilities.

Respondents in the intervention group received e-HCN with the following stages: 1) The patient or their family downloads the e-HCN application from the website: <https://hainers.co.id> using an android smartphone, then orders services through the application, enters the service approval page containing the rights and responsibilities of the patient, then gives consent to get the service; 2) The patient or their family chooses the service category, type of service, level of care needed (minimally or partially), and length of care (in this study, the standard for each respondent is 3 days/weeks for 4 consecutive weeks); 3) The patient completes their identity, writes down the current condition, writes the address, then activates the Global Positioning System (GPS) and the application automatically generates a medical record number for the patient; 4) The system automatically selects the case manager according to the closest position to the patient's address, the case manager receives a service request from the patient, and immediately goes to the patient's house; 5) The case manager conducts nursing assessments, formulates nursing diagnoses using the Indonesian Nursing Diagnosis Standards (INDS), prepares a nursing care plan using the Indonesian Nursing Outcomes Standards (INOS), and the Indonesian Nursing Intervention Standards (INIS), which is documented using an online application; 6) The case manager completes a service contract with the patient or their family that contains agreements on service categories, types of services, and duration of services; 7) The case manager selects professional nurses (through the application) who will carry out e-HCN; 8) Professional nurses receive e-HCN service orders in the application; 9) Professional nurse teams perform e-HCN for one shift per day, with 3 days/week, for 4 consecutive weeks, according to the nursing care plan that has been created by the case manager; 10) Professional nurses document nursing care, report the patient condition, and the case manager evaluates the nursing care in accordance with the goals that have been set forth; 11) The case manager terminates the contract with the patient or their family according to the specified time. The flowchart of e-HCN is shown in Fig. 1.

### Control

Patients and families in the control group received the community health nursing care (CHNC) program from the public health center (PHC) where the patient was domiciled. The intervention starts with: 1) The family goes to PHC to get CHNC services; 2) The professional nurse team goes to the patient's house and completes a contract with the patient and their family for the implementation of post-hospital discharge nursing care; 3) The professional nurse conducts nursing assessments, formulates nursing diagnoses, determines nursing interventions (using the same nursing standards as the intervention group), and performs nursing care on patients 3 days/week for 4 consecutive weeks; 4) Nurses evaluate patient progress and nursing outcomes.

### Data analysis

We used bivariate analysis to test the equality of characteristics between the two groups, in which the categorical-scale characteristics were tested using the chi-



