OPEN ACCESS ■ DOUBLE-BLIND PEER REVIEW

ISSN 3088-4020 (Online)

THAI HEALTH SCIENCES FRONTIERS

(THSF)

HEALTH SCIENCES RESEARCH & INNOVATION

A double-blind peer-reviewed, open-access journal for health sciences research and innovation in Thailand.

CURRENT ISSUE

Volume 1 Issue 3

September – December 2026

Vol. 1 No. 3 | September – December 2026

SCOPE

Nursing ■ Medicine ■ Pharmacy ■ Physical Therapy

Community Public Health ■ Primary Health Care ■ Research and Development (R&D)

Patient-Care Model Development ■ Innovation for Real Clinical Practice

PUBLISHER: KEY DATA COMPANY LIMITED

E-mail: keydatacorp@gmail.com | Tel. 064-314-6622

ThaiJO: he05.tci-thaijo.org/index.php/THSF

ISSN 3088-4020

9 773088 402004

ISSN 3088-4020 (Online)

Thai Health Sciences Frontiers (THSF)

Thai Health Sciences Frontiers is published to disseminate research and innovations in the health sciences that link knowledge to real practice at the clinical level, in community hospitals, and in primary health care systems, and to serve as a forum for learning exchange and academic networking among health professionals in all fields in Thailand.

Advisory Board

	Dr. Patcharaporn Junlun, M.D.	Physician, Specialist in Preventive Medicine; Director, So Phisai Hospital, Bueng Kan Province

Editorial Board of Thai Health Sciences Frontiers

Editor-in-Chief	Dr. Chontira Choommanee	Retired Registered Nurse (Senior Professional Level), Namon Hospital, Kalasin Province
Associate Editor	Dr. Siwaboon Chaisongkram, M.D.	Director, Kabinburi Hospital, Prachinburi Province
Editorial Board	Asst. Prof. Dr. Nichaphat Khansakorn	Faculty of Public Health, Mahidol University
	Dr. Patcharaporn Junlun, M.D.	Director, So Phisai Hospital, Bueng Kan Province
	Dr. Sangchom Siripanich	Retired Public Health Technical Officer (Senior Professional Level), Department of Disease Control
	Dr. Adisak Palasan	Faculty of Science and Technology, Rajabhat Maha Sarakham University
	Miss Nittaya Sangprajak	Faculty of Health Science and Technology, Kalasin University
	Mr. Aphisit Chuakhampheng	Boromarajonani College of Nursing, Songkhla, Praboromarajchanok Institute
	Dr. Wittaya Phonnakhu	Kuchinarai District Health Office, Kalasin Province

Publisher	Key Data Company Limited
Contact	Tel. 064-314-6622 E-mail : keydatacorp@gmail.com
Address	314/127 Sukhumvit 40 Road, Phra Khanong Subdistrict, Khlong Toei District, Bangkok 10110 Website (ThaiJO system): https://he05.tci-thaijo.org/index.php/THSF
Publication Schedule	3 issues per year (January–April, May–August, September–December)

Instructions for Manuscript Submission

Thai Health Sciences Frontiers (THSF) welcomes academic articles and research articles in the health sciences from all professions, including nursing, medicine, pharmacy, physical therapy, community public health, and primary health care, that have not been published elsewhere and are not under consideration by another journal. The editorial board reserves the right to edit manuscripts and to consider them for publication in order of receipt. The criteria and guidelines are as follows:

1. Articles Submitted for Publication

Original research article is a report of the author's study, exploration, or research, including research and development (R&D) and the development of patient-care models, that has not been published in any other journal. It should contain the following sections in order: title; author name(s); abstract in Thai and English; introduction; research objectives; hypothesis (if any); research conceptual framework (if any); research methodology; research instruments and instrument quality; results; conclusion and discussion; recommendations; and references. Acknowledgments may be placed between the recommendations and the references. The total number of authors must not exceed 8.

Academic article is an article presenting knowledge, concepts, or academic experience in the health sciences, with analysis, synthesis, and references to reliable empirical evidence. It consists of an introduction, content, conclusion, and references. The total number of authors must not exceed 5.

Review article is an article written by compiling knowledge on a particular subject from journals or books, both domestic and international. It consists of an introduction, background knowledge on the topic, literature search methods, the content reviewed, critique, and references.

Case report is a report of an interesting patient or case study that provides insights or guidance useful for clinical practice. It consists of an introduction, case report, discussion, conclusion, and references. Patient-identifying information must not be disclosed, and consent must be obtained from the patient or the legal representative.

All article types must not exceed 15 A4 pages, including tables, figures, and references.

2. Manuscript Preparation

Title should be short and concise yet comprehensive, consistent with the objectives and content. The title must be given in both Thai and English, without abbreviations.

Author names (article owners) must be given in both Thai and English (without abbreviations), together with position, affiliation, and full address in both Thai and English. Identify the corresponding author and provide an e-mail address at which he or she can be contacted.

Abstract is a condensed summary of the essential content, including only what is necessary and only the key statistics. Use concise, complete sentences in prose form, not itemized points. Each abstract must not exceed 300 words and should cover the objectives, materials and methods, results and discussion, or brief recommendations. Do not include reference citations in the abstract. The abstract must be written in both Thai and English.

Keywords in both Thai and English, 3–5 terms, placed at the end of the abstract in each language and separated by commas (,).

Introduction explains the background and significance of the problem that necessitates the research, related studies by others, and the knowledge gap that this research will fill.

Research objectives, hypothesis, and research conceptual framework State the objectives clearly and measurably. State the hypothesis and conceptual framework where applicable.

Research methodology describes the research design, population and sample, sample size calculation and sampling methods, data collection methods, and data analysis methods or statistics used, as well as protection of participants' rights, stating the name of the human research ethics committee, the certificate number, and the date of approval.

Research instruments and instrument quality describes the characteristics of the instruments, how they were developed or their sources, and the results of quality testing, such as content validity (CVI/IOC) and reliability.

Results describe the findings in the order of the objectives, presenting the evidence systematically. If there are many figures or variables, use tables, and do not repeat in the text the numbers shown in the tables except for key data. Table titles are placed above the table, together with the sample size (n), while figure or chart titles are placed below the figure. An article should contain no more than 3–5 tables.

Conclusion and discussion should discuss the results in comparison with the stated objectives and hypotheses—whether they agree or differ, to what extent, and why—and should refer to relevant theories or the findings of other researchers.

Recommendations are suggestions on how the research results may be used in practice, administration, or policy, as well as suggestions for future research.

Acknowledgments (if any) acknowledge significant assistance or support received, including research funding sources, in a single paragraph.

References The authors are responsible for the accuracy of the references. Citations follow the Vancouver system, with the number placed in square brackets [ ] after the text or after the name of the person whose statement is cited. Use number 1 for the first reference and continue in order. If a source is cited again, use the original number. The reference list at the end must be arranged in the order of citation in the text. References should be no more than 10 years old, except for textbooks on theory or philosophy. Thai-language sources must be translated into English and followed by (in Thai).

Heading arrangement Main headings are typed flush with the left margin; subheadings are indented 3–5 characters.

3. Reference Format

3.1 Citing Journals

The format is as follows:

Number. Author name(s). Title. Journal title. Year of publication;Volume(Issue):First page-last page.

English-language journals

Use the surname first, followed by the initials of the given name(s). Abbreviate journal titles according to the Index Medicus system.

Thai-language journals

Translate the entire reference entry into English, following the same format as for English-language journals. Use the Gregorian (C.E.) year and append (in Thai) at the end.

If there are more than 6 authors, list only the first 6, separated by commas (,), followed by et al.

Page numbers: give the first page in full and omit the repeated digits from the last page; for example, 131-156 is written as 131-56. Do not leave a space around the ; and : when giving the year of publication, volume(issue), and page numbers.

1. Muangsapaya W, Winichagoon P, Fucharoen S, Pootrakul P, Wasi P. Improved technique for detecting intraerythrocytic inclusion bodies in thalassemic trait. J Med Assoc Thai. 1985;68:43-5.

2. Jaidee S, Meesuk S. Effects of a diabetes care program. Thai Journal of Nursing. 2023;15(2):45-58. (in Thai)

3.2 Citing Books or Textbooks

Format for a book or textbook written entirely by the author(s)

Number. Author name(s). Book title. Edition. Place of publication: Publisher; Year of publication. (Give the edition only for the second edition onward.)

1. Gilstrap LC, Cunningham FG. Operative obstetrics. 2nd ed. New York: McGraw-Hill; 2002.

2. Chaturanon W. Critical care nursing. Bangkok: Chulalongkorn University Press; 2022. (in Thai)

Format for a chapter in a book or textbook

Number. Author name(s). Chapter title. In: Editor name(s), editor. Book title. Edition. Place of publication: Publisher; Year of publication. p. First page-last page.

1. Wood WG. Hemoglobin analysis. In: Weatherall DJ, editor. The thalassemias. New York: Churchill Livingstone; 1983. p. 31-53.

3.3 Electronic Media

Electronic books (E-books)

Number. Author name(s). Title [Type of medium/material]. Year of publication [cited Year Month Day]. Available from: URL address

Journal articles published on the Internet

Number. Author name(s). Article title. Journal title [Internet]. Year of publication [cited Year Month Day];Volume(Issue):Pages. Available from: URL address

1. Annas GJ. Resurrection of a stem-cell funding barrier--Dickey-Wicker in court. N Engl J Med [Internet]. 2010 [cited 2010 Jun 15];363:1687-9. Available from: http://www.nejm.org/doi/pdf/10.1056/NEJMp1010466

Articles with a digital object identifier (DOI)

1. Degenhardt L, Bohnert KM, Anthony JC. Assessment of cocaine and other drug dependence in the general population: "gated" vs. "ungated" approaches. Drug Alcohol Depend [Internet]. 2008 Mar [cited 2010 Apr 15];93(3):227-32. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2756072/ doi:10.1016/j.drugalcdep.2007.09.024

3.4 Other References

Conference or seminar proceedings

Number. Author name(s). Title. In: Editor name(s), editor. Name of conference; Day Month Year of conference; Venue. Place of publication: Publisher; Year of publication. p. First page-last page.

1. Bengtsson S, Solheim BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, editors. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 1992 Sep 6-10; Geneva, Switzerland. Amsterdam: North-Holland; 1992. p. 1561-5.

Theses and dissertations

Number. Author name(s). Title [Type/degree level]. Place of publication: University; Year of degree conferral.

1. Srichairattanakool A. Comparison of the quality of life of patients with chronic myeloid leukemia in the chronic and blastic phases [master's thesis]. Bangkok: Chulalongkorn University; 2000. (in Thai)

Newspaper articles

Number. Author name(s). Title. Newspaper name. Year Month Day; Section: Page number (Column number).

4. Manuscript Submission

4.1 Prepare the manuscript in Microsoft Word, single-sided on A4 paper, using TH SarabunPSK 16 pt, with 2.54 cm margins on all sides and no two-column layout. The length must not exceed 15 pages including references, and the format must follow the journal's template.

4.2 Illustrations: line drawings must be drawn in black ink on white paper; photographs should be .jpg files with a resolution of no less than 600×800 pixels. Write captions separately rather than within the image, and number each illustration so that the layout can be typeset correctly.

4.3 Submit the manuscript (Word file) together with the academic article/research article submission form, giving the author's name, address, telephone number, and a convenient e-mail address, to the Editor of Thai Health Sciences Frontiers by e-mail: keydatacorp@gmail.com, tel. 064-314-6622. Once the editor has determined that the article is consistent with the aims and scope of the journal, the author then submits the article through the ThaiJO system.

4.4 For research articles involving human participants, attach a copy of the certificate of approval (COA) from the human research ethics committee for the project submitted for publication.

4.5 For research articles that are part of a thesis or dissertation, attach a certificate from the principal advisor and, if available, evidence of a plagiarism check (e.g., Akkharawisut).

5. Receipt of Manuscripts

5.1 For accepted manuscripts, the editorial board will notify the authors.

5.2 Every manuscript will be reviewed by at least 3 experts through double-blind peer review.

5.3 For manuscripts not accepted for publication, the editorial board will notify the authors but will not return the manuscripts.

5.4 If an author does not revise the article as required by the editorial board, or the editorial board receives no communication, the journal reserves the right to decline that author's submissions in the future.

6. Publication Fees

The journal charges a publication fee only after an article has been accepted for publication, at the rate of 4,500 baht for Thai-language articles and 6,500 baht for English-language articles. Payment is made by bank transfer to the following account: account name Key Data Company Limited; bank: Siam Commercial Bank (SCB), Gateway Ekamai Branch, Bangkok; account number 416-013-9078. Then send the publication fee invoice and proof of transfer to e-mail: keydatacorp@gmail.com

Responsibility

Articles published in Thai Health Sciences Frontiers are regarded as the personal opinions of their authors, and the editorial board does not necessarily agree with them. Authors are responsible for their

own articles. The editorial board has the right to edit text for linguistic correctness and appropriateness. Published articles are the copyright of Thai Health Sciences Frontiers (Key Data Company Limited).

Every article is reviewed
by at least 3 experts
through double-blind peer review
before publication in the journal

Thai Health Sciences Frontiers
is published as Open Access
Readers can access every article
free of charge

Editorial

Thai Health Sciences Frontiers (THSF), Volume 1 Issue 3 (September – December 2026), is an issue that the editorial board is immensely proud to present to readers. The journal was founded with the aim of serving as an academic forum for health professionals in all disciplines to disseminate research and innovations that link knowledge to real practice at the clinical level, in community hospitals, and in primary health care systems.

In this issue, readers will find a diverse range of research articles and academic articles covering nursing, medicine, pharmacy, community public health, and the development of patient-care models. Every article has been reviewed by at least 3 experts through double-blind peer review to ensure academic quality and credibility. The editorial board sincerely hopes that the knowledge in these articles will benefit the development of health services and can be applied concretely in readers' work settings.

The editorial board thanks all authors who entrusted us with their work for publication; the reviewers who gave their valuable time to evaluate the manuscripts and provide helpful suggestions; and all advisors and committee members who helped bring this issue to completion. The journal welcomes articles from academics and health personnel everywhere and is ready to listen to suggestions for improving its quality further.

Dr. Chontira Choommanee

Editor-in-Chief

Thai Health Sciences Frontiers

Contents

Vol. 1 No. 3 September – December 2026

Title	Page
Editorial	
Editorial Dr. Chontira Choommanee	vii
Research Articles	
Effects of a Health Literacy Promoting Program on Health Behaviors among Fecal Immunochemical Test (FIT)-Positive Individuals in Kuddon Subdistrict, Huaimek District, Kalasin Province Suchawadee Srimungkhun	1
Results of development of community infectious disease surveillance network of Khamin Subdistrict, Mueang District, Kalasin Province Chuan Anosri	16
Effects of a Household Solid Waste Management Behavior Promotion Program among People in Phato Hospital, Chumphon Province Wannawisa Thipwong	31
Development of an Innovative Ward Stock and Distribution System for Analog Insulin to Promote Patient Safety and Rational Drug Use at Sunpasitthiprasong Hospital Rattanaporn Sansud	61
Development of a Nursing Care Model for End-Stage Liver Cancer Patients in the Service Area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province Papatchaya Prathumwan	73
Review Article / Case Report	
Emergency Nursing Care for a Teenage Parturient Using Methamphetamine, Srisatchanalai Hospital: A Case Study Wannapha Pradit	46

Thai Health Sciences Frontiers
วารสารวิทยาศาสตร์สุขภาพไทยก้าวหน้า
THSF

RESEARCH ARTICLE

Effects of a Health Literacy Promoting Program on Health Behaviors among Fecal Immunochemical Test (FIT)-Positive Individuals in Kuddon Subdistrict, Huaimek District, Kalasin Province

Suchawadee Srimungkhun[1]

[1]Public Health Technical Officer (Practitioner Level), Ban Kuddon Subdistrict Health Promoting Hospital, Huaimek District, Kalasin Province

☐ **Received:** 12 September 2026 ✓ **Revised:** 13 September 2026 ☑ **Accepted:** 11 October 2026

Citation: Srimungkhun S. Effects of a Health Literacy Promoting Program on Health Behaviors among Fecal Immunochemical Test (FIT)-Positive Individuals in Kuddon Subdistrict, Huaimek District, Kalasin Province. Thai Health Sciences Frontiers. 2026;Vol.1 (No.3):1-15.

Abstract

This study is a quasi-experimental research design (Two-group pretest-posttest design), conducted using both qualitative and quantitative methods. The objective was to examine the effects of a health literacy promotion program on health behaviors among individuals with a positive colorectal cancer screening result, in Kutdon Subdistrict, Huaimek District, Kalasin Province. The study was conducted from January to September 2026 (B.E. 2569), a total of 9 months. The quantitative sample in the program evaluation phase consisted of 60 individuals aged 50–70 years with a positive colorectal cancer screening result, divided equally into an experimental group and a control group (30 per group). The research instruments included the health literacy promotion program, a general information questionnaire, a health literacy assessment form, a health behavior questionnaire, and a program appropriateness evaluation form. Quantitative data were analyzed using descriptive statistics and inferential statistics (Paired t-test, Independent sample t-test), while qualitative data were analyzed using content analysis.

The results showed that, based on the situational analysis prior to receiving the program, the sample had low levels of health literacy and health behavior. This was predicted to result from the absence of a health literacy promotion process specifically tailored to individuals with a positive colorectal cancer screening result. Following implementation of the developed health literacy promotion program, the experimental group's health knowledge score increased to 6.73±1.46, health literacy skill score increased to 32.57±2.93, overall health literacy score increased to 39.30±2.89, and health behavior score increased to 39.87±2.32. These scores were significantly higher than before receiving the program and significantly higher than the control group at the .05 level (t = 7.67, 19.37, 22.60, 20.96, and t = 5.65, 17.43, 19.02, 18.60, respectively).

Keywords: health literacy, health behavior, colorectal cancer, screening, FIT test

Introduction

The World Health Organization and the International Agency for Research on Cancer reported that in 2024 there were approximately 20.60 million new cancer cases and approximately 9.80 million cancer deaths worldwide. Colorectal cancer was the third most commonly diagnosed cancer in the world, accounting for 9.90% of all new cancer cases, and the second leading cause of cancer death, accounting for 9.40% of all cancer deaths.[1] Although screening by fecal occult blood testing is a low-cost measure that can clearly reduce mortality, surveys of colorectal cancer awareness in many countries have found that 49.30% of the population had never been screened even once, and that even among people with a family history of colorectal cancer, as many as 23.20% had never been screened.[2] This indicates that problems of health literacy and health behaviors related to colorectal cancer screening remain a global public health problem that has not yet been addressed effectively.

In Thailand, colorectal cancer is among the most common cancers in the country, with approximately 15,939 new cases per year (about 44 per day) and approximately 5,476 deaths per year among the Thai population (an average of 15 per day).[3] The Ministry of Public Health has therefore made colorectal cancer screening by fecal occult blood testing a benefit covering Thai people aged 50-70 years under all health insurance schemes. Data from the past 3 fiscal years show that the number of people screened nationwide was 1,450,656 in fiscal year 2023, fell to 1,331,915 in fiscal year 2024, and rose to 1,387,573 in fiscal year 2025, and that in fiscal year 2025 more than 100,000 abnormal results were found.[4] However, although screening coverage has increased, the indicator in the cancer service plan requiring that at least 50.00% of people with abnormal results receive a confirmatory colonoscopy has not been met in practice in many areas. A study at Udon Thani Hospital illustrates this: before the service system was improved, only 18.64% of at-risk people with abnormal results underwent colonoscopy.[5] This indicates that knowing the test result alone is not enough to lead at-risk people to adopt appropriate health behaviors.

A key factor determining whether people with positive screening results appropriately change their health behaviors

after learning the result is their level of health literacy, defined as the knowledge, motivation, and ability of individuals to access, understand, appraise, and apply health information in order to make decisions about treatment, disease prevention, and health promotion in daily life.[6] Low health literacy directly affects health behaviors, which comprise perceived benefits, perceived barriers, and motivation to act to prevent and control disease.[7] When people with positive results do not understand the meaning and seriousness of the result, do not know the correct follow-up steps, or underestimate their own risk, all of which result from a lack of health literacy, they tend to postpone or avoid confirmatory colonoscopy. If left without appropriate continuing care, precancerous lesions or early-stage cancers that could be cured may progress to advanced cancer, which substantially increases mortality and the treatment costs borne by patients and the health service system.

In Kalasin Province, where the sample of this study is located, 23,002 of the 28,096 people in the target population aged 50-70 years were screened for colorectal cancer in fiscal year 2025, or 81.87%, considerably higher than the national average of 49.70%.[8] This indicates that early screening coverage in Kalasin Province is good, but such high coverage does not guarantee that people with abnormal results will enter the process of confirmatory colonoscopy and appropriately change their health behaviors. This is evident in the service network covering Huaimek, Yang Talat, Nong Kung Si, and Tha Khantho Districts, which reported screening and colonoscopy results over a 3-year period and found 19 patients with colorectal cancer, all of whom were successfully treated by laparoscopic surgery.[9] These figures show that new colorectal cancer cases continue to occur in Huaimek District every year, and that continuous care is needed from the screening level through to health behavior change after the result is known.

At the subdistrict level, data on colorectal cancer screening in Kuddon Subdistrict, Huaimek District, Kalasin Province over the past 4 fiscal years (2023-2026) show that the number of people screened rose from 133 in 2023 to 250 in 2024, fell to 201 in 2025, and rose to 306 in 2026, while the numbers of positive results were 4, 30, 20, and 10, respectively. Calculated as proportions, the annual positivity rate ranged from 3.01% to 12.00% of all people screened. This indicates that Kuddon Subdistrict has a considerable population at risk of colorectal cancer each year, yet there is no empirical information on the level of

health literacy and health behaviors of these people after learning their results.