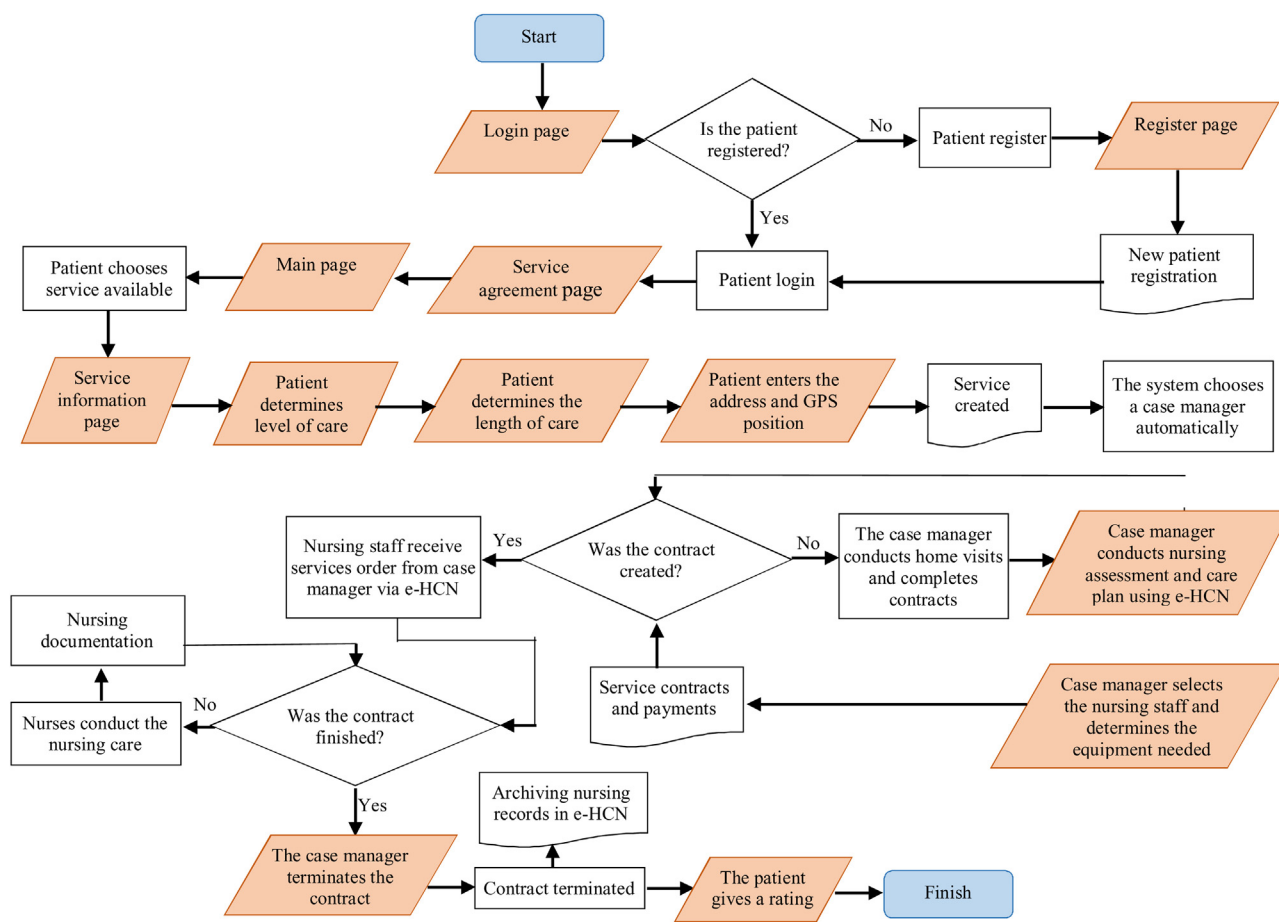


Figure 1 Flowchart of e-HCN.

square test, the numerical-scale characteristics for family age were tested using the independent *t*-test (the data were normally distributed), and patient age was tested using the Mann-Whitney test. Significant differences in pre-test and post-test for composite quality of life between the two groups were tested using an independent *t*-test, while each dimension of quality of life was tested using the Mann-Whitney test. Significant differences in pre-test and post-test for a healthy lifestyle and family burden between the two groups were tested using the Mann-Whitney test. Significant differences between the pre-test and post-test in each group were tested using the Wilcoxon test. We used the Mann-Whitney and the Wilcoxon test for the data analysis on the numerical variables that were not normally distributed.

### Ethical considerations

We apply ethical principles in this study, including maintaining the confidentiality of respondent identity, not publishing patient information unless it is only used for home care nursing purposes, providing complete information and asking for consent from respondents before the intervention, prioritizing patient safety in nursing interventions, stopping nursing interventions if the patient or their family wants it, and consider the benefits obtained far outweigh the negative risks to the patient. The study protocol has been reviewed and

approved by the Research Ethics Committee of Health Polytechnic East Kalimantan Indonesia, with certificate number DP.04.03/7.1/024160/2021.

### Results

The total sample used in this study was 80 patients (40 in the intervention group and 40 in the control group). The flowchart of the trial is shown in Fig. 2. There were no significant differences in the sample characteristics between groups based on patient and family sex, patient and family age, patient education, patient occupation, patient marital status, family and patient relationship, and patient dependency level ( $p > 0.05$ ) (Table 1). This shows that the characteristics of the patient and family are equal in this study.