A review of previous models of care found that most primary care health personnel still provide colorectal cancer risk groups with general health education, without systematically applying a health literacy framework, and lack clear tools for assessing and following up behavioral outcomes after education is provided. In addition, workload constraints and the travel distance to colonoscopy services remain major obstacles that prevent practitioners from following up target groups continuously. Meanwhile, the application of health literacy promotion programs among risk groups for other chronic diseases has already shown positive results, for example among older adults in a semi-urban community[10] and among high-risk groups for diabetes and hypertension,[11] where after the program the experimental groups had higher health literacy and health behavior scores than before the experiment and than the comparison groups. However, no similar study has yet been found that applied this approach to people with positive colorectal cancer screening results in a rural northeastern Thai context, where travel limitations and the education levels of the target population differ from those in urban settings.

Given this background and significance, the researcher saw a need to develop a health literacy promotion program, applied together with the concept of health behavior, for people with positive colorectal cancer screening results in Kuddon Subdistrict, Huaimek District, Kalasin Province. The program is expected to increase the health literacy and appropriately change the health behaviors of the target group, reduce delays in undergoing confirmatory colonoscopy, and prevent the progression of colorectal cancer in the long term.

Research Objectives

1. To examine the health literacy and health behavior problem situation of people with positive colorectal cancer screening results in Kuddon Subdistrict, Huaimek District, Kalasin Province

2. To develop a health literacy promotion program for people with positive colorectal cancer screening results in Kuddon Subdistrict, Huaimek District, Kalasin Province

3. To examine and compare the effects of the health literacy promotion program on health literacy and health behaviors of people with positive colorectal cancer screening results between the experimental group and the control group in Kuddon Subdistrict, Huaimek District, Kalasin Province

Research Methods

This study was quasi-experimental research with a two-group pretest-posttest

design. It was conducted from January to September 2026, a total of 9 months, with the experimental group receiving the health literacy promotion program for 8 weeks. Details are as follows:

Population The population comprised 90 people aged 50-70 years in Kuddon Subdistrict, Huaimek District, Kalasin Province whose colorectal cancer screening by the Fecal Immunochemical Test (FIT) was positive in fiscal years 2024-2025.

Sample The sample comprised people aged 50-70 years in Kuddon Subdistrict, Huaimek District, Kalasin Province whose colorectal cancer screening results were positive in fiscal years 2024-2025. They were selected by purposive sampling according to the specified inclusion and exclusion criteria and divided into an experimental group of 30 people and a control group of 30 people, for a total sample of 60 people.

Inclusion Criteria People aged 50-70 years (completed years) with a positive colorectal cancer screening result by FIT; residing in Kuddon Subdistrict, Huaimek District, Kalasin Province during the study period; physically and mentally able to communicate and provide information; having no intellectual impairment or psychiatric disorder affecting participation in activities; able to read and write or having a caregiver who can help answer the questionnaires; able to participate in activities and follow-up throughout the 8-week program; and willing to participate voluntarily by signing a consent form.

Exclusion Criteria People already diagnosed with colorectal cancer before joining the project; people with severe illness or disability that obstructs participation in activities; people planning to move out of the study area during the research period; people participating in other research during the same period that might affect the results; and people who are unwilling to provide information or who withdraw from the research during implementation.

Research Instruments The instruments used in this research consisted of: 1) a health literacy promotion program for the health behaviors of people with positive colorectal cancer screening results, lasting 8 weeks, adapted from the "Integrated Model of Health Literacy" of Sørensen et al. (2012); 2) an interview form on the general information of the sample, including sex, age, marital status, education level, occupation, average monthly income, other underlying diseases, family history of colorectal cancer, and previous experience of colorectal cancer screening; 3) a health literacy assessment form, adapted from the concept of Sørensen et al. (2012), covering the ability to access, understand, appraise, and apply health information; and 4) a health behavior questionnaire for people with positive colorectal cancer screening results.

Data Analysis General characteristics of the sample were analyzed using descriptive statistics, namely frequency, percentage, mean, and standard deviation. The distribution of the data was tested with the Shapiro-Wilk test. Mean health literacy and health behavior scores were compared within the experimental group before and after the program, and within the control group before and after the experiment, using the paired t-test, and were compared between the experimental and control groups after the program using the independent sample t-test. The confidence level was set at 95%.

Research Ethics

This study strictly followed the principles of research ethics involving human participants. Before data collection, the researcher explained the objectives, procedures, duration, and the benefits and risks of participation to the sample and the focus group participants, emphasizing that participation was voluntary and that they could decline or withdraw from the research at any time without affecting the health services they would normally receive. Participants signed an informed consent form before every round of data collection. All data were kept confidential and presented in aggregate using codes, with no disclosure of information that could identify individuals, and the data were used for academic purposes only. For the control group, the researcher provided usual care during the study and offered the health literacy promotion program after data collection ended so that both groups would benefit equally.

Results

1. Health literacy and health behavior situation among people with positive FIT test results in Kuddon Subdistrict, Huaimek District, Kalasin Province

1.1 General characteristics of the sample Of the 60 quantitative sample members in total, most were female (63.33%), with a mean age of 59.68±5.96 years (minimum 50, maximum 70 years); 55.00% were aged 60-70 years; 65.00% were married; 45.00% had primary education; 48.33% were farmers; mean monthly income was 9,466.67±4,300.05 baht, with 45.00% earning more than 10,000 baht per month; 55.00% had no underlying disease; 81.67% had no family history of colorectal cancer; 71.67% had never received information about colorectal cancer; and 91.67% had been advised to undergo colonoscopy, but a combined 40.00% had not yet done so or were awaiting an appointment.

1.2 Health literacy and health behavior situation before the program The whole sample had a mean pre-program health knowledge score of 4.52±1.42 out of 10 (45.17% of the full score), which is a low level; a mean health literacy skills score of

20.40±2.12 out of 40 (51.00%), a low level; an overall health literacy score (knowledge + skills) with a mean of 24.92±2.55 out of 50 (49.83%), a low level; and a mean health behavior score of 26.18±2.98 out of 50 (52.37%).

1.3 General characteristics of focus group participants in the situation analysis phase There were 20 focus group participants, most of whom were female (75.00%), with a mean age of 45.05±8.66 years. They were public health technical officers (40.00%), professional nurses (30.00%), and village health volunteers (25.00%), with a mean length of work or involvement in screening activities of 8.65±5.43 years. Of them, 75.00% had previously cared for people with positive FIT results, but as many as 65.00% had never received any training on health literacy.

2. Results of developing the health literacy promotion program for people with positive FIT test results in Kuddon Subdistrict, Huaimek District, Kalasin Province

2.1 The developed health literacy promotion program The program lasts 8 weeks in total, once a week, 60-90 minutes per session. It was designed around a three-phase structure following the research and development process: 1) the situation analysis and preparation phase (week 1); 2) the development and implementation phase, with activities based on the four dimensions of the health literacy framework, namely accessing, understanding, appraising, and applying health information, together with health behavior modification and strengthening of social support according to Pender's concept (weeks 2-7); and 3) the evaluation and follow-up phase (week 8). The activities of each week are sequentially linked, starting from building basic knowledge and understanding, moving to practicing analytical thinking and decision-making skills, and finally to real-life implementation with continuous support from family and community. This is expected to enable people with positive colorectal cancer screening results to improve their health literacy and health behaviors and to undergo confirmatory colonoscopy more promptly, as shown in Table 1.

Table 1 Health literacy promotion program for the health behaviors of people with positive colorectal cancer screening results, Kuddon Subdistrict, Huaimek District, Kalasin Province (8 weeks)

Week	Activities/Content	Tools Used	Duration	Academic Rationale
1	Orientation to explain the program objectives, build rapport with the target group, and assess health literacy	Health literacy assessment form, health behavior questionnaire,	60 minutes	Building rapport and trust is the foundation of participatory learning. The pre-program assessment

Week	Activities/Content	Tools Used	Duration	Academic Rationale
	and health behaviors before joining the program (Pre-test)	program introduction handout		provides baseline information for designing activities suited to each individual.
2	Education on colorectal cancer, the meaning of a positive FIT result, and introduction to reliable sources of health information	Video media, leaflets, LINE group for consultation	60 minutes	Corresponds to the Access dimension of health information in the health literacy framework (Sørensen et al., 2012), which is the first step in building health literacy.
3	Small-group discussion to build understanding of the meaning of the test result, the confirmatory colonoscopy procedure, and the consequences of not continuing follow-up, using case examples and visual aids	Illustrations/case examples, group discussion record form	90 minutes	Corresponds to the Understand dimension of health information (Sørensen et al., 2012) and helps adjust the perceived likelihood of risk and severity of disease according to Pender's health behavior concept (Danyutthasilp, 2018).
4	Practice in appraising the credibility of health information received from various media and distinguishing accurate information from mistaken beliefs through case study activities	True/false health information case study set, group exercises	60 minutes	Corresponds to the Appraise dimension of health information (Sørensen et al., 2012) and strengthens the ability to make critical health decisions.
5	Practice applying information in real life by jointly preparing an Individual Action Plan and setting a colonoscopy appointment date	Individual action plan form, appointment calendar	90 minutes	Corresponds to the Apply dimension of health information (Sørensen et al., 2012) and the Commitment to a Plan of Action stage in Pender's

Week	Activities/Content	Tools Used	Duration	Academic Rationale
				concept (Danyutthasilp, 2018).
6	Demonstration and practice of behavior modification regarding a risk-reducing diet (reducing red meat and processed foods, increasing vegetables and fruit) and exercise suitable for older adults	Food demonstration kit, exercise manual, behavior record form	90 minutes	Strengthens the Perceived Benefits of Action, a key determinant of health behavior in Pender's concept (Danyutthasilp, 2018).
7	Empowerment and building a social support network, in which family members, village health volunteers, and peers in the same group jointly follow up through home visits/encouraging telephone calls	Follow-up visit record form, telephone counseling guide	60 minutes	Corresponds to Interpersonal Influences and social support, which strengthen the continuity of health behaviors in Pender's concept (Danyutthasilp, 2018).
8	Summary of lessons learned, review of the knowledge and skills gained throughout the program, post-program assessment of health literacy and health behaviors (Post-test), and planning of continued follow-up	Health literacy assessment form, health behavior questionnaire, continued follow-up planning form	60 minutes	The post-program assessment measures outcomes according to the research objectives, and planning continued follow-up helps sustain health behaviors in the long term.

2.2 Expert validation of the program's appropriateness The developed program was reviewed for appropriateness by 12 experts: 4 experts from Subdistrict Health Promoting Hospitals, 4 experts from District Public Health Offices, and experts from Huaimek Community Hospital in program development. Overall, the program was appropriate at a high level, with an overall mean of 4.28±0.71 out of 5.

3. Comparison of health literacy and health behaviors among people with positive FIT test results in Kuddon Subdistrict, Huaimek District, Kalasin Province, before and after the program and between the experimental and control groups

3.1 Within-group comparison (before-after the experiment) The experimental group's health knowledge score increased from 4.43±1.48 to 6.73±1.46 (t=7.67, p<0.001); health literacy skills score increased from 20.77±1.96 to 32.57±2.93 (t=19.37, p<0.001); overall health literacy score increased from 25.20±2.52 to 39.30±2.89 (t=22.60, p<0.001); and health behavior score increased from 25.97±2.71 to 39.87±2.32 (t=20.96, p<0.001), all statistically significant differences. In contrast, the control group's scores on all variables increased only slightly and not significantly (p>0.05), as shown in Table 3.

Table 3 Comparison of mean health literacy and health behavior scores before and after the program by group (Paired t-test)

Variable	Group	Before		After		t	p-value
		$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Health knowledge (max 10)	Experimental	4.43	1.48	6.73	1.46	7.67	<0.001*
Health knowledge (max 10)	Control	4.60	1.38	4.67	1.37	0.16	0.872
Health literacy skills (max 40)	Experimental	20.77	1.96	32.57	2.93	19.37	<0.001*
Health literacy skills (max 40)	Control	20.03	2.24	21.00	2.15	1.64	0.112
Overall health literacy (max 50)	Experimental	25.20	2.52	39.30	2.89	22.60	<0.001*
Overall health literacy (max 50)	Control	24.63	2.58	25.67	2.66	1.58	0.125
Health behavior (max 50)	Experimental	25.97	2.71	39.87	2.32	20.96	<0.001*
Health behavior (max 50)	Control	26.40	3.27	27.67	2.75	1.63	0.115

*Statistically significant, p-value <.05

3.2 Comparison between the experimental and control groups Before the program, the experimental and control groups did not differ in health knowledge, health literacy skills, overall health literacy, or health behavior (p>0.05 for all variables), indicating that the two groups were equivalent before the experiment began. After the program, the experimental group scored significantly higher than the control group on all variables: health knowledge (6.73±1.46 vs 4.67±1.37, t=5.65, p<0.001), health literacy skills (32.57±2.93 vs 21.00±2.15, t=17.43, p<0.001), overall health literacy (39.30±2.89 vs 25.67±2.66, t=19.02, p<0.001), and health behavior (39.87±2.32 vs 27.67±2.75, t=18.60, p<0.001), as shown in Table 4.

Table 4 Comparison of mean health literacy and health behavior scores between the experimental and control groups (Independent Sample t-test)

Variable	Experimental group		Control group		t	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Health knowledge, before (max 10)	4.43	1.48	4.60	1.38	-0.45	0.653
Health knowledge, after (max 10)	6.73	1.46	4.67	1.37	5.65	<0.001*
Literacy skills, before (max 40)	20.77	1.96	20.03	2.24	1.35	0.182
Literacy skills, after (max 40)	32.57	2.93	21.00	2.15	17.43	<0.001*
Overall health literacy, before (max 50)	25.20	2.52	24.63	2.58	0.86	0.393
Overall health literacy, after (max 50)	39.30	2.89	25.67	2.66	19.02	<0.001*
Health behavior, before (max 50)	25.97	2.71	26.40	3.27	-0.56	0.578
Health behavior, after (max 50)	39.87	2.32	27.67	2.75	18.60	<0.001*

*Statistically significant, p-value <.05

3.3 Comparison of confirmatory colonoscopy rates between groups When categorical variables were analyzed, the proportion who had undergone colonoscopy was 63.33% in the experimental group versus 56.67% in the control group, which was not statistically significantly different (χ^2=0.07, p=0.792), as shown in Table 5.

Table 5 Comparison of confirmatory colonoscopy rates between the experimental and control groups

Status	Experimental group (%)	Control group (%)	χ^2	p-value
Underwent colonoscopy	63.33	56.67	0.07	0.792
Not yet undergone/awaiting appointment	36.67	43.33		

Discussion

The study of the health literacy and health behavior problem situation of people with positive colorectal cancer screening results found that the sample had low health literacy and health behaviors before the program. This is consistent with Sørensen's[6] health literacy framework, which holds that individuals need knowledge, motivation, and the abilities to access, understand, appraise, and apply health information together in order to develop appropriate health behaviors. When the target group in a rural area, most of whom were farmers with low education levels, still lacked these

components, their result follow-up behaviors and lifestyle changes were inappropriate. These findings are consistent with Pakdeepaiboonsakul[11] and Chaimongkol,[10] who found that chronic disease risk groups in community settings likewise had low to moderate levels of health literacy and health behaviors before joining the program, showing that this problem is not limited to any single disease but is a shared characteristic of risk groups for chronic noncommunicable diseases at the primary care level in general. In addition, the fact that colonoscopy uptake did not yet cover the entire target group reflects the gap between awareness of test results and actual practice. This accords with the finding of Chandam et al.[5] that even when at-risk people completed FIT screening, the rate of colonoscopy after an abnormal result remained below target, and with international empirical evidence from Lim[12] and Zarrinkamar,[13] who found that even though people with positive FIT results had a high level of knowledge about disease symptoms, the proportion undergoing colonoscopy still fell short of international standards. This confirms that knowledge alone is not sufficient to change behavior; perceived severity, perceived benefits, and social support are also needed, according to Pender's health behavior concept.[7] This underscores the need for health literacy approaches tailored to people with positive screening results rather than general health education.

Regarding the development of the health literacy promotion program for people with positive colorectal cancer screening results, the developed program received a high appropriateness rating from experts, which suggests that designing activities around the four dimensions of health literacy, together with strengthening health behaviors according to Pender's concept, is a suitable approach for the local context. This result is consistent with Pakdeepaiboonsakul[11] and Phuseenam et al.,[14] who developed health literacy programs based on the same framework and likewise found a high level of acceptance from both experts and target groups. The choice of visual media and demonstration activities as key components of the program is also consistent with the findings of Pansuwan and Naosuwan,[15] who found that video media helped colorectal cancer risk groups clearly understand the procedures to follow and reduced anxiety well, and with the qualitative findings of Boirot[16] in France, who found that both patients and general practitioners preferred video media to leaflets because it can convey complex procedures in an easily understood way and reduce discomfort with sensitive topics such as stool testing. This matches the nature of the target group in this study, most of whom had low education levels and may be unfamiliar with academic language. Furthermore, the inclusion of social support and home-visit follow-up in the program is consistent with the concept of Sripattha et

al.,[17] who found that integrating social support into a pre-colonoscopy preparation program effectively strengthened preparation behaviors and reduced anxiety among patients at risk of colorectal cancer. This confirms that programs that are holistic, addressing knowledge, skills, and social support, are more likely to be accepted and put into practice than education alone.

Regarding the comparison of the effects of the program on health literacy and health behaviors between the experimental and control groups, the finding that the experimental group's health literacy and health behavior scores were clearly higher than before the program and higher than the control group confirms the effectiveness of the developed program. It is consistent with several earlier studies using the same framework, namely Chaimongkol,[10] Pakdeepaiboonsakul,[11] and Phuseenam et al.,[14] which found results in the same direction: groups receiving health literacy promotion programs improved markedly compared with control groups or with pre-experiment scores. This shows that systematic education through a process covering accessing, understanding, appraising, and applying health information is a robust approach to changing the behavior of chronic disease risk groups in the Thai context, not limited to any single disease. Meanwhile, the control group, which received usual care, changed only slightly, consistent with the observations of Chandam et al.[5] and Sripattha et al.[17] that usual care without activities specifically strengthening health literacy is insufficient to significantly stimulate behavior change among patients at risk of colorectal cancer. However, when considering the link between increased health literacy and actual colonoscopy uptake, evidence from Lim,[12] who found that direct advice from a physician was an important predictor of compliance, and from O'Leary,[18] who found that having a dedicated care navigator clearly increased colonoscopy rates, indicates that increased health literacy alone may not be sufficient to fully drive actual practice if it is not accompanied by appointment or follow-up support systems. This is consistent with the long-term follow-up results of Azizi Sani Dopolani,[19] who found that even when health literacy remained high over time, sustaining health behaviors still required continuous reinforcement from the health service system. The findings of this study therefore suggest that future program development should integrate follow-up and coordination mechanisms with health literacy components, in order to achieve end-to-end outcomes from knowledge through to genuine access to confirmatory colonoscopy.

Acknowledgments

The researcher thanks the director of Kuddon Subdistrict Health Promoting Hospital and the Kalasin Provincial Public Health Office for supporting the research; the experts who advised on developing the instruments and improving the program; the public health technical officers, professional nurses, laboratory staff, and physicians of the Huaimek District Health Network who cooperated in developing and piloting the program; and the at-risk patients and their families who participated willingly.

References

1. Sung H, Filho AM, Laversanne M, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2024: GLOBOCAN estimates of incidence and mortality worldwide for 34 cancers in 186 countries. CA Cancer J Clin. 2026;76(4):e70090.

2. BGI Genomics. 2024 global state of colorectal cancer awareness report [Internet]. Shenzhen: BGI Genomics; 2024 [cited 2026 Sep 13]. Available from: https://www.bgi.com/global/news/bgi-genomics-2024-global-state-of-colorectal-cancer-awareness-report

3. Local Health Security Fund. Colorectal cancer screening project using FIT test, fiscal year 2024 [Internet]. 2024 [cited 2026 Sep 13]. Available from: https://localfund.happynetwork.org/project/176761

4. National Health Security Office. NHSO supports FIT test for colorectal cancer screening among people aged 50–70 years, all healthcare schemes, free every 2 years [Internet]. 2026 [cited 2026 Sep 13]. Available from: https://www.hfocus.org/content/2026/07/38619

5. Chandam P, Boonyanam S, Songsri C, Lohawet N. Effects of implementing access guidelines for colorectal cancer screening among at-risk populations through network participation, primary care unit, Udon Thani Hospital. Udon Thani Hosp Med J. 2025;33(1):125-36.

6. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: a systematic review and integration of definitions and models. BMC Public Health. 2012;12:80.

7. Danyutthasilp C. Pender's health promotion model. Songklanagarind J Nurs. 2018;38(2):132-41.

8. Ministry of Public Health. Health data center (Health KPI): indicator 021.3, percentage of people receiving colorectal cancer screening, Health Region 7 [Internet]. 2025 [cited 2026 Sep 13].

9. Khaosod. Kalasin: Yang Talat Hospital achieves 100% success in laparoscopic surgery for colorectal cancer [Internet]. 2026 [cited 2026 Sep 13]. Available from: https://www.khaosod.co.th/around-thailand/news_10139534

10. Chaimongkol P. Effectiveness of a health literacy promotion program on desirable health behaviors among elderly people in a semi-urban community in Khon Kaen province. J Reg Health Promot Cent 7 Khon Kaen. 2023;15(3):124-37.

11. Pakdeepaiboonsakul R. Effectiveness of a health literacy promotion program on health behaviors among high-risk groups for diabetes and hypertension. Thai J Public Health Health Educ. 2025;5(2):e275531.