There was an increase in the mean quality of life in the physical domain in each group after treatment although the statistical test showed that there was no significant difference in the quality of life in the physical domain between the two groups for pretest ( $p = 0.546$ ) and post-test ( $p = 0.624$ ). There was no significant difference in the quality of life in the physical domain between the pre-test and post-test in the intervention group ( $p = 0.265$ ), as well as in the control group ( $p = 0.260$ ) (Table 2). The results of this statistical test

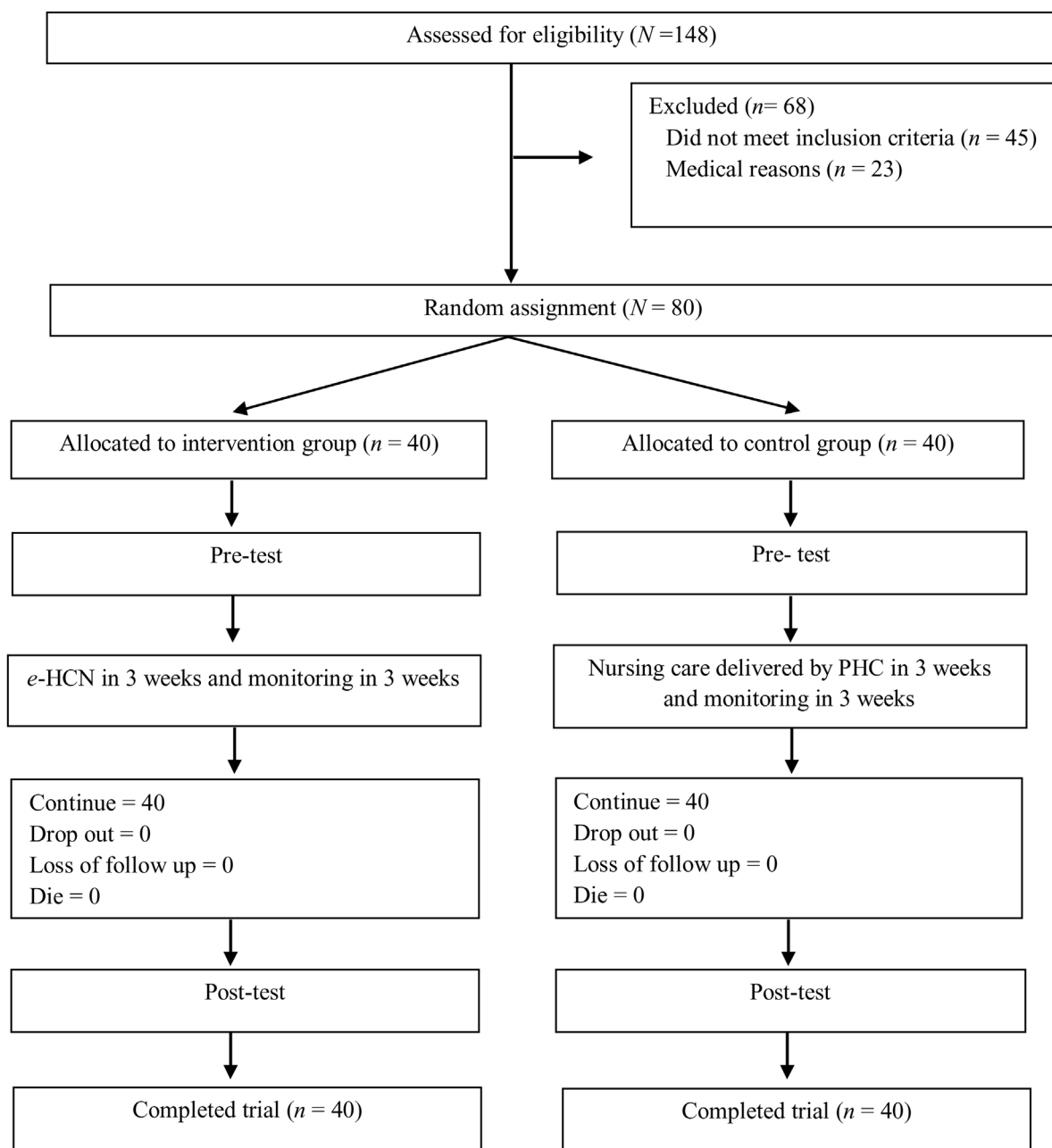


Figure 2 Flowchart of the trial.

indicate that e-HCN is no different in improving the quality of life in the physical domain when compared to CHNC.