12. Lim TZ, Lau J, Wong GJ, Tan LYT, Chang YJ, Natarajan K, et al. Factors predicting improved compliance towards colonoscopy in individuals with positive faecal immunochemical test (FIT). Cancer Med. 2021;10(21):7735-46.

13. Zarrinkamar M, Ebrahimi M, Zahedi M, Amini F, Geran M, Ghadirzadeh E. Prevalence, determinants, and barriers to follow-up colonoscopy after a positive fecal immunochemical test in Qaemshahr, Iran: a population-based cross-sectional study from 2022 to 2023. Prev Med Rep. 2025.

14. Phuseenam S, Isarangkul Na Ayutthaya W, Sinsuphan N. Development of health literacy and colorectal cancer prevention among village health volunteers, Phra Lap subdistrict, Mueang district, Khon Kaen province. J Educ Health Environ Manag. 2024;9(2):872-81.

15. Pansuwan C, Naosuwan K. Effects of using video media on pre-colonoscopy preparation behavior, bowel cleanliness, and anxiety among colorectal cancer risk groups at Na Mom Hospital. Rachawadee J Boromarajonani Coll Nurs Surin. 2022;12(1):136-48.

16. Boirot A, Addamiano MC, Casanova C, Redmond NM, Cazorla G, Rotily M, et al. Acceptability and implementation potential of a health literacy intervention to increase colorectal cancer screening in deprived areas: a qualitative study of patients and general practitioners participating in a cluster randomized controlled trial. PLoS One. 2025;20(8):e0329639.

17. Sripattha L, Boonthom U, Suriya N. Effects of a colonoscopy preparation program with social support on anxiety, bowel cleanliness quality, and satisfaction among patients at risk of colorectal and anal cancer. Mahasarakham Hosp J. 2025;22(1):133-51.

18. O'Leary MC, Reuland DS, Randolph C, Ferrari RM, Brenner AT, Wheeler SB, et al. Reach and effectiveness of a centralized navigation program for patients with positive fecal immunochemical tests requiring follow-up colonoscopy. Prev Med Rep. 2023;34:102211.

19. Azizi Sani Dopolani SF, Shahbazi H, Lotfizadeh M, Naderimagham S. The impact of educational intervention on enhancing health literacy among middle-aged individuals at risk for cardiovascular diseases: a randomized controlled trial. BMC Public Health. 2025;25:2291.

Thai Health Sciences Frontiers
วารสารวิทยาศาสตร์สุขภาพไทยก้าวหน้า
THSF

RESEARCH ARTICLE

Results of Developing a Community Communicable Disease Surveillance Network in Khamin Subdistrict, Mueang Kalasin District, Kalasin Province

Chuan Anosri[1*]

[1]Public Health Technical Officer, Professional Level, Ban Non Chai Subdistrict Health Promoting Hospital, Khamin Subdistrict, Mueang Kalasin District, Kalasin Province

☐ **Received:** 14 October 2026 ✓ **Revised:** 17 October 2026 ☑ **Accepted:** 31 October 2026

Citation: Anosri C. Results of developing a community communicable disease surveillance network in Khamin Subdistrict, Mueang Kalasin District, Kalasin Province. Thai Health Sciences Frontiers. 2026;1(3):16-30.

Abstract

This quasi-experimental one-group pretest-posttest study aimed to compare knowledge, attitudes, behaviors, disease control efficiency, and emergency response capability before and after developing a community communicable disease surveillance network, and to assess participant satisfaction, in Khamin Subdistrict, Mueang Kalasin District, Kalasin Province, from June to December 2024. The sample comprised 47 network members: village health volunteers (VHVs), Subdistrict Health Promoting Hospital officers, Local Administrative Organization disease control officers, and community leaders. Instruments included a 5-stage network development program and questionnaires on demographics, knowledge, attitudes, behaviors, disease control efficiency, emergency response capability, and satisfaction. Data were analyzed using descriptive statistics and the paired t-test.

Most participants were female (61.70%), with a mean age of 49.00±12.23 years; 53.19% were VHVs. After the intervention, all mean scores increased significantly ($p<0.001$) from moderate to good levels: knowledge (10.19±2.73 to 13.72±1.45), attitudes toward network collaboration (34.61±5.24 to 43.69±3.78), surveillance practice behaviors (32.38±6.47 to 42.77±4.29), disease control efficiency (25.95±4.83 to 34.02±3.47), and emergency response capability (21.35±4.72 to 29.36±3.28). Satisfaction was high (43.22±4.57 out of 50; 86.44%), particularly regarding benefits received. Developing a community surveillance network based on Social Network Theory and community participation, integrating knowledge and skill development, positive attitudes, communication and reporting systems, emergency simulations, and continuous follow-up, strengthened partners' capacity to monitor, prevent, and control communicable diseases and may serve as a model for primary care units in similar contexts.

Keywords: Communicable disease surveillance network, network development, community participation, village health volunteers

Introduction

The communicable disease surveillance system is a key component of the public health system, playing a vital role in preventing and controlling disease transmission at the population level, particularly following the COVID-19 pandemic, which severely affected health systems worldwide. The World Health Organization has therefore prioritized the development of surveillance systems capable of detecting outbreaks at an early stage.[1] Meanwhile, major communicable diseases such as dengue hemorrhagic fever, influenza, and emerging infectious diseases continue to impose a burden on the health system. Successful control of these diseases depends on the efficiency of the surveillance system and the speed of response to emergencies. Developing a surveillance network that integrates inter-agency collaboration and fosters community participation is therefore a key strategy for addressing public health threats.

Thailand has continuously developed its epidemiological surveillance system since 1969.[2] The 506 reporting system, the country's principal system for communicable disease surveillance, was upgraded to a digital platform (D506) and became fully operational on 1 January 2023.[3] The success of Thailand's communicable disease surveillance system stems from the collaboration of a network spanning the Ministry of Public Health, Provincial Public Health Offices, and Subdistrict Health Promoting Hospitals (SHPHs) down to village health volunteers (VHVs) at the community level. There are more than one million VHVs nationwide, each responsible for approximately 20 households, and they played a crucial role in surveying, screening, and referring at-risk groups during the COVID-19 pandemic.[4]

Social Network Theory explains that relationships among members, communication patterns, and the flow of information within a network are factors that determine the effectiveness of collaborative work.[5] The researcher therefore applied this theory together with the concept of Community Participation, in which the community takes part in planning, implementation, monitoring, and evaluation, and the concept of an Integrated Health System, which emphasizes linking information systems, coordinating plans, and sharing resources, as the conceptual framework for network development. International empirical evidence also indicates that community-based surveillance enables earlier detection of public health events and faster outbreak

response, particularly in areas with limited access to services.[6,7]

Khamin Subdistrict, Mueang Kalasin District, Kalasin Province, comprises both urban and rural communities with differing communicable disease surveillance needs. Data from 2024 show that the area continues to experience major communicable diseases, namely dengue hemorrhagic fever, diarrhea, and respiratory tract infections, with morbidity rates of approximately 15.40, 89.20, and 234.60 per 100,000 population, respectively. Surveillance in the area is carried out by the SHPH in collaboration with approximately 58 VHVs across 12 villages.[8] However, a preliminary assessment revealed that the network still had limitations in coordination, information flow, and emergency response, including a lack of data linkage between agencies, delayed reporting, a lack of systematic monitoring and evaluation, inequitable access to surveillance services in remote areas, and VHVs' limited ability to use information technology for reporting.

Given this background and significance, the researcher recognized that systematically developing a community communicable disease surveillance network, based on Social Network Theory and community participation, through the development of knowledge, attitudes, skills, communication and reporting systems, and emergency response drills, is an important approach to strengthening the surveillance, prevention, and control of communicable diseases at the primary care level. It would also provide information for establishing communicable disease surveillance guidelines in areas with similar contexts. The researcher therefore developed a community communicable disease surveillance network in Khamin Subdistrict and studied the effects of this development.

Research Objectives

1. To compare knowledge, attitudes, behaviors, disease control efficiency, and emergency response capability before and after the development of a community communicable disease surveillance network in Khamin Subdistrict, Mueang Kalasin District, Kalasin Province.

2. To assess satisfaction after the development of the community communicable disease surveillance network in Khamin Subdistrict, Mueang Kalasin District, Kalasin Province.

Methods

This study employed a quasi-experimental, one-group pretest-posttest design and was conducted from June to December 2024, for a total duration of 7 months. The study was divided into 3 phases:

Phase 1, preparation, sample selection, and pretest data collection (June 2024); Phase 2, implementation of the communicable disease surveillance network development program and follow-up (July–November 2024); and Phase 3, posttest data collection (2 weeks after program completion) and data analysis (December 2024).

Population: The population consisted of 54 members of the community communicable disease surveillance network in Khamin Subdistrict, Mueang Kalasin District, Kalasin Province, comprising village health volunteers (VHVs), SHPH public health officers, Local Administrative Organization (LAO) disease control officers, and community leaders.

Sample: The sample size was calculated using G*Power for the paired t-test (Means: Difference between two dependent means), with a medium effect size (effect size = 0.50),[9] a significance level of α = .05, a power of 0.80, and a two-tailed test, yielding a sample size of 34. This was increased by 30% to compensate for attrition, as the study was lengthy and required continuous participation, resulting in a sample size of 49: 27 VHVs, 5 SHPH public health officers, 5 LAO disease control officers, and 12 community leaders. Participants were selected from the network member registry using proportional stratified random sampling according to the inclusion criteria. During the study, 2 participants (4.08%) withdrew because they did not complete 2 training sessions, leaving 47 participants for data analysis, which exceeded the calculated minimum sample size.

Inclusion Criteria: Personnel working in the communicable disease surveillance system in Khamin Subdistrict, aged 18 years or older, having held their position for at least 6 months, able to attend all activities, and voluntarily consenting to participate in the study.

Exclusion Criteria: Plans to transfer or retire during the study period, inability to read or write Thai, health problems preventing continuous participation in activities, or withdrawal during the study.

Research Instruments: The research instruments consisted of the intervention instrument and the data collection instruments, as follows.

1. Intervention instrument: The community communicable disease surveillance network development program, developed by the researcher based on a literature review, focus group discussions with experts, and a study of the community context. The program comprised 5 stages. Stage 1, Building the knowledge base (July 2024), included a 1-day orientation to build shared understanding and a 2-day training on basic knowledge of communicable diseases, the surveillance system, and the D506 reporting system. Stage 2, Attitude development (August 2024), included a 1-day workshop to build positive attitudes toward

network collaboration and 2 days of developing communication and reporting systems via applications and LINE groups. Stage 3, Skill development (September 2024), included 2 days of hands-on practice in community surveys and data collection, 1 day of screening and referral skill development, and 1 day of emergency simulation and response. Stage 4, Implementation and monitoring (October 2024), included fieldwork with weekly follow-up for 4 weeks and 2 network meetings to exchange experiences. Stage 5, Evaluation and conclusion (November 2024), included an assessment of achievements and a summary of results to plan continued operations.

2. Data collection instruments: Six instruments were used: 1) a 6-item general information interview form; 2) a 15-item knowledge assessment on the communicable disease surveillance system with yes/no answers, total score 15, interpreted as good (12-15 points), moderate (9-11 points), and low (0-8 points); 3) a 10-item assessment of attitudes toward network collaboration, total score 50 (including 4 negatively worded items, which were reverse-scored before analysis); 4) a 10-item assessment of communicable disease surveillance practice behaviors, total score 50; 5) a disease control efficiency assessment[10] of 8 items (total score 40) and an emergency response capability assessment of 7 items (total score 35); and 6) a 10-item assessment of satisfaction with the network development, total score 50.[11] Instruments 3-6 used a 5-point rating scale and were interpreted according to Bloom's criteria as good (80-100%), moderate (60-79%), and low (below 60%).

3. Instrument quality testing: Content validity was examined by 3 experts, namely 1 physician specializing in epidemiology and 2 public health technical officers with expertise in epidemiology, using the Index of Item-Objective Congruence (IOC); all items scored at least 0.67 (criterion ≥ 0.50). The instruments were then piloted with 30 individuals with characteristics similar to the sample in another subdistrict of Mueang Kalasin District. The reliability of the knowledge assessment (KR-20) was 0.76, and the Cronbach's alpha coefficient of the attitude, behavior, disease control efficiency, emergency response capability, and satisfaction assessments was 0.84 (overall 0.86).

Data Collection: The researcher collected pretest data in June 2024 using the general information interview form and instruments 2–5, implemented the network development program from July to November 2024, and collected posttest data 2 weeks after program completion (December 2024) using instruments 2–6 through self-administered questionnaires.

Data Analysis: Data were analyzed as follows.

1. General characteristics of the sample, including sex, age, education level, position/role, and communicable disease

surveillance experience, were analyzed using frequency, percentage, arithmetic mean, and standard deviation.

2. Mean scores of knowledge, attitudes, behaviors, disease control efficiency, and emergency response capability before and after the network development within the same group were compared using the paired t-test, after the normality of score differences was confirmed with the Shapiro-Wilk test; the Wilcoxon signed-rank test was to be used if the differences were not normally distributed. Mean differences ($\bar{d}$), 95% confidence intervals (95% CI), and effect sizes (Cohen's dz) were reported, with statistical significance set at .05.

3. Satisfaction with the network development was analyzed using means and standard deviations and interpreted according to the criteria for each item and overall; suggestions from open-ended questions were summarized by thematic grouping.

Research Ethics

This study was approved by the Human Research Ethics Committee of the Kalasin Provincial Public Health Office. The researcher protected participants' rights by explaining the objectives, research procedures, and benefits of the study in advance. Participants had the right to accept or decline participation without any effect on the services they received or their work. Data were kept confidential using codes instead of real names, and results were presented in aggregate for academic purposes only. All participants signed informed consent forms before participating in the study.

Results

1. General Characteristics of the Sample

Of the 47 network members in the sample, most were female (29; 61.70%). The largest age group was 50-59 years (18; 38.30%), followed by 40-49 years (15; 31.91%), with a mean age of 49.00±12.23 years (minimum 32, maximum 67 years). The most common education level was upper secondary/vocational certificate (14; 29.79%), followed by primary education (12; 25.53%). Most were VHVs (25; 53.19%), followed by community leaders (12; 25.53%), while SHPH public health officers and LAO disease control officers numbered 5 each (10.64%). The most common communicable disease surveillance experience was 1-5 years (18; 38.30%), followed by 6-10 years (14; 29.79%), with a mean experience of 7.40±2.12 years, as shown in Table 1.

Table 1 General characteristics of participants in the community communicable disease surveillance network development, Khamin Subdistrict, Mueang Kalasin District, Kalasin Province (n = 47)

General characteristics	Number	Percentage
1. Sex		
Male	18	38.30
Female	29	61.70
2. Age (years)		
30-39 years	8	17.02
40-49 years	15	31.91
50-59 years	18	38.30
60 years and over	6	12.77
Age ($\bar{x}$±S.D.) = 49.00±12.23 years (min–max = 32–67 years)		
3. Education level		
Primary education	12	25.53
Lower secondary education	8	17.02
Upper secondary/vocational certificate	14	29.79
Diploma/high vocational certificate	5	10.64
Bachelor's degree	7	14.89
Higher than bachelor's degree	1	2.13
4. Position/role		
Village health volunteer (VHV)	25	53.19
SHPH public health officer	5	10.64
LAO disease control officer	5	10.64
Community leader	12	25.53
5. Communicable disease surveillance experience		
Less than 1 year	5	10.64
1-5 years	18	38.30
6-10 years	14	29.79
11-15 years	7	14.89
More than 15 years	3	6.38
Experience ($\bar{x}$±S.D.) = 7.40±2.12 years		

2. Comparison of Knowledge, Attitudes, Behaviors, Disease Control Efficiency, and Emergency Response Capability Before and After the Development of the Community Communicable Disease Surveillance Network

2.1 Knowledge of the communicable disease surveillance system: Before the network development, the mean knowledge score was 10.19±2.73 (67.93%), at a moderate level. The items with the fewest correct answers were that VHVs can report communicable diseases directly through the D506 system (38.30% correct), that all communicable disease patients must be isolated in hospital (44.68% correct), and that false or delayed reporting does not affect disease control (51.06% correct). After the network development, the mean knowledge score increased to 13.72±1.45 (91.47%), at a good level. The items with the most correct answers were that wearing a face mask helps prevent the spread of respiratory diseases and that handwashing with soap and clean water helps prevent communicable diseases (97.87% correct), while correct answers on reporting through the D506 system increased to 85.11%.

2.2 Attitudes toward network collaboration: Before the network development, the mean attitude score was 34.61±5.24 (69.22%), at a moderate level. The lowest-scoring items were that network meetings are a waste of time and unnecessary ($\bar{x}$ = 2.72) and that coordinating with various agencies makes work more complicated ($\bar{x}$ = 2.85). After the network development, the mean attitude score increased to 43.69±3.78 (87.38%), at a good level. The highest-scoring item was that information exchange among network members is important ($\bar{x}$ = 4.51), and all items were at a good level.

2.3 Communicable disease surveillance practice behaviors: Before the network development, the mean behavior score was 32.38±6.47 (64.76%), at a moderate level. The lowest-scoring items were coordinating with network members when communicable disease cases are found ($\bar{x}$ = 2.89) and attending network meetings and related activities ($\bar{x}$ = 2.96), both at a low level. After the network development, the mean behavior score increased to 42.77±4.29 (85.54%), at a good level. The highest-scoring item was referring communicable disease patients to appropriate agencies ($\bar{x}$ = 4.43), followed by reporting surveillance data within the specified time ($\bar{x}$ = 4.38).

2.4 Disease control efficiency: Before the network development, the mean disease control efficiency score was 25.95±4.83 (64.88%), at a moderate level. The lowest-

scoring items were continuous monitoring and evaluation of disease control ($\bar{x}$ = 2.98) and timeliness of surveillance data reporting ($\bar{x}$ = 3.06). After the network development, the mean score increased to 34.02±3.47 (85.05%), at a good level. The highest-scoring item was the ability to prevent disease spread ($\bar{x}$ = 4.38), followed by timeliness of surveillance data reporting ($\bar{x}$ = 4.36).

2.5 Emergency response capability: Before the network development, the mean score was 21.35±4.72 (61.00%), at a moderate level. The lowest-scoring items were coordination among network members in emergencies ($\bar{x}$ = 2.72), the ability to mobilize resources to respond to the situation ($\bar{x}$ = 2.87), and monitoring and evaluation of operations in emergencies ($\bar{x}$ = 2.96), all at a low level. After the network development, the mean score increased to 29.36±3.28 (83.89%), at a good level. The highest-scoring item was the ability to communicate with the public in emergencies ($\bar{x}$ = 4.34), followed by the speed of detecting and reporting disease outbreaks ($\bar{x}$ = 4.26).

2.6 Overall difference testing: The paired t-test showed that after the network development, the mean scores for knowledge ($\bar{d}$ = 3.53, 95% CI = 2.71-4.35), attitudes ($\bar{d}$ = 9.08, 95% CI = 7.46-10.70), behaviors ($\bar{d}$ = 10.39, 95% CI = 8.28-12.50), disease control efficiency ($\bar{d}$ = 8.07, 95% CI = 6.51-9.63), and emergency response capability ($\bar{d}$ = 8.01, 95% CI = 6.35-9.67) were significantly higher than before the development in all domains ($p<0.001$), with effect sizes (Cohen's dz) of 1.27, 1.64, 1.45, 1.51, and 1.42, respectively, all of which are considered large, as shown in Table 2.

Table 2 Comparison of mean scores of knowledge, attitudes, behaviors, disease control efficiency, and emergency response capability before and after the development of the community communicable disease surveillance network (n = 47) (paired t-test)

Variable (total score)	Before development		After development		95% CI	t	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.			
Knowledge (15)	10.19	2.73	13.72	1.45	2.71-4.35	8.74	< 0.001*
Attitudes (50)	34.61	5.24	43.69	3.78	7.46-10.70	11.26	< 0.001*
Behaviors (50)	32.38	6.47	42.77	4.29	8.28-12.50	9.95	< 0.001*
Disease control efficiency (40)	25.95	4.83	34.02	3.47	6.51-9.63	10.38	< 0.001*
Emergency response capability (35)	21.35	4.72	29.36	3.28	6.35-9.67	9.72	< 0.001*

*Statistically significant at p-value <.05

Note: All variables were at a moderate level before development and at a good level after development; $\bar{d}$ = mean difference (after – before); df = 46

3. Satisfaction After the Development of the Community Communicable Disease Surveillance Network

Network members' overall satisfaction with the network development had a mean score of 43.22±4.57 out of 50 (86.44%), at a good level. By item, the highest-scoring item was benefits received ($\bar{x}$±S.D. = 4.45±0.62), followed by overall satisfaction ($\bar{x}$±S.D. = 4.41±0.64) and appropriateness of the speakers ($\bar{x}$±S.D. = 4.38±0.65). The lowest-scoring items, though still at a good level, were appropriateness of the duration ($\bar{x}$±S.D. = 4.19±0.76) and support and follow-up ($\bar{x}$±S.D. = 4.23±0.74), as shown in Table 3.