There was an increase in the quality of life in the psychological domain in the intervention group, from 71.75 to 77.85. There was a significant difference in the quality of life in the psychological health domain between the pre-test and post-test in the intervention group ( $p = 0.001$ ). There was a slight decrease in quality of life in the psychological domain in the control group from 71.60 to 71.20, but statistical tests showed no significant difference between pre-test and post-test ( $p = 0.558$ ). The statistical test of the difference in pre-test quality of life in the psychological health domain between the two groups showed no significant difference ( $p = 0.863$ ), but the post-test did show a significant

difference ( $p = 0.014$ ). This shows that e-HCN is effective in improving the quality of life in the psychological domain when compared to CHNC.

There was a significant increase in the social domain of quality of life in the intervention group, from 60.48 to 63.15 ( $p = 0.049$ ). There was an increase from 63.15 to 63.48 in the control group, but statistical tests showed no significant difference ( $p = 0.681$ ). The statistical test of the difference in the social domain pre-test between groups showed no significant difference ( $p = 0.319$ ), as well as the post-test ( $p = 0.960$ ). The results of this statistical test indicate that e-HCN is as good as CHNC in improving the social domain of quality of life.

**Table 1** The characteristics of respondents and their families (n = 80).

Variables	Intervention group (n = 40)		Control group (n = 40)		X <sup>2</sup> , Z, or t	P
	n	%	n	%		
Sex (patient)						
Male	19	47.5	20	50	0.001 <sup>a</sup>	1.000
Female	21	52.5	20	50		
Education level (patient)					0.389 <sup>a</sup>	0.943
University	14	35	14	35		
Senior high school	20	50	21	52.5		
Junior high school	4	10	4	10		
Elementary school	2	5	1	2.5		
Occupation (patient)					0.507 <sup>a</sup>	
Civil servants/army/police	12	30	11	27.5		
Entrepreneur/business	17	42.5	20	50		
Farmer	4	10	3	7.5		
Housewife/retired	7	17.5	6	15		
Patient marital status					3.187 <sup>a</sup>	0.203
Marry	24	60	22	55		
Unmarried	7	17.5	3	7.5		
Widow/Widower	5	22.5	15	37.5		
Age (patient) (Mean, SD)	51.3	9.41	51	9.58	-0.212 <sup>b</sup>	0.832
Patient dependency level					0.050 <sup>a</sup>	0.823
Minimally dependent	20	50	18	45		
Partially dependent	20	50	22	55		
Sex (family)					1.857 <sup>a</sup>	0.173
Male	13	32.5	20	50		
Female	27	67.5	20	50		
Family-patient relationship					2.371 <sup>a</sup>	0.499
Spouse (husband/wife)	19	47.5	22	55		
Parent	7	17.5	5	12.5		
Son/daughter	10	25	6	15		
Sibling	4	10	7	17.5		
Age (family) (Mean, SD)	44.18	9.46	46.83	8.28	-1.333 <sup>c</sup>	0.186

<sup>a</sup> Chi test.

<sup>b</sup> Mann Whitney test.

<sup>c</sup> Independent t-test.

There was a significant increase in the mean of the environmental domain in the intervention group from 62.45 to 67.22 ( $p = 0.001$ ). There was a decrease in the control group from 65.60 to 63.35, but statistical tests showed no significant difference ( $p = 0.661$ ). The pre-test between groups showed no significant difference ( $p = 0.824$ ), but the post-test did show a significant difference ( $p = 0.021$ ). This shows that e-HCN is effective in improving quality of life in the environmental domain when compared to CHNC.

There was a significant increase in the mean healthy lifestyle in the intervention group from 18.50 to 20.08 ( $p = 0.009$ ) and the control group from 18 to 18.63 ( $p = 0.016$ ) (Table 3). Pre-test of healthy lifestyle between groups showed no significant difference ( $p = 0.309$ ), as well as in post-test ( $p = 0.083$ ). This shows that e-HCN is equally as good in improving healthy living behavior as CHNC.

There was a significant decrease in the mean family burden in the intervention group from 34.95 to 31.85 ( $p = 0.001$ )

(Table 3). There was a slight decrease in the mean family burden in the control group from 35.20 to 34.80, but statistical tests showed no significant difference ( $p = 0.649$ ). Pre-test family burden between groups showed no significant difference ( $p = 0.606$ ), while the post-test did show a significant difference ( $p = 0.015$ ). This shows that e-HCN is effective in reducing family burden when compared to CHNC.