Table 3 Satisfaction with the development of the community communicable disease surveillance network, Khamin Subdistrict, Mueang Kalasin District, Kalasin Province (n = 47)

Satisfaction with network development	$\bar{x}$	S.D.	Level
1. Appropriateness of program content	4.34	0.68	Good
2. Appropriateness of activity format	4.28	0.71	Good
3. Appropriateness of duration	4.19	0.76	Good
4. Appropriateness of media and tools	4.26	0.73	Good
5. Appropriateness of venue	4.32	0.69	Good
6. Appropriateness of speakers	4.38	0.65	Good
7. Support and follow-up	4.23	0.74	Good
8. Benefits received	4.45	0.62	Good
9. Overall satisfaction	4.41	0.64	Good
10. Willingness to recommend to others	4.36	0.67	Good
Total (maximum score 50)	**43.22**	**4.57**	**Good**

Discussion

Most participants in the network development were female, with a mean age of approximately 49 years; more than half were VHVs, and their mean communicable disease surveillance experience was 7.40 years. These characteristics are consistent with lessons learned from COVID-19 surveillance, prevention, and control by VHVs in northeastern Thailand, which found that most VHVs were female and played a key role in community communicable disease surveillance.[12] The relatively high age and experience of the participants reflect an understanding of the community context, which is an important asset in driving the network; at the same time, this may be a limitation in the use of digital technology. Activities therefore need to emphasize hands-on practice alongside knowledge provision.

Regarding knowledge of the communicable disease surveillance system, participants' knowledge scores increased significantly from a moderate to a good level after the network development. This may be because the program provided basic training on communicable diseases, the surveillance system, and the D506 reporting system combined with hands-on practice, consistent with a study finding that developing the knowledge of VHVs and communities in communicable disease prevention and surveillance significantly improved operational efficiency.[13] In particular, reporting through the D506 system, the lowest-scoring item before the development, increased markedly afterward, reflecting the importance of building capacity to use digital information systems. This is consistent with the approach of developing digital tools for displaying the situation of notifiable diseases under epidemiological surveillance.[14] Knowledge of basic disease prevention, such as handwashing and wearing face masks, was answered correctly by nearly all participants after the development (97.87%), which may reflect a good baseline knowledge of disease prevention.

Regarding attitudes toward network collaboration, attitudes changed from a moderate to a good level. Scores on negative statements, such as network meetings being a waste of time and coordination making work more complicated, improved markedly, reflecting a shift in perspective from fragmented to integrated work. This may result from workshop activities, experience sharing, and the creation of a shared vision, consistent with recommendations emphasizing cross-sector collaboration within communities to strengthen disease surveillance in rural areas,[15] and with Social Network Theory, which explains that information exchange and good relationships among members are at the heart of effective network collaboration.[5]

Regarding communicable disease surveillance practice behaviors, behaviors increased from a moderate to a good level. Notable improvements were seen in

coordinating with network members when cases were found and attending network meetings, both of which were at a low level before the development. This may be the result of developing clear communication and reporting channels, field practice, and weekly follow-up, consistent with a study finding that community-based surveillance detects public health events more effectively when clear reporting and coordination systems are in place.[7]

Regarding disease control efficiency, scores increased from a moderate to a good level, particularly the timeliness of surveillance data reporting, which is a key factor in controlling disease spread. This is consistent with a study finding that developing an integrated communicable disease prevention strategy effectively improved screening and patient care.[16] However, continuous monitoring and evaluation of disease control was the lowest-scoring item before the development; therefore, a simple and continuous monitoring and evaluation system should be further developed.

Regarding emergency response capability, scores increased from a moderate to a good level, particularly in coordination among network members and resource mobilization in emergencies, which were the lowest-scoring items before the development. This increase may result from simulation exercises, role assignments, and communication system testing, consistent with a review finding that people-centred community-based surveillance enables rapid outbreak detection and response.[6]

Regarding satisfaction, network members were satisfied with the network development at a good level, with benefits received scoring the highest, indicating that members valued the development in concrete terms. This is consistent with a study finding that VHVs and communities were satisfied with the developed surveillance system at a good level or higher,[13] and with the concept of community empowerment through participation and capacity building.[17] Appropriateness of the duration and support and follow-up scored the lowest, although still at a good level, reflecting the need to schedule activities in line with network members' workloads and to provide continuous support after the program ends.

This study has several limitations: 1) it was a one-group study without a comparison group, so the results may have been influenced by other factors, such as events in the area during the study (history) and the effect of repeated administration of the same instruments (testing effect); 2) disease control efficiency and emergency response capability were measured by self-assessment and may therefore be subject to social desirability bias; and 3) outcomes were measured only 2 weeks after program completion, so the sustainability of the outcomes cannot yet be determined.

Conclusion

The development of the community communicable disease surveillance network in Khamin Subdistrict, Mueang Kalasin District, Kalasin Province, based on Social Network Theory and community participation through a 5-stage program, was associated with significant increases in network members' knowledge, attitudes, behaviors, disease control efficiency, and emergency response capability from a moderate to a good level, and network members were satisfied with the development at a good level. This program may therefore serve as a guideline for strengthening the communicable disease surveillance capacity of primary care units in similar contexts.

Recommendations

1. Recommendations for Applying the Research Findings

1.1 District and provincial health agencies should establish the development of subdistrict-level communicable disease surveillance networks as a standard practice, shifting from reactive to proactive surveillance, and should promote budget integration among health agencies, local administrative organizations, and health security funds to support continuous operations.

1.2 The capacity of network members should be continuously developed, particularly in using the D506 reporting system and information technology, through monthly experience-sharing meetings and online media, together with incentive and recognition systems for outstanding network members.

1.3 A simple yet effective monitoring and evaluation system should be developed using indicators of knowledge, attitudes, behaviors, disease control efficiency, and emergency response capability, reassessed every 6 months, with the results used to improve operations.

1.4 Primary care units in similar contexts can adapt the program, starting with a joint situation analysis among multidisciplinary teams, local administrative organizations, and community network partners, tailoring activities to the population characteristics and culture of the area, and establishing learning networks and mentoring systems between subdistricts.

2. Recommendations for Future Research

2.1 Future studies should use a research design with a control group, conduct long-term follow-up to assess network sustainability, and examine application to the surveillance of other communicable diseases, such as respiratory, foodborne, and vector-borne diseases.

2.2 Objective indicators, such as the timeliness of reporting through the D506 system and the number of unusual events detected, should be added alongside self-

assessment to confirm disease control efficiency outcomes.

Acknowledgments

The author would like to thank the Director of Ban Non Chai Subdistrict Health Promoting Hospital for permitting the use of the study area and supporting the research; the Kalasin Provincial Chief Medical Officer and the Human Research Ethics Committee of the Kalasin Provincial Public Health Office for granting permission and ethical approval; and the Mueang Kalasin District Chief, village headmen, and all community leaders in Khamin Subdistrict for their support and facilitation. Sincere thanks are also extended to all members of the community communicable disease surveillance network who willingly participated in the research throughout the 7-month period, the multidisciplinary team of Ban Non Chai Subdistrict Health Promoting Hospital, and the 3 experts who kindly reviewed the research instruments and provided valuable suggestions.

References

1. Buehler JW, Hopkins RS, Overhage JM, Sosin DM, Tong V. Framework for evaluating public health surveillance systems for early detection of outbreaks: recommendations from the CDC Working Group. MMWR Recomm Rep. 2004;53(RR-5):1-11.

2. Department of Disease Control. Guidelines for communicable disease surveillance for public health personnel. Bangkok: The Agricultural Cooperative Federation of Thailand Printing; 2024. (in Thai)

3. Department of Disease Control. Digital surveillance system (D506) implementation in Thailand. Wkly Epidemiol Surveill Rep. 2024;55(12):189-95.

4. Health Workforce Research and Development Office. Roles of village health volunteers in COVID-19 control. Nonthaburi: Health Systems Research Institute; 2020. (in Thai)

5. Wasserman S, Faust K. Social network analysis: methods and applications. Cambridge: Cambridge University Press; 1994.

6. Ratnayake R, Tammaro M, Tiffany A, Kongelf A, Polonsky JA, McClelland A. People-centred surveillance: a narrative review of community-based surveillance among crisis-affected populations. Lancet Planet Health. 2020;4(10):e483-95.

7. Merali S, Asiedu-Bekoe F, Clara A, Adjabeng M, Baffoenyarko I, Frimpong JA, et al. Community-based surveillance advances the Global Health Security Agenda in Ghana. PLoS One. 2020;15(8):e0237320.

8. Ban Non Chai Subdistrict Health Promoting Hospital. Annual disease surveillance situation report 2024. Kalasin: Kalasin Provincial Administrative Organization; 2024. (in Thai)

9. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale (NJ): Lawrence Erlbaum Associates; 1988.

10. Akkarapan P, Panwit S, Iamla-or W. Evaluation of the efficiency of community communicable disease surveillance systems. Journal of Health Science Research. 2022;16(2):45-58. (in Thai)

11. Green LW, Kreuter MW. Health program planning: an educational and ecological approach. 4th ed. New York: McGraw-Hill; 2005.

12. Sridaoruang C, Worawong J, Sriring P, Klangklang R, Haohan J, Jaisue D, et al. Lessons learned from the community-based COVID-19 surveillance, prevention and control model of village health volunteers in northeastern Thailand. Nonthaburi: Health Systems Research Institute; 2021. (in Thai)

13. Nawamawat J, Sittisart W, Lekpet K, Thianthavorn P. Participation of village health volunteers and communities in COVID-19 prevention and surveillance using a geographic information system. Nonthaburi: Health Systems Research Institute; 2021. (in Thai)

14. Areechokchai D, Sayumpurujinan S. Development of a dashboard for notifiable disease situations under the Communicable Diseases Act B.E. 2558. Wkly Epidemiol Surveill Rep. 2024;55(9):15-26. (in Thai)

15. Worsley-Tonks KE, Bender JB, Deem SL, Ferguson AW, Fèvre EM, Martínez-López B, et al. Strengthening global health security by improving disease surveillance in remote rural areas of low-income and middle-income countries. Lancet Glob Health. 2022;10(4):e579-84.

16. Kaewphamon T, Saengsai S, Namwong T. Development of an integrated strategy for prevention of HIV, viral hepatitis and sexually transmitted infections, Yasothon Province. Thai AIDS J. 2024;36(3):135-48. (in Thai)

17. Lohpansa K, et al. Community empowerment for health promotion and prevention of non-communicable diseases. Nursing, Health, and Education Journal. 2024;7(1):88-99. (in Thai)

Thai Health Sciences Frontiers
วารสารวิทยาศาสตร์สุขภาพไทยก้าวหน้า
THSF

RESEARCH ARTICLE

Effects of a Household Solid Waste Management Behavior Promotion Program among Residents in the Service Area of Phato Hospital, Chumphon Province

Wannawisa Thipwong[1]*

[1]Public Health Technical Officer (Practitioner Level), Primary and Holistic Care Services Department, Phato Hospital, Phato District, Chumphon Province

*Corresponding author

☐ **Received:** 14 September 2026 ✓ **Revised:** 16 September 2026 ☑ **Accepted:** 21 October 2026

Citation: Thipwong W. Effects of a household solid waste management behavior promotion program among residents in the service area of Phato Hospital, Chumphon Province. Thai Health Sciences Frontiers. 2026;1(3):31-45.

Abstract

This one-group pretest-posttest quasi-experimental study aimed to develop a household solid waste management behavior promotion program based on the GREEN & CLEAN Hospital Challenge low-carbon concept, to compare residents' knowledge, attitudes, and behaviors before and after the program, and to assess their satisfaction in the service area of Phato Hospital, Chumphon Province, from May to June 2026. Forty-two residents were selected by simple random sampling. Instruments comprised a 5-activity program, a knowledge test, and questionnaires (CVI = 0.92; reliability 0.81–0.92). Data were analyzed using descriptive statistics and the paired t-test.

The program comprised two educational sessions, one waste separation demonstration and practice session, and two home visits over five weeks. Participants were mostly male (54.76%) and farmers (52.38%), with a mean age of 42.31±10.30 years. After the program, mean scores increased for knowledge (from 10.90±2.37 to 12.02±4.24, out of 20), attitudes (from 3.00±0.45 to 3.19±0.74), and behaviors (from 2.30±0.49 to 2.52±0.74). Knowledge and behavior improved significantly but with small effect sizes (p=0.039 and 0.045; Cohen's dz = 0.33 and 0.32), whereas attitude did not (p=0.051). Overall satisfaction was high (4.15±1.12). The program may modestly improve knowledge and behaviors and may serve as a guideline for agricultural communities with similar contexts, provided structural support and longer follow-up are added.

Keywords: Household solid waste management, GREEN & CLEAN Hospital Challenge, low carbon, environmental health behavior

Introduction

Solid waste is a global environmental crisis that continues to intensify. Worldwide, more than 2.01 billion tons of solid waste are generated each year, of which only 16.00% is properly recycled, while 46.00% is disposed of in an unsustainable manner. The Global Waste Management Outlook 2024 of the United Nations Environment Programme warns that, without urgent action, global municipal waste generation will increase by another two-thirds by 2050 and waste management costs will nearly double. This problem is directly linked to climate change, as the decomposition of organic waste and improper waste disposal are sources of methane and carbon dioxide, which are major greenhouse gases.[1]

In Thailand, 25.70 million tons of solid waste were generated in 2022, of which 7.10 million tons (27.63%) were improperly disposed of.[2] In 2023, the amount rose to 26.95 million tons, or an average of 73,840 tons per day, with an average generation rate of 1.12 kg per person per day, and as much as 7.47 million tons (27.72%) were still improperly disposed of.[3] In the southern region, solid waste increased from 8,384 tons per day in 2021 to 9,705 tons per day in 2023, the highest rate of increase among all regions of the country.[4] In Chumphon Province, solid waste increased from approximately 412.00 tons per day in 2022 to approximately 452.00 tons per day in 2024. The key problems in the area are the lack of waste separation at source and the lack of knowledge about proper waste management among residents of remote and agricultural areas, resulting in open burning and roadside dumping of waste, which cause air pollution and greenhouse gas emissions.[3]

Household solid waste management behavior is influenced by several factors, including knowledge, attitudes, motivation, and environmental enabling factors. Studies have found that knowledge and attitudes are positively associated with household solid waste management behavior,[5] and that motivation, access to information, and social support are associated with household waste reduction and separation behaviors.[6] Waste management based on the 3Rs principle, namely Reduce, Reuse, and Recycle, starting with separation at source, is therefore central to solving the problem. In addition, the GREEN & CLEAN Hospital Challenge concept of the Ministry of Public Health, which aims to improve environmental health in health care facilities, covers the management of all types of waste (GARBAGE), standard restroom development (RESTROOM), energy management (ENERGY), environmental management (ENVIRONMENT), food and water sanitation (NUTRITION), and the development of low-carbon and climate-resilient hospitals (Low Carbon and Climate Resilient Health Care).[7] This concept can also be applied as a framework for promoting environmental management at the community level.

Phato District, Chumphon Province, covers an area of approximately 1,017 square kilometers. Most of the population works in agriculture, particularly fruit orchards and oil palm plantations. Communities are dispersed across mountainous areas and foothill plains, which

limits access to the waste collection services of local administrative organizations. Community solid waste increased from approximately 8.20 tons per day in 2022 to 9.80 tons per day in 2024, with 28.00-32.00% of all waste remaining improperly managed,[3] posing a risk of contaminating natural water sources that are important headwaters of the province. In 2025, Phato Hospital received the GREEN & CLEAN Hospital Challenge award for low-carbon and climate-resilient hospitals, reflecting the organization's capacity to drive environmental work systematically. However, solid waste management in the area has so far relied on occasional campaigns and has lacked systematic and continuous implementation at the household level. Residents still lack sufficient knowledge, do not separate waste at source, and engage in inappropriate waste dumping and burning.

Given this background, the researcher recognized that developing a household solid waste management behavior promotion program applying the GREEN & CLEAN Hospital Challenge concept on low carbon and climate change, through education, demonstration and practice of waste separation, and follow-up of household behaviors, is an important approach to linking the hospital's capacity to concrete solutions for environmental problems at the household level, and would provide information for developing solid waste management systems in agricultural communities with similar contexts. The researcher therefore developed this program and studied its effects on residents' knowledge, attitudes, behaviors, and satisfaction.

Objectives

1. To develop a household solid waste management behavior promotion program applying the GREEN & CLEAN Hospital Challenge concept on low carbon and climate change for residents in the service area of Phato Hospital, Chumphon Province.

2. To compare residents' knowledge, attitudes, and household solid waste management behaviors before and after receiving the household solid waste management behavior promotion program, Phato Hospital, Chumphon Province.

3. To assess residents' satisfaction with the household solid waste management behavior promotion program, Phato Hospital, Chumphon Province.

Methods

This study employed research and development combined with a quasi-experimental one-group pretest-posttest design. It was conducted from May to June 2026, over a total of 8 weeks (including 5 weeks of program implementation), in three phases: Phase 1, pre-intervention assessment and preparation, sample selection, and pretest data collection (week 1); Phase 2, implementation of the household solid waste management behavior promotion program (weeks 2-6); and Phase 3, posttest data collection, satisfaction assessment, and data analysis (weeks 7-8).

Population: Residents in the service area of Phato Hospital, Phato District, Chumphon Province, covering 4 subdistricts and 46 villages,

namely Phato, Pak Song, Pang Wan, and Phra Rak Subdistricts, totaling 650 households.

Sample: The sample size was calculated using G*Power version 3.1[8] for the paired t-test (Means: Difference between two dependent means), with a medium effect size (effect size = 0.50)[9] and a significance level of α = .05, yielding a sample of 42 participants. Participants were selected by simple random sampling using a random number table, with the population registers of the villages in the service area as the sampling frame; one representative was randomly selected from each household. All 42 participants completed the study and were included in the data analysis.

Inclusion criteria: Being listed in a house registration or actually residing in the service area of Phato Hospital; aged 18 years or older; being the person primarily responsible for household solid waste management; able to communicate in Thai; being physically and mentally healthy; residing in the area throughout the study period; and voluntarily consenting to participate in the study.

Exclusion criteria: Having an uncontrolled chronic disease or an acute illness that prevented participation in the activities; concurrently participating in another project related to solid waste management; planning to relocate or travel away from the area for an extended period; being unable to complete all program activities; or requesting to withdraw during the study.

Research instruments: These comprised the intervention instrument and the data collection instruments, as follows.

1. Intervention instrument: The household solid waste management behavior promotion program applying the GREEN & CLEAN Hospital Challenge concept on low carbon and climate change, developed by the researcher based on a literature review, a situational survey, in-depth interviews with residents, community leaders, village health volunteers, and health personnel, and focus group discussions with stakeholders. The program was implemented during weeks 2-6 and consisted of five activities: Activity 1, the first educational session on "The four types of solid waste and their impacts on the environment and health," using videos, flipcharts, and a participatory lecture (60 minutes, week 2); Activity 2, the second educational session on "The 3Rs principle and the GREEN & CLEAN low-carbon concept," using a lecture, group discussion, and examples from farmers' daily lives (60 minutes, week 3); Activity 3, demonstration and practice of separating the four types of solid waste at source in the household using real waste samples from the agricultural community (90 minutes, week 4); Activity 4, the first home visit to observe waste bin arrangement and household waste separation and to provide individual advice (week 5); and Activity 5, the second home visit to continuously follow up on behaviors, provide positive reinforcement to households practicing correctly, and give additional advice to households with remaining shortcomings (week 6). After the program, certificates and a household solid waste management handbook were presented to reinforce the maintenance of correct behaviors (week 8).

2. Data collection instruments: Four instruments were used: 1) a 10-item general information questionnaire, comprising 7 items on personal data and 3 items on solid waste

management; 2) a 20-item test of knowledge of household solid waste management covering four domains, namely types of waste, waste separation, impacts of improper waste management, and the GREEN & CLEAN concept and greenhouse gas reduction, with yes/no answers and a total score of 20, interpreted using criteria adapted from Bloom[10] as high (14-20 points), moderate (8-13 points), and low (0-7 points); 3) a questionnaire on attitudes and behaviors regarding household solid waste management using a 5-point rating scale, consisting of 20 attitude items in four domains, with mean scores interpreted according to Best's criteria[11] into five levels: highest (4.51-5.00), high (3.51-4.50), moderate (2.51-3.50), low (1.51-2.50), and lowest (1.00-1.50), and 20 behavior items covering waste reduction (Reduce), reuse (Reuse), separation for recycling (Recycle), and hygienic waste disposal, with mean scores interpreted using class intervals [(5−1)/3] as high (3.68-5.00), moderate (2.34-3.67), and low (1.00-2.33); and 4) a 20-item program satisfaction questionnaire in four domains, namely content and knowledge gained, activities and implementation methods, facilitators and organizers, and application in daily life, using a 5-point rating scale interpreted according to Best's criteria,[11] with an open-ended question for additional suggestions.

3. Instrument quality assessment: The content validity of the program and instruments was examined by three experts: a public health technical officer experienced in environmental health and community solid waste management, a senior health professional experienced in implementing the GREEN & CLEAN Hospital Challenge, and a representative of a local administrative organization responsible for solid waste management. The Content Validity Index (CVI) was used, with a passing criterion of 0.80 or higher;[12] the CVI values of the individual instruments ranged from 0.90 to 0.94. The instruments were then tried out with 30 residents with characteristics similar to those of the sample in the area of a nearby subdistrict health promoting hospital. The reliability of the knowledge test (KR-20) was 0.81, and the Cronbach's alpha coefficients of the attitude, behavior, and satisfaction questionnaires were 0.87, 0.89, and 0.92, respectively, meeting the criterion of 0.70 or higher.[13]

Data Collection

The researcher collected pretest data in week 1 using the general information questionnaire, the knowledge test, and the attitude and behavior questionnaires. The program was implemented in weeks 2-6, and posttest data were collected in week 7 using the knowledge test and the attitude, behavior, and satisfaction questionnaires. Data were collected through interviews, and qualitative data were collected through observation and in-depth questioning during the program development phase.

Data Analysis

1. The general characteristics of the sample, namely sex, age, education level, occupation, income, number of household members, subdistrict of residence, distance to the waste collection point, availability of separated waste bins, and previous experience of receiving knowledge on solid waste management, were analyzed using frequency, percentage, arithmetic mean, and standard deviation. Qualitative data

from the situational survey and in-depth interviews for program development were analyzed using content analysis.

2. The mean scores of knowledge, attitudes, and household solid waste management behaviors before and after the program within the same group were compared using the paired t-test after testing for normality with the Shapiro-Wilk test (the Wilcoxon signed-rank test was to be used if the data were not normally distributed). The mean difference ($\bar{d}$), 95% confidence interval (95% CI), and effect size (Cohen's dz) were reported. Two-tailed tests were used, with statistical significance set at .05. Analyses were performed using SPSS version 26.0.

3. Satisfaction with the program was analyzed using mean and standard deviation and interpreted according to the criteria by item, by domain, and overall. Suggestions from the open-ended question were summarized by thematic grouping.

Research Ethics

This study was approved by the Human Research Ethics Committee of the Chumphon Provincial Public Health Office and was authorized by the Director of Phato Hospital prior to data collection. The researcher protected participants' rights by informing them in advance of the study objectives, procedures, duration of participation, and expected benefits. Participants had the right to accept or decline participation and to withdraw from the study at any time without any effect on their access to health services or any other rights. Data were kept confidential by using codes instead of real names, and the results were presented only in aggregate for academic purposes. All participants signed informed consent forms before participating in the study.

Results

1. General characteristics of the sample

Of the 42 participants, 23 were male (54.76%). The largest age group was 40-49 years (17 participants, 40.48%), with a mean age of 42.31±10.30 years (range 25-63 years). Most had completed primary education (19 participants, 45.24%). The main occupation was farming (orchards/field crops) (22 participants, 52.38%), followed by general labor (12 participants, 28.57%). The most common monthly household income was 5,000-10,000 baht (18 participants, 42.86%). The mean number of household members was 4.17±1.12. The most common distances from home to the waste collection point of the local administrative organization (LAO) were 3-5 km and more than 5 km (13 participants each, 30.95%), with a mean distance of 3.64±1.95 km. Thirty-one participants (73.81%) had no separated waste bins at home, and equal proportions had and had not previously received knowledge about solid waste management (50.00% each), as shown in Table 1.

Table 1 General characteristics of participants in the household solid waste management behavior promotion program, Phato Hospital, Chumphon Province (n = 42)

Characteristics	Number	Percentage
1. Sex		

Characteristics	Number	Percentage
Male	23	54.76
Female	19	45.24
2. Age (years)		
25-29 years	7	16.67
30-39 years	7	16.67
40-49 years	17	40.48
50-59 years	10	23.81
60 years and over	1	2.38
Age ($\bar{x}$±S.D.) = 42.31±10.30 years (min-max = 25-63 years)		
3. Education level		
Primary school	19	45.24
Lower secondary school	9	21.43
Upper secondary school/Vocational certificate	10	23.81
Diploma/High vocational certificate	2	4.76
Bachelor's degree or higher	2	4.76
4. Main occupation		
Farmer (orchards/field crops)	22	52.38
General laborer	12	28.57
Trader/Own business	6	14.29
Homemaker	1	2.38
Others	1	2.38
5. Average monthly household income		
Less than 5,000 baht	3	7.14
5,000-10,000 baht	18	42.86
10,001-20,000 baht	14	33.33
More than 20,000 baht	7	16.67
Income ($\bar{x}$±S.D.) = 12,559.52±6,780.75 baht		
6. Distance from home to the waste collection point of the local administrative organization (LAO)		
Less than 1 km	6	14.29
1.00-2.99 km	10	23.81
3.00-5.00 km	13	30.95
More than 5 km	13	30.95
Distance ($\bar{x}$±S.D.) = 3.64±1.95 km		
7. Availability of separated waste bins in the household		
Yes	11	26.19

Characteristics	Number	Percentage
No	31	73.81
8. Previous experience of receiving knowledge on solid waste management		
Yes	21	50.00
No	21	50.00

2. Results of the development of the household solid waste management behavior promotion program

The situational analysis based on the literature review, secondary data, in-depth interviews, and focus group discussions identified four key problems: 1) most residents lacked knowledge of waste separation by type, particularly the differences among recyclable, organic, and hazardous waste; 2) waste burning in agricultural areas was still accepted in the community; 3) most households had no separated waste bins; and 4) the waste collection system of the local administrative organizations did not reach remote areas. The researcher therefore designed a program with five components: screening and readiness assessment of participants; content and five behavior promotion activities; duration and frequency (5 weeks, 60-90 minutes per activity); program media and tools, namely videos, flipcharts, a household solid waste management handbook, and a behavior monitoring form; and follow-up and evaluation. The appropriateness of the program was assessed by three experts, yielding an overall S-CVI/Ave of 0.92. The CVI was 0.93 for the appropriateness of program content, the appropriateness of data collection instruments, and the feasibility of implementation, and 0.87 for the appropriateness of activities and implementation methods. The experts suggested adding waste samples from agricultural communities to the demonstration activity, simplifying the wording of the questionnaire items and linking them to the agricultural way of life, and scheduling home visits in line with the farmers' harvest seasons. The researcher incorporated these suggestions before actual implementation.

3. Comparison of knowledge, attitudes, and household solid waste management behaviors before and after receiving the household solid waste management behavior promotion program

3.1 Knowledge of household solid waste management Before the program, the mean knowledge score was 10.90±2.37 out of 20, a moderate level. The domain with the lowest score was knowledge of the impacts of improper waste management ($\bar{x}$ = 2.57 out of 5), and the items with the fewest correct answers were “Recyclable waste can be reused,” “Light bulbs, batteries, and pesticide containers are hazardous waste,” and “Separating wet waste from dry waste allows more hygienic waste disposal” (47.62% correct). After the program, the mean knowledge score increased to 12.02±4.24, remaining at a moderate level. The standard deviation nearly doubled, indicating considerable individual variation in response to the program. Scores increased in all domains, with the highest score in knowledge of GREEN & CLEAN and

greenhouse gas reduction ($\bar{x}$ = 3.12). The item with the greatest change was "Light bulbs, batteries, and pesticide containers are hazardous waste," with correct answers increasing from 47.62% to 69.05%.

3.2 Attitudes toward household solid waste management Before the program, the mean attitude score was 3.00±0.45, a moderate level. The domain with the lowest score was attitudes toward waste separation at source ($\bar{x}$ = 2.94), and the item with the lowest score was "Providing separated waste bins in the household is a worthwhile investment" ($\bar{x}$ = 2.86). After the program, the mean attitude score increased to 3.19±0.74, remaining at a moderate level, with scores increasing in all domains. The domain with the highest score was attitudes toward environmental impacts and climate change ($\bar{x}$ = 3.24), and the items with the greatest change were "Providing separated waste bins is a worthwhile investment" (from 2.86 to 3.19) and "Feeling proud if the household can reduce waste" (from 2.95 to 3.24).

3.3 Household solid waste management behaviors Before the program, the mean behavior score was 2.30±0.49, a low level. The domain with the lowest score was separation for recycling (Recycle) ($\bar{x}$ = 2.22), and the item with the lowest score was composting food and vegetable scraps or using them as animal feed ($\bar{x}$ = 2.10). After the program, the mean behavior score increased to 2.52±0.74, a moderate level, with all domains increasing to a moderate level. Separation for recycling had the highest score ($\bar{x}$ = 2.53) and showed the greatest change. The items with the highest scores were avoiding open burning of waste in the open or around the house and buying only necessary goods to reduce packaging waste ($\bar{x}$ = 2.60), and the item with the greatest change was composting food and vegetable scraps or using them as animal feed, which increased from 2.10 to 2.55, changing from a low to a moderate level.

3.4 Overall difference testing The paired t-test showed that the score differences were normally distributed. After the program, participants had significantly higher mean scores for knowledge ($\bar{d}$ = 1.12, 95% CI = 0.09-2.15, t = 2.128, p=0.039) and household solid waste management behaviors ($\bar{d}$ = 0.22, 95% CI = 0.01-0.42, t = 2.070, p=0.045) than before the program, with effect sizes (Cohen's dz) of 0.33 and 0.32, respectively, which are considered small. The attitude score ($\bar{d}$ = 0.19, 95% CI = 0.00-0.38, t = 2.010, p=0.051) did not differ significantly from before the program (dz = 0.31), as shown in Table 2.

Table 2 Comparison of mean scores of knowledge, attitudes, and household solid waste management behaviors before and after receiving the household solid waste management behavior promotion program (n = 42) (Paired t-test)

Variable (total score)	Before the program		After the program		95% CI of $\bar{d}$	t	dz	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.				
Knowledge (20)	10.90	2.37	12.02	4.24	0.09-2.15	2.128	0.33	0.039*

Variable (total score)	Before the program		After the program		95% CI of $\bar{d}$	t	dz	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.				
Attitudes (5)	3.00	0.45	3.19	0.74	0.00-0.38	2.010	0.31	0.051
Behaviors (5)	2.30	0.49	2.52	0.74	0.01-0.42	2.070	0.32	0.045*

*Statistically significant at p-value <.05

Note: Levels before ⟶ after the program: knowledge, moderate ⟶ moderate; attitudes, moderate ⟶ moderate; behaviors, low ⟶ moderate; df = 41; dz = Cohen's dz

4. Residents' satisfaction with the household solid waste management behavior promotion program

Overall satisfaction with the program had a mean score of 4.15±1.12 out of 5 (83.00%), a high level. All domains were at a high level, with the highest score in application in daily life ($\bar{x}$±S.D. = 4.26±0.37), followed by facilitators and organizers ($\bar{x}$±S.D. = 4.13±0.43), content and knowledge gained ($\bar{x}$±S.D. = 4.10±0.45), and activities and implementation methods ($\bar{x}$±S.D. = 4.09±0.37). By item, the highest score was willingness to recommend the program to household and community members ($\bar{x}$±S.D. = 4.38±0.79), followed by the program raising awareness of the importance of reducing household greenhouse gas emissions ($\bar{x}$±S.D. = 4.36±0.66). The items with the lowest scores, although still at a high level and with widely varying opinions, were the appropriateness of the amount of content ($\bar{x}$±S.D. = 3.95±1.10) and the appropriateness of the venue and timing of activities ($\bar{x}$±S.D. = 3.98±0.92), as shown in Table 3.

Table 3 Residents' satisfaction with the household solid waste management behavior promotion program, Phato Hospital, Chumphon Province (n = 42)

Satisfaction with the program	$\bar{x}$	S.D.	Level
1. Content and knowledge gained	4.10	0.45	High
2. Activities and implementation methods	4.09	0.37	High
3. Facilitators and organizers	4.13	0.43	High
4. Application in daily life	4.26	0.37	High
Overall (total score 5)	**4.15**	**0.20**	**High**

Discussion

The developed program passed expert quality assessment (CVI = 0.92) in terms of content, activities, instruments, and feasibility of implementation. This is because the development process was grounded in a comprehensive analysis of the actual situation in the area, including a literature review, in-depth interviews, and focus group discussions with stakeholders, resulting in content and activities that responded to the problems and context of the agricultural community. This is consistent with the proposition that effective solid waste

management behavior change programs must take into account the causal factors of undesirable behaviors, including lack of knowledge and negative attitudes,[14] and with a systematic review finding that behavioral interventions integrating feedback, social norms, and positive reinforcement are supported by empirical evidence for reducing waste and promoting waste separation.[15] Furthermore, using the GREEN & CLEAN Hospital Challenge low-carbon concept as the framework for program design concretely links the mission of health care facilities with solving environmental problems at the household level.

Regarding knowledge of household solid waste management, participants' knowledge scores increased significantly after the program, although the magnitude of change was small (an increase of 1.12 points, or 5.6% of the total score). This may be because the program used a variety of media, including videos, flipcharts, and examples from the agricultural way of life, which suited the participants, most of whom had primary education and worked in agriculture. This is consistent with a study finding that knowledge about solid waste is positively associated with household solid waste management behavior[5] and with a study finding that, after receiving a health literacy promotion program on solid waste management, the experimental group had significantly higher knowledge than before.[16] However, the overall knowledge score remained at a moderate level both before and after the program, which may be due to the relatively short duration of the program and the fact that content on GREEN & CLEAN and greenhouse gas reduction was new and unfamiliar to the target group. In addition, education level is positively associated with household waste management;[17] therefore, learning approaches specially suited to communities in remote areas need to be designed.

Regarding attitudes toward household solid waste management, attitude scores increased slightly but not significantly and remained at a moderate level. This reflects that attitude change usually takes longer than knowledge gain, as attitudes toward burning waste in orchards and fields and convenient dumping are tied to long-standing beliefs and practices in agricultural communities. This is consistent with a study finding that negative attitudes toward solid waste management are an important causal factor leading to inappropriate behaviors and that attitude change requires programs that take into account the specific context of the community.[14] Nevertheless, attitudes toward environmental impacts and climate change had the highest score after the program, indicating that content linking waste management with climate change can create new awareness among the target group. This is consistent with a study finding that attitudes are an important predictor of household waste reduction and separation behaviors.[6]

Regarding household solid waste management behaviors, behavior scores increased significantly and changed from a low to a moderate level, with separation for recycling showing the greatest change. Factors that may have contributed to this change include demonstrations using real waste samples from the agricultural community, combined with home visits for follow-up and positive reinforcement.

This is consistent with a study finding that, after receiving a health literacy promotion program, the experimental group had significantly better waste management behaviors than before,[16] and with evidence supporting positive reinforcement for changing waste management behaviors.[15]

However, behavior scores after the program remained at a moderate level, which may be due to limited structural enabling factors, as 73.81% of participants had no separated waste bins at home and 61.90% lived 3 km or more from the waste collection point of the local administrative organization. This is consistent with a study finding that good knowledge and attitudes alone are insufficient to bring about desirable waste management behaviors without structural enabling factors, such as waste containers and an accessible collection system.[18] This finding indicates that improving waste management behaviors in agricultural communities requires both individual capacity building and infrastructure support from local administrative organizations.

Regarding satisfaction, residents' overall satisfaction with the program was high. This may be because the program was designed to fit the real-life context of the agricultural community, using waste samples from the community, easy-to-understand language, and activities held at convenient times and places. This is consistent with a study finding that programs adapted to specific contexts and target groups are highly accepted.[16] The domain with the highest satisfaction was application in daily life, particularly the willingness to recommend the program to others and awareness of the importance of reducing household greenhouse gas emissions, reflecting the potential for scaling up through community networks. This is consistent with a study finding that social support is associated with household waste reduction and separation behaviors[6] and with evidence that community-level interventions based on social norms have the potential to sustain desirable behaviors in the long term.[15]

The items with the lowest satisfaction were the appropriateness of the amount of content and of the venue and timing of activities, although these were still at a high level. This suggests that the content was rather extensive relative to the duration of the activities and that activities should be scheduled in line with farmers' seasons and workloads. This is consistent with the suggestion that program design for remote communities with limited income and education must pay particular attention to the appropriate amount and depth of content.[17]

This study has several limitations: 1) it was a one-group study without a comparison group, so the results may have been influenced by other factors, such as environmental campaigns by other agencies and repeated administration of the same measures (testing effect); 2) behaviors were self-reported and may be subject to social desirability bias; 3) the observed effect size (dz of approximately 0.3) was smaller than that used for the sample size calculation (0.50), so the study may have been underpowered, particularly for the attitude variable; and 4) outcomes were measured only 1 week after the end of the activities, so the sustainability of behavior change cannot yet be concluded.

Conclusion

The household solid waste management behavior promotion program applying the GREEN & CLEAN Hospital Challenge concept on low carbon and climate change consisted of five activities over five weeks and was assessed as appropriate by experts. After the program, residents' knowledge and household solid waste management behavior scores increased significantly but with small effect sizes, with behaviors changing from a low to a moderate level, whereas attitudes did not change significantly. Residents were highly satisfied with the program. Its implementation should therefore be supplemented with structural enabling factors, such as separated waste bins and a collection system, together with long-term follow-up.

Recommendations

1. Recommendations for applying the research findings

1.1 Provincial and health region public health agencies should consider scaling up the household solid waste management behavior promotion program applying the GREEN & CLEAN Hospital Challenge low-carbon concept to other community hospitals serving agricultural communities dispersed in remote areas, incorporating it into environmental health work and allocating continuous budget support.

1.2 Local administrative organizations should integrate their solid waste management plans with Phato Hospital by supporting the provision of separated waste bins to households that still lack them, developing a waste collection system that reaches remote areas, and considering the issuance of local ordinances on waste management appropriate to the context of agricultural communities.

1.3 Health personnel and village health volunteers should be trained as leaders in promoting waste separation in the community, and learning media suited to the target group should be developed, such as illustrated leaflets, short videos, and waste separation guide signs installed in households, while adjusting the amount of content and the timing of activities to fit farmers' seasons and way of life.

1.4 A continuous monitoring and evaluation system should be established using household waste separation behavior records and home visits, together with a collaborative network among hospitals, subdistrict health promoting hospitals, local administrative organizations, schools, and farmer groups, to ensure the continuous and sustainable promotion of solid waste management behaviors.

2. Recommendations for future research

2.1 Future studies should use a research design with a control group, conduct long-term follow-up of at least 6 months to 1 year, and measure quantitative outcomes, such as reductions in waste weight and household greenhouse gas emissions, as well as explore the application of digital technologies, such as LINE Official Account, for monitoring and reinforcing behaviors in remote areas.

2.2 The sample size should be calculated based on the effect size found in this study (dz of approximately 0.3), and hypothesis testing

methods should be pre-specified to ensure adequate statistical power.

Acknowledgments

The author would like to thank the Director of Phato Hospital for permission to conduct the study; the Head of the Primary and Holistic Care Services Department and the Human Research Ethics Committee for approving and supporting the research; the Chumphon Provincial Public Health Office and the Phato District Public Health Office for providing the study area; and community leaders, village health volunteers, and local administrative organizations in the area for their cooperation in coordination and facilitation. Thanks are also extended to all participants who willingly took part in the study and to the three experts who kindly provided advice on program development and the quality assessment of the research instruments.

References

1. United Nations Environment Programme. Global waste management outlook 2024 [Internet]. Nairobi: United Nations Environment Programme; 2024.

2. Pollution Control Department. Thailand state of municipal solid waste report 2022. Bangkok: Pollution Control Department, Ministry of Natural Resources and Environment; 2023. (in Thai)

3. Pollution Control Department. Thailand state of municipal solid waste report 2023. Bangkok: Pollution Control Department, Ministry of Natural Resources and Environment; 2024. (in Thai)

4. National Statistical Office. Environment statistics of Thailand 2024. Bangkok: National Statistical Office; 2024. (in Thai)

5. Radapitakkul K, Pho-am O, Makmai P. Knowledge, attitudes and household solid waste management among village health volunteers in Pa Faek Subdistrict, Kong Krailat District, Sukhothai Province. Journal of Public Health and Health Sciences. 2021;4(1):77-86. (in Thai)

6. Piromwong E, Laemlak P, Pitakpong A. Factors affecting household solid waste reduction and separation in Pong Pha Subdistrict Administrative Organization, Mae Sai District, Chiang Rai Province. Academic Journal of Community Public Health. 2022;9(3):86-97. (in Thai)

7. Department of Health. GREEN & CLEAN Hospital Challenge criteria for fiscal year 2023. Nonthaburi: Department of Health, Ministry of Public Health; 2023. (in Thai)

8. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39(2):175-91.

9. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale (NJ): Lawrence Erlbaum Associates; 1988.

10. Bloom BS, Hastings JT, Madaus GF. Handbook on formative and summative evaluation of student learning. New York: McGraw-Hill; 1971.

11. Best JW. Research in education. 3rd ed. Englewood Cliffs (NJ): Prentice-Hall; 1977.

12. Lynn MR. Determination and quantification of content validity. Nurs Res. 1986;35(6):382-5.

13. Nunnally JC, Bernstein IH. Psychometric theory. 3rd ed. New York: McGraw-Hill; 1994.

14. Srisamran S. Behaviors and causal factors of solid waste management among people in communities. Research and Development Health System Journal. 2022;15(2):46-59. (in Thai)

15. Wilson BM, Delmas MA, Rajagopal D. Behavioral interventions for waste reduction: a systematic review of experimental studies. Front Psychol. 2025;16:1561467.

16. Chanthama K, Somanan R, Pidtarate T, Daengkrachang T, Saksornyut P, Hengboriboonpong-Jaidee P. Effectiveness of a health literacy promotion program on solid waste management behavior among people in Tha Bun Mi Subdistrict, Ko Chan District, Chonburi Province. Research and Development Health System Journal. 2025;18(2):190-204. (in Thai)

17. Srijuntrapun P, Ket-um P, Attavanich W. Socio-demographic drivers of household food waste management practices in Thailand. PLoS One. 2025;20(4):e0321054.

18. Eshete H, Desalegn A, Tigu F. Knowledge, attitudes and practices on household solid waste management and associated factors in Gelemso town, Ethiopia. PLoS One. 2023;18(2):e0278181.

Thai Health Sciences Frontiers
วารสารวิทยาศาสตร์สุขภาพไทยก้าวหน้า
THSF

CASE STUDY

Emergency Nursing Care for a Teenage Parturient with Methamphetamine Use at Srisatchanalai Hospital: A Case Study

Wannapha Pradit[1]*

[1]Registered Nurse, Practitioner Level, Emergency, Accident and Forensic Nursing Department, Srisatchanalai Hospital, Srisatchanalai District, Sukhothai Province *Corresponding author

☐ **Received:** 14 October 2026 ✓ **Revised:** 19 October 2026 ☑ **Accepted:** 31 October 2026

Citation: Pradit W. Emergency nursing care for a teenage parturient with methamphetamine use at Srisatchanalai Hospital: a case study. Thai Health Sciences Frontiers. 2026;1(3):46-60.