## Discussion

This study proves mobile application-based home care nursing (e-HCN) is effective in improving the quality of life in the psychological and environmental domains. Nursing care delivered at home creates a more comfortable environment and increases the closeness between patient and family. Patients feel the psychological impact and family support more optimally. The presence of professional nurses and

**Table 2** Patients' Quality of Life Before and After Treatment in Intervention and Control Groups (Mean ± SD).

Quality of life	Intervention group (n = 40)	Control group (n = 40)	t or Z	P
Composite				
Pre test	269.23 ± 40.88	274.48 ± 31.69	-0.642 <sup>b</sup>	0.523
Post test	284.60 ± 30.45	275.50 ± 30.68	1.331 <sup>b</sup>	0.187
Physical domain				
Pre test	74.55 ± 12.68	75.97 ± 11.08	-0.603 <sup>a</sup>	0.546
Post test	75.60 ± 12.73	77.15 ± 10.01	-0.491 <sup>a</sup>	0.624
Psychological domain				
Pre test	71.75 ± 12.64	71.60 ± 10.77	-0.172 <sup>a</sup>	0.863
Post test	77.85 ± 8.77	71.20 ± 10.43	-2.445 <sup>a</sup>	0.014
Social domain				
Pre test	60.48 ± 13.08	63.15 ± 12.31	-0.996 <sup>a</sup>	0.319
Post test	63.15 ± 11.87	63.48 ± 11.34	-0.050 <sup>a</sup>	0.960
Environmental				
Pre test	62.45 ± 12.37	65.60 ± 8.62	-0.222 <sup>a</sup>	0.824
Post test	67.22 ± 9.76	63.35 ± 9.83	-2.314 <sup>a</sup>	0.021

<sup>a</sup> Mann Whitney test.  
<sup>b</sup> Independent t-test.

**Table 3** Patients' Healthy lifestyle and Family Burden before and after Treatment in Intervention and Control Groups (Mean ± SD).

Variables	Intervention group (n = 40)	Control group (n = 40)	Z	P
Healthy lifestyle				
Pre test	18.50 ± 1.97	18.00 ± 1.75	-1.018 <sup>a</sup>	0.309
Post test	20.08 ± 1.93	18.63 ± 1.97	-1.734 <sup>a</sup>	0.083
Family burden				
Pre test	34.95 ± 5.26	35.20 ± 5.48	-0.516 <sup>a</sup>	0.606
Post test	31.85 ± 4.34	34.80 ± 5.73	-2.241 <sup>a</sup>	0.015

<sup>a</sup> Mann Whitney test.

home care aides increase patient self-efficacy. Also, families are more flexible in accompanying patients and exploring their role when caring for patients at home.

Research proves that home health care improves general health, increases patient ability to carry out daily activities, and improves quality of life, especially in the physical, psychological, and environmental health domains, though not in the social relation domain.<sup>11</sup> Quality of life in the physical domain is influenced by age, ability to carry out daily activities (ADLs) at the beginning of the intervention, and ADL changes. The quality of life in the psychological domain is influenced by the ability to carry out daily activities at the beginning of the intervention, changes in the ability to perform ADLs, instrumental ADLs (IADLs) at the beginning of the intervention, and changes in IADLs.<sup>11</sup> The quality of life in the domain of social relations was significantly influenced by the number of nurses who visited patients at home. Meanwhile, the quality of life in the environmental health domain was influenced by the duration of the service provided by the nurse, the age of the patient, the ability to perform ADLs at the beginning of the intervention, and IADL changes.<sup>11</sup> According to this study, it is important for nurses who provide home care services to train patients to perform ADLs at home—especially IADLs—by involving the family, optimizing the duration of nurse-patient interactions, and

optimizing the number of nurses visiting patients. Other research proves that nursing home care improves the quality of life in patients with major depression.<sup>12</sup>

e-HCN is a real-time order-based home care nursing service. When a patient orders a service, the request is sent immediately to the case manager, complete with the ordering history and location based on GPS. E-home care nursing makes it easier for patients and their families to order services. They can order services and include the type of service needed (one-time or regular care), the type of service requested (wound care, post-surgical care, chronic disease care, disability care, or elderly care), the level of care needed by the patient (minimum, partial, total), and service duration. The patient gets information about their rights and responsibilities as patients, and about nurses as service providers. Patients also get information on estimated costs, based on service requests, in a transparent manner.