Abstract

This case study examined a teenage parturient who used methamphetamine and received care at Srisatchanalai Hospital, Sukhothai Province. The objectives were to assess her health status and formulate nursing diagnoses; to plan and deliver nursing care using the nursing process across four phases (antenatal, emergency, labor, and postpartum with follow-up), with emphasis on the emergency nurse's role in screening, risk assessment, and interdepartmental coordination; and to evaluate nursing outcomes and derive lessons learned. The study was conducted from October 2025 to June 2026 (9 months). The case was selected purposively. Data were collected from medical records, interviews with the patient and her guardian, observation, and physical examination, and analyzed using content analysis based on a risk assessment and screening framework, the nursing process, and the concept of continuity of care and referral system. Trustworthiness was ensured through data triangulation and expert review.

The case was a 16-year-old Thai primigravida who attended her first antenatal visit at 11+5 weeks of gestation. Her urine amphetamine test was positive, her ASSIST V2 score was 16, she had mild depression (9Q = 7), and a history of a previous suicide attempt; she was referred to the mental health and substance use service on the same day. Seven nursing diagnoses covering all phases were identified. She stopped using methamphetamine by the second antenatal visit, and her urine tests were negative from November 17, 2025 until delivery. Her 9Q score decreased from 7 to 3 at the fourth visit, with no recurrence of suicidal ideation. She presented to the emergency department once with acute anxiety from a family conflict; her symptoms subsided within 35 minutes and she was safely discharged. She had a normal vaginal delivery of a female infant weighing 2,640 g without severe complications. Nursing outcomes were fully achieved for six of seven diagnoses and partially achieved for one (readiness for the maternal role), because she remained concerned about the costs of child-rearing. Key lessons were screening at the first point of entry into the system, continuous cross-departmental care, the emergency

nurse serving as a system link who is sensitive to psychological risk, and non-judgmental care that fosters trust.

Keywords: Emergency nursing, teenage parturient, methamphetamine, case study, continuity of care

Introduction

Adolescent pregnancy is a public health problem that continues to receive global attention. Each year, approximately 16 million girls aged 15-19 years and about 2 million girls under 15 years give birth; 95.00% of adolescent births occur in low- and middle-income countries, and complications of pregnancy and childbirth remain a leading cause of death among girls aged 15-19 years worldwide.[1] At the same time, amphetamine-type stimulant use has expanded in parallel, with approximately 30.70 million users worldwide and record-high seizures of these substances in 2023.[2] When both problems occur in the same individual, namely an adolescent pregnant woman who uses amphetamine-type stimulants, she belongs to a high-risk group with complex obstetric, psychiatric, and social needs.

In Thailand, although the live birth rate among women aged 15-19 years has been declining, standing at 20.90 per 1,000 women aged 15-19 years in 2023, it remains above the Ministry of Public Health target of no more than 19.00 per 1,000.[3] Methamphetamine use during pregnancy increases the risk of preeclampsia, placental abruption, preterm birth, and low birth weight, as well as neonatal hypoglycemia, respiratory distress, jaundice, and withdrawal symptoms.[4] In addition, adolescent pregnant women are at higher risk of depression than adult mothers, which is associated with self-harm ideation,[5] and stress is associated with methamphetamine use among pregnant women.[6] These patients therefore require a more holistic assessment than general patients.

Srisatchanalai District, Sukhothai Province, has faced a persistent problem of drug abuse in the community, to the extent that Srisatchanalai Hospital, together with local administrative agencies, has had to set up community drug screening checkpoints every year.[7] A key challenge for the hospital's emergency nurses is assessing and triaging teenage parturients with multiple overlapping risks, who often

do not disclose information at initial presentation, and care that frequently lacks continuity as patients move between the antenatal clinic, emergency department, labor room, and community postpartum follow-up, each with a different care team.

Most previous studies have focused mainly on nursing care during the antenatal and intrapartum periods, and there is still a lack of studies that systematically link the role of emergency nurses to the care pathway of teenage parturients who use substances, even though international studies indicate that pregnant women with moderate to severe substance use disorders often access services through the emergency department.[8] The author was therefore interested in studying emergency nursing care for a teenage parturient using methamphetamine in the form of a case study, an appropriate method for understanding complex individual phenomena in a real-world context,[9] in order to provide guidance for improving the quality of nursing care and the continuity-of-care system for high-risk teenage parturients in the area.

Research Objectives

1. To assess the health status and formulate nursing diagnoses of a teenage parturient using methamphetamine based on a risk assessment and screening framework.

2. To plan and provide nursing care using the nursing process across four phases (antenatal, emergency, labor, and postpartum with follow-up), with emphasis on the emergency nurse's role in screening, risk assessment, and referral coordination.

3. To evaluate nursing outcomes and derive lessons learned from the care of this teenage parturient, leading to recommendations for developing nursing practice guidelines.

Methods

This study was a case study of one teenage parturient using methamphetamine at the Emergency, Accident and Forensic Nursing Department, Srisatchanalai Hospital, Sukhothai Province. The five-step nursing process was applied, comprising health assessment, nursing diagnosis, planning, nursing intervention, and evaluation,[10] together with the concept of continuity of care and referral system.[11] The study was conducted from October 2025 to June 2026, a total of 9 months, divided into 3 phases: preparation, data collection and nursing care, and data analysis and reporting. The case was followed continuously from the first

antenatal visit through the postpartum period.

Study Case

The case was selected by purposive sampling according to the following criteria: a teenage parturient aged 19 years or younger; a urine test positive for methamphetamine or a history of use; complete medical records from the antenatal through the postpartum period; able to communicate in Thai; fully conscious and able to give information; residing in Srisatchanalai District or nearby areas and reachable by telephone; and consent from both the patient and her guardian to participate. Exclusion criteria were other severe psychiatric complications requiring immediate referral for specialized treatment, loss to follow-up for more than 2 consecutive visits, inability to provide complete information, withdrawal from the study, or transfer of primary care to another hospital.

Research Instruments

The instruments comprised 1) a general information form for the parturient and family, and a clinical data and test results form; 2) an emergency triage form based on the MOPH ED Triage criteria, which assesses chief complaint, vital signs, level of consciousness, vaginal bleeding, uterine contractions, mental state, and self-harm risk behaviors;[12] 3) standard screening tools used in antenatal care, namely the ASSIST V2 for substance use, the withdrawal assessment scale (OAS), the stress test (ST-5), the depression assessment (9Q), and the suicidal ideation assessment (8Q); 4) a nursing record form based on the four-phase nursing process, comprising nursing diagnoses, nursing activities, and outcomes; and 5) a post-discharge follow-up form and referral record, which scheduled telephone follow-up in the first week, a home visit in the second week, and a postpartum clinic follow-up in the sixth week.

The content validity of the instruments was examined by 3 experts, namely an emergency registered nurse, a midwifery nursing instructor, and an obstetrician or medical specialist, yielding item-level Index of Item-Objective Congruence (IOC) values of 0.67-1.00 (mean = 0.83). The instruments were then pilot-tested with 2 patients outside the sample to check language comprehension and the time required.

Data Collection

After explaining the objectives and obtaining consent from the patient and her guardian, the author collected data from medical records, laboratory results, urine drug tests, in-depth interviews with the patient and guardian (approximately 45-60 minutes per session), behavioral

observation, and physical examination. Health status was assessed across the obstetric, substance use, mental health, and family relationship dimensions; nursing diagnoses were formulated; and nursing care was planned and provided by phase, with continuous documentation.

Data Analysis

Qualitative data were analyzed using content analysis and categorized according to the risk assessment and screening framework, the nursing process, and the concept of continuity of care and referral system. A timeline matrix was constructed to present the situation and care in each phase, and lessons learned were synthesized through inductive analysis. Trustworthiness was ensured through data triangulation of interviews, observation, medical records, and information from the guardian, and the data analysis was reviewed by 3 experts (peer review).

Research Ethics

This study was approved by the Human Research Ethics Committee, and permission was obtained from the Director of Srisatchanalai Hospital before any data collection. The author explained the objectives, procedures, benefits, and potential risks to the patient and her guardian, who had the right to refuse or withdraw at any time without affecting the services received, and who signed an informed consent form before participating. All data were kept confidential, codes were used instead of real names, and results were presented in aggregate without any identifying information. Original documents were stored in a locked cabinet and electronic data on a password-protected computer, and all data will be destroyed within 5 years after the end of the study.

Results

1. General Information and Medical History of the Patient

The patient was a 16-year-old single Thai female, a secondary school student living with her grandmother, in her first pregnancy. She had attended 1 antenatal visit at 30 weeks of gestation and was at 38+2 weeks of gestation. She had no underlying disease and no history of drug allergy. She reported smoking methamphetamine for about 8 months, most recently 6 hours before arriving at the hospital, and denied using other substances. Her relatives brought her in with frequent labor pains every 4-5 minutes for 3 hours, accompanied by agitation, insomnia, and rapid speech. On arrival, her blood pressure was 168/108 mmHg, pulse 128 beats/min, respiratory rate 24 breaths/min, temperature 38.1 °C, oxygen saturation 97%, and fetal heart rate 170 beats/min. Dilated

pupils and profuse sweating were observed, with no headache, blurred vision, or epigastric pain. Urine testing was positive for methamphetamine, and urine protein was checked. The patient was triaged as ESI level 2. The sequence of events is shown in Table 1.

Table 1 Sequence of events and nursing care from arrival to discharge from the emergency department and labor room (times shown as relative intervals)

Time period	Patient assessment and situation	Key nursing care
On arrival (minutes 0-5)	Brought in by relatives with frequent labor pains and agitation; BP 168/108 mmHg, pulse 128 beats/min, temperature 38.1 ℃, FHR 170 beats/min; triaged as ESI level 2	Moved immediately to the resuscitation room; placed in the left lateral position; oxygen given and 2 IV lines started per treatment plan; physician and obstetrician notified; a calm, low-stimulus room provided
Minutes 5-15	ABCDE assessment: airway patent, rapid breathing, SpO_2 97%, rapid pulse, dilated pupils, profuse sweating; no warning signs of preeclampsia; uterine contractions every 4-5 minutes; no vaginal bleeding	Vital signs monitored every 5-15 minutes; FHR and uterine contractions monitored continuously by EFM; tepid sponging for fever; IV fluids given per plan; capillary blood glucose checked
Minutes 15-30	BP ≥160/110 mmHg not decreasing; increasing agitation; attempting to get out of bed; refusing examination	Communicated calmly and non-judgmentally using short, clear sentences; reduced stimuli; allowed relatives to stay close as appropriate; avoided physical restraint; gave medications to control agitation and blood pressure as ordered and monitored for side effects
Minutes 30-60	Urine positive for methamphetamine; urine protein: preliminary findings showed no abnormality indicating preeclampsia; cervix dilated 6 cm	Specimens collected and sent, including HIV, VDRL, and HBsAg per protocol; information provided to the physician to differentiate stimulant-induced hypertension from preeclampsia; emergency drugs and equipment

		prepared; labor room and neonatal team notified
Hours 1-6	BP 150/96 mmHg; calmer; regular uterine contractions; FHR within normal limits	Care handed over to the labor room using ISBAR; BP, pulse, and temperature monitored continuously; comfort care provided; encouragement and information given periodically
Delivery	Vaginal delivery at 19:00; infant weight 2,780 g; Apgar scores 8, 9, 9	Delivery and placental delivery managed; uterotonic given per standard to prevent hemorrhage; uterus and blood loss reassessed; infant handed to the pediatrician for assessment
Postpartum to discharge	Stable vital signs; no hemorrhage; patient crying and anxious about the infant and possible prosecution	Mood and self-harm risk assessed; counseling provided; social worker and drug treatment team coordinated; advice given on breastfeeding, contraception, and follow-up appointments

2. Assessment and Nursing Problems

Triage and initial assessment The patient was triaged as ESI level 2 because of severely abnormal vital signs and a high risk to the lives of both mother and fetus, and was therefore taken immediately to the resuscitation room. The ABCDE assessment found A (Airway): patent airway, able to talk; B (Breathing): rapid breathing at 24 breaths/min, normal breath sounds, SpO_2 97%; C (Circulation): rapid pulse, severe hypertension, sweaty skin, no vaginal bleeding; D (Disability): agitation, dilated pupils, no seizures; and E (Exposure): fever of 38.1 °C, with no wounds or signs of assault. Obstetric examination revealed uterine contractions every 4-5 minutes, cephalic presentation, and no sustained uterine rigidity. Once the patient had calmed down, the nurse performed a psychosocial assessment in a private room using the HEADSS approach (home, education, activities, drugs, sexuality, safety, and emotions), together with screening for violence and sexual abuse. The assessment identified 6 nursing problems, ranked by urgency.

3. Nursing Diagnoses and Key Nursing Interventions

3.1 Control of blood pressure and tachycardia (Diagnosis 1). A blood pressure of 160/110 mmHg or higher requires prompt treatment to reduce the risk of stroke and placental abruption.[9] The nurse rechecked blood pressure within 15 minutes using an appropriately sized cuff, prepared antihypertensive drugs and magnesium sulfate according to the treatment plan, and monitored for warning signs of preeclampsia, namely headache, blurred vision, epigastric pain, and hyperreflexia, together with urine and blood test results, so that the physician could differentiate stimulant toxicity from preeclampsia, because the symptoms may overlap and the treatment approaches partly differ.[9,10] In addition, tepid sponging was performed and IV fluids were given according to the treatment plan.

3.2 Safety and management of agitation (Diagnosis 3). The nurse started with non-pharmacological methods: dimming lights and reducing noise, providing a calm room, communicating calmly and non-judgmentally, using short sentences, and allowing a relative trusted by the patient to stay close. Physical restraint was considered a last resort because it may raise body temperature and increase muscle breakdown.[10] When non-pharmacological methods were ineffective, benzodiazepines were given as ordered, as they are the first-line option for controlling stimulant-induced agitation, tachycardia, and hypertension,[10] with monitoring for respiratory depression, left lateral positioning, and raised bed rails.

3.3 Maternal and fetal surveillance during labor (Diagnoses 2 and 4). The nurse continuously monitored FHR and uterine contractions by EFM and reported abnormal patterns to the physician immediately, while assessing for signs of placental abruption, namely persistent abdominal pain, uterine rigidity, and vaginal bleeding, which are more common in methamphetamine users.[4,5] After delivery, postpartum hemorrhage was prevented by routine uterotonic administration, proper delivery of the placenta, uterine massage, and continuous assessment of blood loss.[11]

3.4 Neonatal care and continuity of care (Diagnoses 5 and 6). The nurse prepared neonatal resuscitation equipment and coordinated with the pediatrician before delivery. After birth, the infant's temperature, blood glucose, feeding, and signs of startling, tremors, irritability, or lethargy were monitored.[12,18] For the patient, non-judgmental counseling was provided, her rights and assistance procedures were explained, and the social worker, One Stop Crisis Center, and drug

treatment team were coordinated, along with advice on breastfeeding while substance use continues[17] and postpartum contraception. Nursing diagnoses, interventions, and evaluation are shown in Table 2.

Table 2 Nursing diagnoses, key nursing interventions, and evaluation

Nursing diagnosis	Key nursing interventions	Evaluation
1. Risk for complications of hypertension and tachycardia due to methamphetamine toxicity	Measured BP and pulse every 5-15 minutes; gave antihypertensives and other drugs per treatment plan; tepid sponging; monitored for warning signs of preeclampsia and seizures; sent urine and blood tests to aid differential diagnosis	BP decreased to 150/96 mmHg within 60 minutes; no warning signs of preeclampsia; no seizures; temperature 37.4 ℃
2. Risk for fetal distress due to stimulants and maternal hypertension	Left lateral positioning; oxygen per plan; continuous FHR monitoring by EFM; reported abnormal patterns to the physician; prepared for intrauterine resuscitation	FHR within 110-160 beats/min; no severe abnormal patterns
3. Risk for injury from agitated and aggressive behavior	Calm environment; non-judgmental communication; relatives kept close; restraint avoided; benzodiazepines given as ordered; monitored for respiratory depression	Calmed within 30 minutes; no restraint used; no injury to the patient, fetus, or staff
4. Risk for intrapartum complications and postpartum hemorrhage	Assessed for signs of placental abruption; prepared blood group and IV fluids; routine uterotonic administration; uterine massage;	Safe vaginal delivery; blood loss 300 mL; good uterine contraction

	continuous assessment of blood loss	
5. Risk for neonatal complications	Coordinated with the pediatrician and prepared resuscitation equipment; assessed Apgar score; monitored temperature, blood glucose, feeding, and signs of startling, tremors, irritability, or lethargy	Apgar scores 8, 9, 9; normal blood glucose; no severe withdrawal symptoms; observed for a further 48-72 hours
6. Anxiety of the adolescent patient and family, and need for continuity of care	Non-judgmental counseling; explained rights and assistance procedures; assessed risk of self-harm and violence; coordinated with the social worker, One Stop Crisis Center, and drug treatment team; advised on breastfeeding and contraception	Patient and relatives acknowledged the care plan and consented to treatment; post-discharge follow-up scheduled and community team coordinated

Note: ESI = Emergency Severity Index; EFM = electronic fetal monitoring (continuous monitoring of fetal heart rate and uterine contractions); HEADSS = Home, Education, Activities, Drugs, Sexuality, Safety, Suicide/depression

4. Nursing Outcomes and Continuity of Care

After receiving nursing care, the patient's blood pressure decreased to 150/96 mmHg within 60 minutes, and her agitation subsided without restraint. The fetal heart rate remained within normal limits. She had a vaginal delivery at 38+2 weeks of gestation without postpartum hemorrhage, and her blood pressure 24 hours after delivery was 132/84 mmHg. The newborn weighed 2,780 g with Apgar scores of 8, 9, and 9, was observed continuously, and had a maximum Finnegan score of 4. Before discharge, the patient was referred to the social worker, One Stop Crisis Center, and drug treatment team. Length of hospital stay and follow-up plan: 3 days. The outcomes are shown in Table 3.

Table 3 Maternal and neonatal outcomes and continuity of care after nursing care

Indicator	Finding	Interpretation
Maternal blood pressure 24 hours postpartum	132/84 mmHg	Decreased to normal range
Postpartum blood loss	300 mL	No postpartum hemorrhage
Physical restraint and adverse events in the emergency department	None	Patient, infant, and staff safe
Mode of delivery and gestational age at delivery	Vaginal delivery at 38+2 weeks	Term delivery
Birth weight and Apgar scores at 1, 5, and 10 minutes	2,780 g; 8, 9, 9	Within normal limits
Maximum Finnegan score within 72 hours	4 points	No withdrawal symptoms requiring specific treatment
Continuity of care	Coordinated with the social worker, One Stop Crisis Center, and drug treatment team; follow-up in 3 days	Coordination completed as planned

Discussion

This case study shows that the success of emergency nursing care for a teenage parturient using methamphetamine depends on decisions made in the first minutes. Triage as ESI level 2 on arrival allowed the patient to enter the resuscitation room and receive immediate monitoring of vital signs and fetal heart rate, consistent with the ESI principle that patients at high risk to life or with vital signs in the danger zone should be assessed rapidly.[16] This patient had concurrent labor, severe hypertension, and agitation, and therefore required a team that coordinated simultaneously from the outset.

Hypertension in this patient may have resulted from methamphetamine toxicity, preeclampsia, or both. Methamphetamine stimulates the sympathetic nervous system, raising blood pressure and pulse rate, increasing body temperature, and dilating the pupils,[10] whereas preeclampsia is diagnosed by

hypertension with proteinuria or target-organ dysfunction,[9] and methamphetamine users are at greater risk of hypertension during pregnancy.[4,5] Because the nurse did not stop at giving antihypertensive drugs but also collected specimens and monitored for warning signs of preeclampsia, the physician was able to make correct treatment decisions and prepare magnesium sulfate in time if the criteria were met.

Managing agitation with non-pharmacological methods first and avoiding restraint is consistent with a systematic review indicating that restraint may raise body temperature and cause muscle breakdown, and that benzodiazepines are the first-line drugs for controlling stimulant-related symptoms.[10] In teenage parturients, respectful communication, having relatives nearby, and brief step-by-step explanations also help the patient cooperate with examinations and fetal monitoring.

Regarding fetal and intrapartum risks, several studies have found that methamphetamine and amphetamine use during pregnancy is associated with preterm birth, fetal growth restriction or low birth weight, and placental abruption,[4-7] which supports the nurse's use of continuous EFM, left lateral positioning, and monitoring for signs of abruption in this case. Prevention of postpartum hemorrhage followed the principles of third-stage labor management recommended by the World Health Organization, namely uterotonic administration, proper delivery of the placenta, and postpartum uterine assessment.[11]

For the newborn, infants with prenatal amphetamine exposure have been reported to be at risk of preterm birth and low birth weight and may show lethargy, poor feeding, or irritability in the early period.[12] The Finnegan scale was developed for opioid withdrawal syndrome;[18] it can therefore serve only as an aid for initial symptom monitoring together with the pediatrician's clinical judgment. Regarding breastfeeding, individualized counseling should follow the Academy of Breastfeeding Medicine guidelines, which generally recommend avoiding breastfeeding while methamphetamine use continues.[17]

The psychosocial dimension is often overlooked in the emergency department. Teenage parturients are at higher risk of obstetric complications than adult women,[2] and stimulant users during pregnancy are often undetected or enter treatment late.[8] Treating the patient as a person in need of care rather than as an

offender encouraged her to disclose accurate information on substance use, in line with legal provisions that direct drug users into treatment[14] and the law supporting assistance for teenage mothers.[13] Screening for violence and sexual abuse in pediatric patients is therefore a duty that must be performed alongside clinical care.

In the context of a community hospital, this case study highlights 3 system issues: 1) there should be practice guidelines and alert signs for triaging parturients with a history of substance use; 2) the emergency department, labor room, and pediatric team should conduct joint drills and have clear referral channels when cases exceed the hospital's capacity; and 3) there should be a system linking patients with social workers and drug treatment teams before discharge.

This study has limitations: 1) as a single case study, its findings cannot be generalized to other teenage parturients; 2) substance use data were based on self-report and urine screening tests, which cannot confirm the amount or duration of use; 3) the infant was followed only briefly during hospitalization, so long-term growth and developmental outcomes are unknown; and 4) the author was involved in the patient's care and may therefore have introduced bias in recording and interpreting the data, which was minimized through data triangulation.

Conclusion

This teenage parturient using methamphetamine received nursing care based on the nursing process covering 6 nursing diagnoses, including ESI level 2 triage, ABCDE assessment, control of blood pressure and agitation without restraint, continuous maternal and fetal surveillance, prevention of postpartum hemorrhage, and coordination of continuing care with the multidisciplinary team. As a result, the mother was safe, there was no hemorrhage, and the infant was monitored continuously. The key lessons are to carefully differentiate stimulant toxicity from preeclampsia, to treat the patient without stigma, and to plan continuity of care starting in the emergency department.

Recommendations

1. Recommendations for Applying the Findings

1.1 The hospital should develop emergency nursing practice guidelines for parturients using stimulants, specifying triage criteria, an ABCDE assessment flowchart, control of blood pressure and

agitation, maternal and fetal surveillance, and criteria for consultation or referral.

1.2 Joint training and drills should be conducted among emergency department nurses, labor room nurses, and the pediatric team, covering differentiation of stimulant toxicity from preeclampsia, de-escalation without restraint, and maternal and neonatal resuscitation.

1.3 Emergency department staff should be trained in non-judgmental communication and adolescent psychosocial screening, such as HEADSS, and a private space for counseling should be provided.

1.4 A continuity-of-care network should be established with social workers, the One Stop Crisis Center, sub-district health promoting hospitals, schools, local administrative organizations, and drug treatment facilities, so that teenage mothers receive treatment, contraception, and infant developmental follow-up continuously after discharge.

2. Recommendations for Future Research

2.1 Studies of multiple teenage parturients using substances (case series) or retrospective medical record reviews from several hospitals should be conducted to estimate prevalence and complications within the health region.

2.2 The guidelines derived from this case study should be developed and tested through action research, with long-term follow-up of mothers and infants.

Acknowledgments

The author would like to thank the Director of Srisatchanalai Hospital for permission to conduct this study; the Head of the Nursing Department; the heads of the emergency department and labor room; the obstetricians, pediatricians, social workers, and multidisciplinary team for their information and advice; and the experts who reviewed the nursing diagnoses and interventions. The author also thanks the patient and her family for consenting to the publication of this case study for academic benefit.

References

1. Bureau of Reproductive Health, Department of Health. Teenage pregnancy surveillance report 2024. Nonthaburi: Department of Health, Ministry of Public Health; 2024. (in Thai)

2. Ganchimeg T, Ota E, Morisaki N, Laopaiboon M, Lumbiganon P, Zhang J, et al. Pregnancy and childbirth outcomes among adolescent mothers: a World Health Organization multicountry study. BJOG. 2014;121(Suppl 1):40-8.

3. United Nations Office on Drugs and Crime. Synthetic drugs in East and Southeast Asia: latest developments and challenges 2024. Bangkok: UNODC; 2024.

4. American College of Obstetricians and Gynecologists. Committee Opinion No. 479: methamphetamine abuse in women of reproductive age. Obstet Gynecol. 2011;117(3):751-5.

5. Gorman MC, Orme KS, Nguyen NT, Kent EJ 3rd, Caughey AB. Outcomes in pregnancies complicated by methamphetamine use. Am J Obstet Gynecol. 2014;211(4):429.e1-7.

6. Good MM, Solt I, Acuna JG, Rotmensch S, Kim MJ. Methamphetamine use during pregnancy: maternal and neonatal implications. Obstet Gynecol. 2010;116(2 Pt 1):330-4.

7. Ladhani NN, Shah PS, Murphy KE. Prenatal amphetamine exposure and birth outcomes: a systematic review and metaanalysis. Am J Obstet Gynecol. 2011;205(3):219.e1-7.

8. Smid MC, Metz TD, Gordon AJ. Stimulant use in pregnancy: an under-recognized epidemic among pregnant women. Clin Obstet Gynecol. 2019;62(1):168-84.

9. American College of Obstetricians and Gynecologists. ACOG Practice Bulletin No. 222: gestational hypertension and preeclampsia. Obstet Gynecol. 2020;135(6):e237-60.

10. Richards JR, Albertson TE, Derlet RW, Lange RA, Olson KR, Horowitz BZ. Treatment of toxicity from amphetamines, related derivatives, and analogues: a systematic clinical review. Drug Alcohol Depend. 2015;150:1-13.

11. World Health Organization. WHO recommendations for the prevention and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2012.

12. Oei JL, Abdel-Latif ME, Clark R, Craig F, Lui K. Short-term outcomes of mothers and infants exposed to antenatal amphetamines. Arch Dis Child Fetal Neonatal Ed. 2010;95(1):F36-41.

13. Act on the Prevention and Solution of the Adolescent Pregnancy Problem, B.E. 2559 (2016). Royal Thai Government Gazette. 2016. (in Thai)

14. Narcotics Code, B.E. 2564 (2021). Royal Thai Government Gazette. 2021. (in Thai)

15. Gagnier JJ, Kienle G, Altman DG, Moher D, Sox H, Riley D; CARE Group. The CARE guidelines: consensus-based clinical case reporting guideline development. BMJ Case Rep. 2013;2013:bcr2013201554.

16. Gilboy N, Tanabe P, Travers D, Rosenau AM. Emergency Severity Index (ESI): a triage tool for emergency department care, version 4. Implementation handbook 2012 edition. Rockville (MD): Agency for Healthcare Research and Quality; 2011.

17. Reece-Stremtan S, Marinelli KA; Academy of Breastfeeding Medicine. ABM clinical protocol #21: guidelines for breastfeeding and substance use or substance use disorder, revised 2015. Breastfeed Med. 2015;10(3):135-41.

18. Finnegan LP, Connaughton JF Jr, Kron RE, Emich JP. Neonatal abstinence syndrome: assessment and management. Addict Dis. 1975;2(1-2):141-58.

Thai Health Sciences Frontiers
วารสารวิทยาศาสตร์สุขภาพไทยก้าวหน้า

บทความวิจัย | RESEARCH ARTICLE

การพัฒนานวัตกรรมระบบกระจายและสำรองยาอินซูลินแอนะล็อกบนหอผู้ป่วย เพื่อความปลอดภัยของผู้ป่วยและการใช้ยาอย่างสมเหตุผล โรงพยาบาลสรรพสิทธิประสงค์

Development of an Innovative Ward Stock and Distribution System for Analog Insulin to Promote Patient Safety and Rational Drug Use at Sunpasitthiprasong Hospital

รัตนาภรณ์ แสนสุด[1*]

Rattanaporn Sansud[1*]

[1] เภสัชกรชำนาญการ กลุ่มงานเภสัชกรรม โรงพยาบาลสรรพสิทธิประสงค์ อำเภอเมืองอุบลราชธานี จังหวัดอุบลราชธานี

*ผู้นิพนธ์ประสานงาน (Corresponding author)

☐ **รับบทความ:** 1 กันยายน 2569 ✓ **แก้ไขบทความ:** 15 กันยายน 2569 ☑ **ตอบรับบทความ:** 21 กันยายน 2569

การอ้างอิง (Citation): รัตนาภรณ์ แสนสุด. การพัฒนานวัตกรรมระบบกระจายและสำรองยาอินซูลินแอนะล็อกบนหอผู้ป่วยเพื่อความปลอดภัยของผู้ป่วยและการใช้ยาอย่างสมเหตุผล โรงพยาบาลสรรพสิทธิประสงค์. วารสารวิทยาศาสตร์สุขภาพไทยก้าวหน้า. 2569;1(3):61-72.

บทคัดย่อ

การวิจัยเชิงปฏิบัติการนี้มีวัตถุประสงค์เพื่อพัฒนาและประเมินผลนวัตกรรมระบบกระจายและสำรองยาอินซูลินแอนะล็อกบนหอผู้ป่วย “Sunpasit Insulin Smart Stock” โดยใช้ Novomix® เป็นยาต้นแบบ ใน 20 หอผู้ป่วยอายุรกรรมและหัวใจและหลอดเลือด โรงพยาบาลสรรพสิทธิประสงค์ ระหว่างเดือนมิถุนายน พ.ศ. 2566 ถึงพฤษภาคม พ.ศ. 2567 กลุ่มตัวอย่าง ได้แก่ ทีมสหวิชาชีพ 32 คน คัดเลือกแบบเจาะจง คำสั่งใช้ยา 360 คำสั่ง และบุคลากร 120 คน สุ่มอย่างเป็นระบบ เครื่องมือประกอบด้วยแนวทางการสนทนากลุ่ม แบบบันทึกการเบิกยา คำสั่งใช้ยา และความคลาดเคลื่อนทางยา และแบบสอบถามความพึงพอใจ วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนา Mann-Whitney U test, Chi-square test, Exact binomial test, Poisson rate ratio test, One-sample t-test และการวิเคราะห์เนื้อหา

ผลการวิจัยพบว่า นวัตกรรมระบบมี 3 องค์ประกอบ ได้แก่ การคัดกรองการสั่งใช้ยาตามเงื่อนไขแพทย์เฉพาะทาง พร้อมหน้าต่างแจ้งเตือนในโปรแกรม IPserv ระบบยาสำรองบนหอผู้ป่วยที่คิดราคาเป็นยูนิตตามที่ใช้จริง และมาตรการความปลอดภัยข้างเตียง หลังใช้ระบบ การสั่งใช้ยาตามเงื่อนไขเพิ่มจากร้อยละ 65.56 เป็น 93.89 ($p<.001$) ระยะเวลารอคอยยาลดลงจาก 116.48±28.14 เป็น 21.37±10.01 นาที ($p<.001$) ผู้ป่วยได้รับยาภายใน 30 นาทีร้อยละ 86.67 ผ่านเป้าหมายร้อยละ 80 ($p=.013$) อัตราความคลาดเคลื่อนทางยาลดลงจาก 0.17 เป็น 0.06 ครั้งต่อ 1,000 วันนอน (Rate ratio=0.34, $p=.035$) จำนวนหลอดที่เบิกลดลงร้อยละ 16.67 แต่ไม่มีนัยสำคัญทางสถิติ ($p=.396$) และความพึงพอใจของบุคลากรอยู่ในระดับมาก ($\bar{x}$=4.17, S.D.=0.33) นวัตกรรมระบบนี้ช่วยเพิ่มความปลอดภัยของผู้ป่วยและส่งเสริมการใช้ยาอย่างสมเหตุผล จึงควรขยายผลสู่ยาราคาสูงที่มีความเสี่ยงสูงรายการอื่น

คำสำคัญ: อินซูลินแอนะล็อก, ระบบยาสำรองบนหอผู้ป่วย, การใช้ยาอย่างสมเหตุผล, ความปลอดภัยของผู้ป่วย

Abstract

This action research aimed to develop and evaluate “Sunpasit Insulin Smart Stock,” an innovative ward stock and distribution system for analog insulin, using insulin aspart/insulin aspart protamine (Novomix®) as the model drug in 20 medical and cardiovascular wards of Sunpasitthiprasong Hospital. The study was conducted from June 2023 to May 2024 following the PAOR cycle. Samples comprised 32 purposively selected interprofessional team members, 360 systematically sampled Novomix® orders (180 per period), and 120 health personnel. Instruments included a focus group guide, record forms for requisitions, orders, and medication errors, and a satisfaction questionnaire. Data were analyzed using descriptive statistics, the Mann-Whitney U test, chi-square test, exact binomial test, Poisson rate ratio test, one-sample t-test, and content analysis.

The system comprised three components: specialist-based prescribing criteria with an alert window in the IPserv program, a ward stock system with unit-based charging according to actual use, and bedside safety measures. After implementation, orders meeting the prescribing criteria increased from 65.56% to 93.89% ($p<.001$). The waiting time from order to administration decreased from 116.48±28.14 to 21.37±10.01 minutes ($p<.001$), and 86.67% of doses were given within 30 minutes, exceeding the 80% target ($p=.013$). The insulin-related medication error rate fell from 0.17 to 0.06 per 1,000 patient-days (rate ratio=0.34, $p=.035$). Pens requisitioned decreased by 16.67%, which was not statistically significant ($p=.396$). Staff satisfaction was high (mean=4.17, SD=0.33). The system improved patient safety and supported rational drug use, and may serve as a model for other high-cost, high-alert medications.

Keywords: Analog insulin, Ward stock system, Rational drug use, Patient safety

บทนำ

โรคเบาหวานเป็นภาระทางสุขภาพระดับโลก โดยมีผู้ป่วย 589 ล้านคนในปี ค.ศ. 2024[1] อินซูลินจัดเป็นยาที่มีความเสี่ยงสูง (High-alert Medication) ซึ่งความคลาดเคลื่อนเพียงเล็กน้อยอาจทำให้เกิดภาวะน้ำตาลในเลือดต่ำหรือสูงรุนแรง[2] และความคลาดเคลื่อนทางยาก่อความสูญเสีย 42,000 ล้านดอลลาร์สหรัฐต่อปี[3] ปากกาอินซูลินบนหอผู้ป่วยมีทั้งความเสี่ยงจากการใช้ร่วมกัน[4] และความสิ้นเปลือง โดยจ่ายเฉลี่ย 2.20 ด้ามต่อผู้ป่วย ขณะที่จำเป็นจริงเพียง 1.20 ด้าม[5] ประเทศไทยมีความชุกของเบาหวานร้อยละ 10.60[6] และรายจ่ายค่ายาสูงถึงร้อยละ 40 ของรายจ่ายสุขภาพ จึงขับเคลื่อนนโยบายการใช้ยาอย่างสมเหตุผล (Rational Drug Use: RDU)[7] อินซูลินชนิดปากกามีต้นทุนสูงกว่าชนิดขวดเกือบสองเท่า[8] จึงต้องมีระบบกำกับการสั่งใช้และการกระจายยาที่รัดกุม

จังหวัดอุบลราชธานีมีผู้ป่วยเบาหวานเพิ่มเป็น 104,900 ราย ในปี พ.ศ. 2567 และควบคุมระดับน้ำตาลได้ดีเพียงร้อยละ 31.25[9] โรงพยาบาลสรรพ

สิทธิประสงค์เป็นโรงพยาบาลศูนย์ที่รับส่งต่อผู้ป่วยจากเขตสุขภาพที่ 10 มูลค่าการใช้ Novomix® ซึ่งเป็นยาบัญชี ง. เพิ่มขึ้นร้อยละ 31.08 ในปีงบประมาณ พ.ศ. 2566[10] ระบบเดิมจ่ายยารายละ 1 หลอดและคิดราคาเต็มหลอด จึงมีจุดอ่อนด้านความสิ้นเปลือง ความล่าช้าของการได้รับยาก่อนอาหาร การขาดกลไกคัดกรองการสั่งใช้ และการเก็บปากการวมในตู้เย็นโดยไม่มีฉลากระบุตัวผู้ป่วย[2,4]

แนวคิดที่ใช้ออกแบบนวัตกรรมระบบ ได้แก่ ระบบกระจายยาในโรงพยาบาล[11,12] แนวคิดลีนที่มุ่งขจัดความสูญเปล่าจากการรอคอยและยาคงคลังเกิน[13] การจัดการยาที่มีความเสี่ยงสูงด้วยมาตรการเชิงระบบ[14] หลักการใช้ยาอย่างสมเหตุผล[7] และการวิจัยเชิงปฏิบัติการ[15] งานวิจัยในประเทศไทยที่ผ่านมาพัฒนาระบบจ่ายยาผู้ป่วยในภาพรวม[16] แต่ยังไม่มีการศึกษาที่บูรณาการการคัดกรองคำสั่งใช้ ระบบยาสำรองที่คิดราคาเป็นยูนิต และมาตรการความปลอดภัยข้างเตียงสำหรับอินซูลินแอนะล็อกชนิดปากกาเข้าเป็นระบบเดียว

ผู้วิจัยจึงพัฒนานวัตกรรมระบบ “Sunpasit Insulin Smart Stock” ด้วยกระบวนการวิจัยเชิงปฏิบัติการ โดยมุ่งเป้าหมายสองด้านควบคู่กัน คือ ความปลอดภัยของผู้ป่วย (Patient Safety) และการใช้ยาอย่างสมเหตุผล[17,18] ผลการวิจัยจะใช้เป็นต้นแบบการบริหารจัดการยาราคาสูงที่มีความเสี่ยงสูงรายการอื่นในโรงพยาบาลและเครือข่ายบริการต่อไป

วัตถุประสงค์การวิจัย

1. เพื่อศึกษาสถานการณ์ ปัญหา อุปสรรค และความต้องการในการกระจาย สำรอง และบริหารยาอินซูลินแอนะล็อกบนหอผู้ป่วย โรงพยาบาลสรรพสิทธิประสงค์
2. เพื่อพัฒนาและทดลองใช้นวัตกรรมระบบ “Sunpasit Insulin Smart Stock” ซึ่งประกอบด้วยการคัดกรองการสั่งใช้ยาตามเงื่อนไขแพทย์เฉพาะทาง ระบบยาสำรองบนหอผู้ป่วยที่คิดราคาเป็นยูนิต และมาตรการความปลอดภัยข้างเตียงผู้ป่วย
3. เพื่อประเมินผลลัพธ์ของนวัตกรรมระบบด้านการใช้ยาอย่างสมเหตุผล ด้านความปลอดภัยของผู้ป่วย และความพึงพอใจของบุคลากรสหวิชาชีพ

วิธีการวิจัย

การวิจัยเชิงปฏิบัติการ (Action Research) ตามแนวคิดของ Kemmis และ McTaggart[15] ดำเนินการระหว่างเดือนมิถุนายน พ.ศ. 2566 ถึง พฤษภาคม พ.ศ. 2567 ใน 4 ขั้นตอน ได้แก่ Plan (มิถุนายน–พฤศจิกายน พ.ศ. 2566) Act (ธันวาคม พ.ศ. 2566–กุมภาพันธ์ พ.ศ. 2567) Observe (ธันวาคม พ.ศ. 2566–พฤษภาคม พ.ศ. 2567) และ Reflect (มีนาคม–พฤษภาคม พ.ศ. 2567) ประเมินผลลัพธ์แบบกลุ่มเดียววัดก่อน-หลัง เปรียบเทียบข้อมูลช่วงละ 6 เดือน ในหอผู้ป่วยอายุรกรรม 14 หอ และหอผู้ป่วยหัวใจและหลอดเลือด 6 หอ มีรายละเอียดดังนี้

ประชากร

1) ข้อมูลการใช้ยา Novomix® ของผู้ป่วยในหอผู้ป่วยที่ศึกษา ได้แก่ คำสั่งใช้ยา บันทึกการเบิกยา มูลค่ายาจากโปรแกรม IPserv และรายงานความคลาดเคลื่อนทางยา และ 2) บุคลากรสหวิชาชีพที่เกี่ยวข้องประมาณ 420 คน

กลุ่มตัวอย่าง

1) กลุ่มพัฒนานวัตกรรมระบบ 32 คน (อายุรแพทย์ต่อมไร้ท่อ 2 คน เภสัชกร 6 คน เจ้าพนักงานเภสัชกรรม 2 คน พยาบาลวิชาชีพ 20 คน และนักวิชาการคอมพิวเตอร์ 2 คน) คัดเลือกแบบเจาะจง 2) ข้อมูลการเบิกยารายเดือน 12 เดือน 3) คำสั่งใช้ยาช่วงละ 180 คำสั่ง คำนวณจากสูตรเปรียบเทียบค่าเฉลี่ยสองกลุ่มอิสระ[19] (α = 0.05, Power = 0.80) ได้ 141.12 คำสั่ง เพิ่มร้อยละ 20 สุ่มอย่างเป็นระบบ และ 4) บุคลากร 120 คน คำนวณด้วยสูตรของ Cochran[20]

เกณฑ์การคัดเข้า (Inclusion Criteria)

กลุ่มพัฒนาต้องปฏิบัติงานเกี่ยวกับการสั่งใช้จ่าย หรือบริหารยาอินซูลินไม่น้อยกว่า 1 ปี และผู้ตอบแบบประเมินต้องปฏิบัติงานภายใต้นวัตกรรมระบบไม่น้อยกว่า 1 เดือนและไม่เป็นสมาชิกกลุ่มพัฒนา

เกณฑ์การคัดออก (Exclusion Criteria)

คำสั่งใช้ยาที่ถูกยกเลิกก่อนบริหารยา คำสั่งที่บันทึกเวลาไม่ครบถ้วน และคำสั่งของผู้ป่วยที่ใช้ปากกาอินซูลินที่นำมาจากบ้าน