We integrate the e-nursing record into e-HCN. This application is used by case managers and nurses to document nursing assessments, nursing diagnoses, nursing outcomes, nursing interventions, nursing implementation, and patient progress based on nursing language standards including the Indonesian Nursing Diagnostic Standards (INDS),<sup>13</sup> Indonesian Nursing Outcome Standards (INOS),<sup>14</sup> and Indonesian Nursing Intervention Standards (INIS).<sup>15</sup> The use of standardized



nursing language for diagnosis, outcomes, and interventions is needed to improve patient outcomes in home care nursing. The use of standardized nursing language using North American Nursing Diagnosis Association (NANDA), Nursing Outcome Classification (NOC), and Nursing Intervention Outcome (NIC) is very useful when used in home care nursing for heart failure patients.<sup>16</sup>

The use of e-home care allows case managers to find updates on patient conditions and facilitates communication among nurses and between case managers and nurses. They don't have to be in direct contact when reporting and discussing patient conditions. Progress of patient conditions through the e-homecare nursing application allows case managers to collaborate with other health professionals such as doctors, nutritionists, and physiotherapists, according to patient needs. Research proves that e-home care applications can be used to monitor chronic disease services and can increase the effectiveness and efficiency of intervention time.<sup>17</sup>

Family is involved in every part of the patient care process and information is provided about patient condition, nursing problems, nursing interventions, and the expected outcome of the patient. Accurate and clear information can increase family knowledge about the patient care process. The presence of nurses at home can help patients meet their basic daily needs and facilitate learning how to meet their needs independently. This can reduce the anxiety and burden experienced by the family. This is in line with the research of Dharma et al., which proves that the caregiver empowerment program based on the adaptation model (CEP-BAM) is effective in increasing the use of adaptive coping and reducing family burden after 4 months of intervention, and continuing until 6 months.<sup>18</sup> In the CEP-BAM intervention model, the nurse visits patients' homes and empowers their families. The nurse teaches families how to recognize the problems experienced by patients, learn adaptive coping strategies while caring for patients, and how to reduce stress when caring for patients at home.<sup>18</sup> Home care nursing delivered to stroke patients and education given to caregivers can reduce the burden on caregivers and improve patient quality of life.<sup>19</sup>

Home care for COVID-19 patients has also been proven to maintain safe care during a pandemic, a low incidence of COVID-19 transmission during treatment, a low hospitalization rate, and a lower mortality rate when compared to care in healthcare institutions.<sup>20</sup> Case management led by a case manager is a popular service delivery model for elderly care at home.<sup>21</sup> The satisfaction of patients undergoing medical home is influenced by their positive perception of the case manager.<sup>22</sup> These two studies prove the importance of the case manager's role in patient care at home.

As limitations, it is necessary to consider that this study was conducted on post-hospital discharge patients who needed home care nursing, including post-digestive surgery, chronic diseases (diabetes mellitus, heart failure, kidney diseases), diabetic wounds, or post-stroke who were paralyzed. The results of this study cannot be applied to patients undergoing home care for other conditions. Another limitation is the use of consecutive sampling in selecting samples from all post-discharge patients during January–October 2022. Patients were selected after being discharged when meeting the eligibility criteria until the number was met.

Random sampling was not used because the number of patients discharged at the same time did not meet the minimum sample size.

As conclusion, home care nursing is an alternative to post-hospital discharge follow-up care in cases of chronic illness and disability that require long-term care, such as during the COVID-19 pandemic. Patients who have comorbidities can be treated at home safely without fear of being contaminated with COVID-19. Home care for post-hospital discharge patients allows them to avoid contact with other patients compared to visiting a hospital outpatient unit. The use of online applications to order home care nursing services makes it easy for patients and their families to access home care services in real-time, whenever they need it.

This study proves that the e-HCN service model is effective in improving the quality of life at psychological and environmental health level when compared to CHNC and in reducing the family burden, although further research would be required.

## Conflict of interest

None declared.

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