เครื่องมือวิจัย

ประกอบด้วย 1) นวัตกรรมระบบ 3 องค์ประกอบ ได้แก่ (1) เกณฑ์การคัดกรองการสั่งใช้ยา โดยผู้ป่วยรายใหม่ต้องเริ่มยาโดยอายุรแพทย์หรือกุมารแพทย์ต่อมไร้ท่อ และการสั่งยาต่อเนื่องเฉพาะแพทย์ระดับ Staff พร้อมหน้าต่างแจ้งเตือนใน IPserv และรหัสยา NVMI4 หน่วยเป็นยูนิต[17] (2) ระบบยาสำรองหอละ 1 หลอด คิดราคาเป็นยูนิตและเบิกทดแทนผ่านแบบฟอร์มเบิกยาเรือน[18] (3) มาตรการความปลอดภัยข้างเตียง ได้แก่ ฉลาก QR Code ระบุตัวผู้ป่วยและอายุยาหลังเปิดใช้ 4 สัปดาห์[21] ปากกาหนึ่งด้ามต่อผู้ป่วยหนึ่งราย และแบบตรวจสอบโดยเภสัชกร 8 ข้อ 2) เครื่องมือเก็บข้อมูล ได้แก่ แนวทางการสนทนากลุ่ม แบบบันทึกการเบิกยาและมูลค่ายา แบบบันทึกคำสั่งใช้ยา แบบรวบรวมความคลาดเคลื่อนทางยาตามเกณฑ์ NCC MERP[22] และแบบสอบถามความพึงพอใจ 5 ระดับ 16 ข้อ แปลผลตามเกณฑ์ของ Best[23] ผ่านการตรวจสอบโดยผู้เชี่ยวชาญ 3 ท่าน ได้ค่า IOC 0.67–1.00 ค่าแอลฟาของครอนบาค 0.93 ค่า Cohen's Kappa 0.84–0.88 และค่า ICC 0.97

การเก็บรวบรวมข้อมูล

ขั้นตอน Plan รวบรวมข้อมูลทุติยภูมิจาก IPserv และรายงานความคลาดเคลื่อนทางยา ร่วมกับสนทนากลุ่ม 3 กลุ่ม ขั้นตอน Act รวบรวมบันทึกการเบิกทดแทนและผลการตรวจสอบยาสำรองรายเดือน ขั้นตอน Observe เก็บข้อมูลหลังพัฒนาด้วยเครื่องมือชุดเดิมและแบบสอบถามในเดือนเมษายน–พฤษภาคม พ.ศ. 2567 และขั้นตอน Reflect จัดประชุมสะท้อนผลร่วมกับทีมสหวิชาชีพ

การวิเคราะห์ข้อมูล

ใช้สถิติเชิงพรรณนา ตรวจสอบการแจกแจงด้วย Shapiro-Wilk test เปรียบเทียบการเบิกยามูลค่ายา และระยะเวลารอคอยยาด้วย Mann-Whitney U test เปรียบเทียบสัดส่วนด้วย Chi-square test ทดสอบเทียบเป้าหมายร้อยละ 80 ด้วย Exact binomial test เปรียบเทียบอัตราความคลาดเคลื่อนด้วย Poisson rate ratio test และทดสอบความพึงพอใจเทียบเกณฑ์ 3.51 ด้วย One-sample t-test ที่ระดับนัยสำคัญ .05 ข้อมูลเชิงคุณภาพใช้การวิเคราะห์เนื้อหา[24] ร่วมกับการตรวจสอบแบบสามเส้า

จริยธรรมการวิจัย

การวิจัยครั้งนี้ดำเนินการตามปฏิญญาเฮลซิงกิ[25] และชี้แจงวัตถุประสงค์แก่บุคลากรผู้เข้าร่วม ซึ่งลงนามยินยอมด้วยความสมัครใจและถอนตัวได้ตลอดเวลาโดยไม่มีผลต่อการปฏิบัติงาน ข้อมูลผู้ป่วยเป็นข้อมูลทุติยภูมิ ใช้รหัสแทนชื่อและเลขประจำตัว เก็บเป็นความลับตามพระราชบัญญัติคุ้มครองข้อมูลส่วนบุคคล พ.ศ. 2562 และนำเสนอผลในภาพรวม

ผลการศึกษา

1. สถานการณ์ ปัญหา อุปสรรค และความต้องการในการกระจาย สำรอง และบริหารยาอินซูลินแอนะล็อกบนหอผู้ป่วย

1.1 ข้อมูลทั่วไปของกลุ่มพัฒนานวัตกรรมระบบ จำนวน 32 คน ส่วนใหญ่เป็นพยาบาลวิชาชีพ ร้อยละ 62.50 รองลงมาคือเภสัชกร ร้อยละ 18.75 มีประสบการณ์เกี่ยวกับยาอินซูลินเฉลี่ย 14.66±6.64 ปี

1.2 สภาพปัญหาตามกระบวนการใช้ยา พบปัญหาหลัก 3 ด้าน ได้แก่ ด้านการสั่งใช้ยา คำสั่งเป็นไปตามเงื่อนไขเพียงร้อยละ 65.56 “IPserv ไม่มีอะไรเตือนเลย เภสัชกรต้องโทรถามแพทย์เอง” ด้านการจ่ายยา เบิกยา 60 หลอด (12,840 บาท) คิดราคาเต็มหลอด และจ่ายปากกาซ้ำซ้อน 6 ครั้ง และด้านการบริหารยา รอคอยยาเฉลี่ย 116.48±28.14 นาที ได้รับยาภายใน 30 นาทีเพียงร้อยละ 3.89 และ “เคยเกือบหยิบปากกาของเตียงข้าง ๆ มาใช้” การวิเคราะห์เนื้อหาสังเคราะห์เป็นแนวทางพัฒนา 3 องค์ประกอบ ดังแสดงในตาราง 1

ตาราง 1 ผลการวิเคราะห์สภาพปัญหาและแนวทางการพัฒนานวัตกรรมระบบ

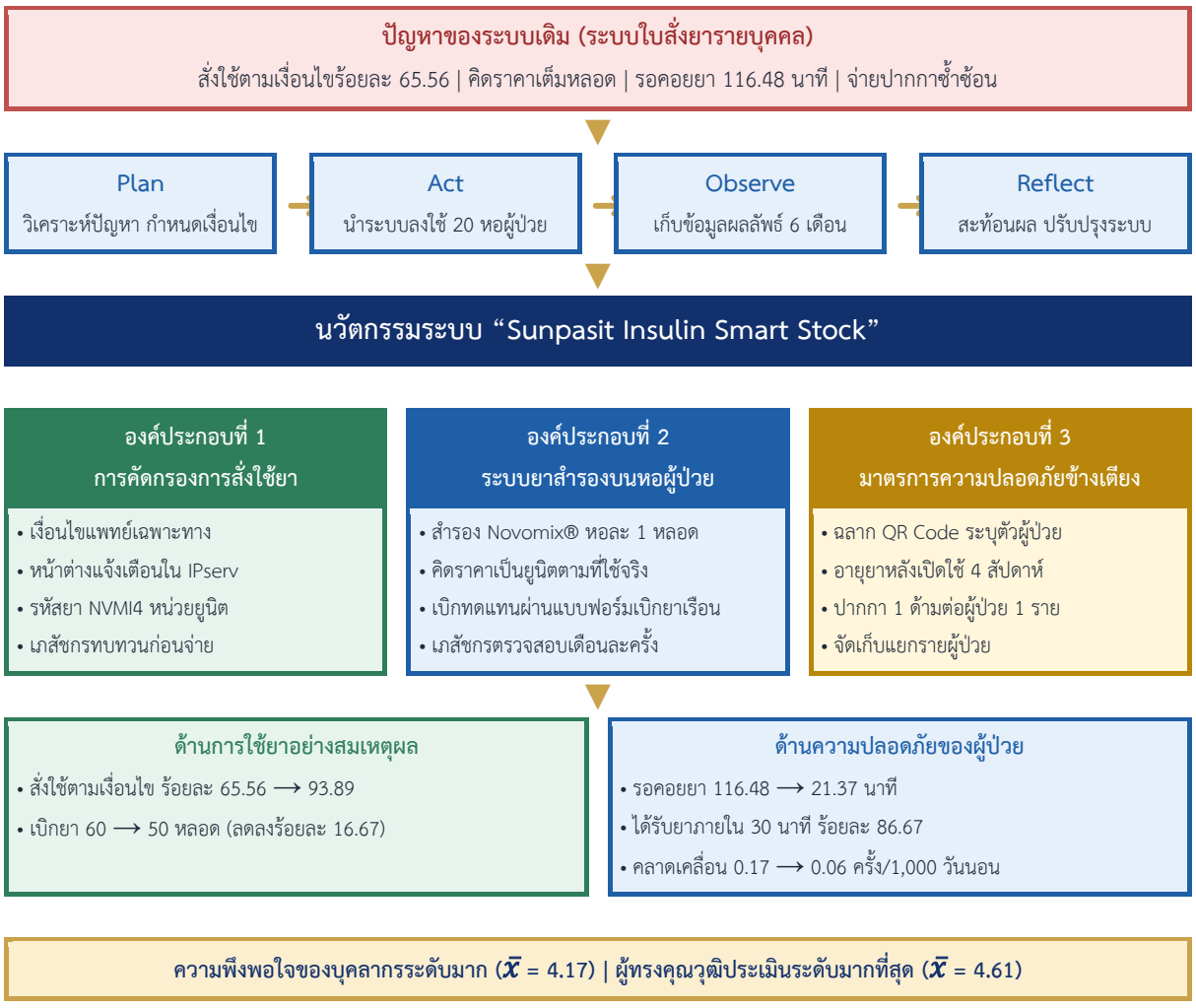
ประเด็น	ปัญหาที่พบ	แนวทางที่ควรพัฒนา
ด้านการสั่งใช้ยา	• สั่งใช้ตามเงื่อนไขแพทย์เฉพาะทางร้อยละ 65.56 • IPserv ไม่มีระบบแจ้งเตือนเงื่อนไข และ Re-med ไม่ผ่านการทบทวน • ความคลาดเคลื่อนขั้นตอนสั่งใช้ยา 3 ครั้ง	• กำหนดเงื่อนไขการสั่งใช้ยาร่วมกับคณะอนุกรรมการกลุ่มยาย่อยโรคต่อมไร้ท่อ • ตั้งหน้าต่างแจ้งเตือนใน IPserv (องค์ประกอบที่ 1)
ด้านการจ่ายยาและการเบิกยาจากคลัง	• จ่ายยาผู้ป่วยรายละ 1 หลอด ภาระงานสูง • เบิกยา 60 หลอด มูลค่า 12,840 บาท คิดราคาเต็มหลอด • จ่ายปากกาซ้ำซ้อน 6 ครั้ง	• สำรอง Novomix® หอผู้ป่วยละ 1 หลอด • คิดราคาเป็นยูนิตตามที่ใช้จริง • เบิกทดแทนผ่านแบบฟอร์มเบิกยาเรือน (องค์ประกอบที่ 2)
ด้านการบริหารยาข้างเตียงผู้ป่วย	• รอคอยยาเฉลี่ย 116.48 นาที ได้รับยาภายใน 30 นาทีร้อยละ 3.89 • ฉลากไม่ชัดเจน ไม่ทราบวันเปิดใช้ เสี่ยงใช้ปากการ่วมกัน • ความคลาดเคลื่อนขั้นตอนบริหารยา 3 ครั้ง	• ฉลากระบุตัวผู้ป่วย ขนาดยา เวลา และอายุยาหลังเปิดใช้ • ปากกาหนึ่งด้ามต่อผู้ป่วยหนึ่งราย จัดเก็บแยกรายผู้ป่วย • เภสัชกรตรวจสอบยาสำรอง (องค์ประกอบที่ 3)

2. การพัฒนาและทดลองใช้นวัตกรรมระบบ “Sunpasit Insulin Smart Stock”

2.1 ขั้นตอน Plan และ Act ผู้อำนวยการโรงพยาบาลอนุมัติเงื่อนไขการสั่งจ่าย Novomix® เมื่อวันที่ 7 กันยายน พ.ศ. 2566 และเพิ่มเป็นยาสำรองบนหอผู้ป่วยเมื่อวันที่ 14 พฤศจิกายน พ.ศ. 2566 จากนั้นตั้งรหัสยา NVMI4 พร้อมหน้าต่างแจ้งเตือน กระจายยาสำรองไปยัง 20 หอผู้ป่วย และเริ่มใช้แบบฟอร์มเบิกยาเรือนเมื่อวันที่ 14

ธันวาคม พ.ศ. 2566 เภสัชกรนิเทศรวม 60 ครั้ง คะแนนการปฏิบัติเพิ่มจากร้อยละ 81.25 เป็น 95.00 ภายใน 3 เดือน และการตรวจสอบฉลากก่อนบริหารยาเพิ่มจากร้อยละ 60.00 เป็น 100.00

2.2 ขั้นตอน Reflect การประชุมสะท้อนผลได้ข้อค้นพบ 10 ข้อ 6 ประเด็น จุดแข็งคือหน้าต่างแจ้งเตือนและฉลากใหม่ จุดที่ต้องปรับปรุงคือการหักลบยากลับบ้านที่ยังทำด้วยมือ และพยาบาลใหม่ยังไม่เข้าใจหลักปากกาหนึ่งด้ามต่อผู้ป่วยหนึ่งราย ทีมจึงเสนอพัฒนาโปรแกรมตัดยากลับบ้านอัตโนมัติ ปรับอายุยาหลังเปิดใช้เป็น 4 สัปดาห์ และบรรจุในการปฐมนิเทศพยาบาลใหม่ ได้นวัตกรรมระบบฉบับสมบูรณ์ดังแสดงในภาพ 1 ซึ่งผู้ทรงคุณวุฒิ 3 ท่านประเมินความเหมาะสมในระดับมากที่สุด (4.61±0.10)



ภาพ 1 นวัตกรรมระบบกระจายและสำรองยาอินซูลินแอนะล็อกบนหอผู้ป่วย “Sunpasit Insulin Smart Stock” ฉบับสมบูรณ์

3. ผลลัพธ์ของนวัตกรรมระบบ “Sunpasit Insulin Smart Stock”

3.1 จำนวนการเบิกยาจากคลังและมูลค่ายา หลังใช้นวัตกรรมระบบ การเบิกยาลดลงจาก 60 หลอด (12,840 บาท) เป็น 50 หลอด (10,700 บาท) หรือร้อยละ 16.67 โดยเดือนแรกเบิก 20 หลอดตามการกระจายยาสำรองเริ่มต้น และคงที่ 5 หลอดต่อเดือนในช่วงกุมภาพันธ์–พฤษภาคม พ.ศ. 2567 เนื่องจากข้อมูลไม่แจกแจงแบบปกติ (Shapiro-Wilk: W = 0.67, p = .003) จึงใช้ Mann-Whitney U test พบว่าไม่แตกต่างกันอย่างมีนัยสำคัญทางสถิติ (p = .396) ดังแสดงในตาราง 2

ตาราง 2 การเปรียบเทียบจำนวนหลอดที่เบิกจากคลังและมูลค่ายาเฉลี่ยรายเดือน ก่อนและหลังการใช้นวัตกรรมระบบ (n = 6 เดือนต่อช่วง)

ตัวชี้วัด	ก่อนพัฒนา		หลังพัฒนา		U	Z	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.			
จำนวนหลอดที่เบิก (หลอดต่อเดือน)	10.00	6.32	8.33	6.06	12.50	-0.85	.396
มูลค่ายา (บาทต่อเดือน)	2,140.00	1,353.45	1,783.33	1,295.83	12.50	-0.85	.396
รวม 6 เดือน (หลอด/บาท)	60 / 12,840		50 / 10,700				

มูลค่ายา = จำนวนหลอด × 214 บาทต่อหลอด

3.2 การสั่งใช้ยาตามเงื่อนไขแพทย์เฉพาะทาง คำสั่งใช้ยาที่ผ่านเกณฑ์เพิ่มจากร้อยละ 65.56 เป็นร้อยละ 93.89 อย่างมีนัยสำคัญทางสถิติ (χ^2 = 44.69, p < .001) โดยคำสั่งที่เข้าเงื่อนไขข้อบ่งใช้เพิ่มจากร้อยละ 77.78 เป็น 97.78 และคำสั่งที่แพทย์ผู้สั่งเป็นไปตามเงื่อนไขเพิ่มจากร้อยละ 87.78 เป็น 96.11 ดังแสดงในตาราง 3

ตาราง 3 ผลการสั่งใช้ยา Novomix® ตามเงื่อนไขแพทย์เฉพาะทาง ก่อนและหลังการใช้นวัตกรรมระบบ (ช่วงละ 180 คำสั่ง)

รายการ	ก่อนพัฒนา		หลังพัฒนา		χ^2	p-value
	จำนวน	ร้อยละ	จำนวน	ร้อยละ		
แพทย์ผู้สั่งใช้ยา						
- อายุรแพทย์/กุมารแพทย์ต่อมไร้ท่อ	67	37.22	92	51.11		
- แพทย์ระดับ Staff	91	50.56	81	45.00		
- อื่น ๆ	22	12.22	7	3.89		
ผลการตรวจสอบตามเงื่อนไข						
- เข้าเงื่อนไขข้อบ่งใช้	140	77.78	176	97.78	33.56	<.001*
- แพทย์ผู้สั่งเป็นไปตามเงื่อนไข	158	87.78	173	96.11	8.44	.004*
- ผ่านเกณฑ์การสั่งใช้ยาตามเงื่อนไข	118	65.56	169	93.89	44.69	<.001*

*มีนัยสำคัญทางสถิติ p-value <.05

3.3 ระยะเวลารอคอยยา ระยะเวลาตั้งแต่แพทย์สั่งใช้จนพยาบาลบริหารยาลดลงจาก 116.48±28.14 นาที เป็น 21.37±10.01 นาที หรือร้อยละ 81.66 (U = 409.00, p < .001) ผู้ป่วยได้รับยาภายใน 30 นาทีเพิ่มจากร้อยละ 3.89 เป็น 86.67 (χ^2 = 248.90, p < .001) ผ่านเป้าหมายร้อยละ 80 (Exact binomial test, p = .013) และหลังพัฒนาไม่พบคำสั่งที่รอยานานกว่า 90 นาที ดังแสดงในตาราง 4

ตาราง 4 การเปรียบเทียบระยะเวลารอคอยยาตั้งแต่แพทย์สั่งใช้จนพยาบาลบริหารยา ก่อนและหลังการใช้นวัตกรรมระบบ (ช่วงละ 180 คำสั่ง)

ตัวชี้วัด	ก่อนพัฒนา	หลังพัฒนา	สถิติทดสอบ	p-value
ระยะเวลารอคอยยา (นาที) $\bar{x}$±S.D.	116.48±28.14	21.37±10.01	U = 409.00 Z = -16.00	<.001*
มัธยฐาน (IQR)	121.00 (103.75–134.00)	20.00 (15.75–25.25)		
ได้รับยาภายใน 30 นาที จำนวน (ร้อยละ)	7 (3.89)	156 (86.67)	χ^2 = 248.90	<.001*
เทียบเป้าหมาย ≥ ร้อยละ 80 (หลังพัฒนา)		86.67 (95% CI: 80.81–91.27)	Exact Binomial	.013*
รอคอยยามากกว่า 90 นาที จำนวน (ร้อยละ)	157 (87.22)	0 (0.00)		

*มีนัยสำคัญทางสถิติ p-value <.05

3.4 อุบัติการณ์ความคลาดเคลื่อนทางยา ก่อนพัฒนาพบความคลาดเคลื่อนที่เกี่ยวข้องกับอินซูลินแอนะล็อก 15 ครั้ง (0.17 ครั้งต่อ 1,000 วันนอน) หลังพัฒนาพบ 5 ครั้ง (0.06 ครั้งต่อ 1,000 วันนอน) ลดลงร้อยละ 66.42 อย่างมีนัยสำคัญทางสถิติ (Rate ratio = 0.34, 95% CI: 0.12–0.92, p = .035) การจ่ายปากกาซ้ำซ้อนลดลงจาก 6 ครั้ง เหลือ 1 ครั้ง และหลังพัฒนาไม่พบความคลาดเคลื่อนระดับ E–I ดังแสดงในตาราง 5

ตาราง 5 อุบัติการณ์ความคลาดเคลื่อนทางยาที่เกี่ยวข้องกับอินซูลินแอนะล็อก จำแนกตามขั้นตอนและระดับความรุนแรง

รายการ	ก่อนพัฒนา		หลังพัฒนา	
	จำนวน	ร้อยละ	จำนวน	ร้อยละ
ขั้นตอนและประเภทเหตุการณ์				
- การสั่งใช้ยา (สั่งขนาดยาไม่ระบุมื้ออาหาร)	3	20.00	1	20.00
- การคัดลอกคำสั่ง (คัดลอกขนาดยาผิด)	1	6.67	1	20.00
- การจัดยาก่อนจ่าย (จัดปากกาผิดชนิด)	2	13.33	1	20.00
- การจ่ายยา (จ่ายปากกาซ้ำซ้อนกับปากกาเดิม)	6	40.00	1	20.00
- การบริหารยา (ฉีดยาไม่สัมพันธ์กับมื้ออาหาร)	3	20.00	1	20.00
ระดับความรุนแรง (NCC MERP)				
- ระดับ A	1	6.67	1	20.00
- ระดับ B–D	13	86.67	4	80.00
- ระดับ E–I	1	6.67	0	0.00
รวม	**15**	**100.00**	**5**	**100.00**
วันนอนผู้ป่วยใน (วัน)	90,126		89,467	
อัตราต่อ 1,000 วันนอน	0.17		0.06	
Rate ratio (95% CI); p-value	0.34 (0.12, 0.92); p = .035*			

*มีนัยสำคัญทางสถิติ p-value <.05

3.5 ความพึงพอใจของบุคลากรสหวิชาชีพ ผู้ตอบแบบสอบถาม 120 คน ส่วนใหญ่เป็นเพศหญิง ร้อยละ 87.50 อายุเฉลี่ย 36.36±7.64 ปี เป็นพยาบาลวิชาชีพ ร้อยละ 66.67 ความพึงพอใจภาพรวมอยู่ในระดับมาก ($\bar{x}$ =

4.17, S.D. = 0.33) สูงกว่าเกณฑ์ 3.51 คะแนนอย่างมีนัยสำคัญทางสถิติ (t = 21.51, df = 119, p < .001) ด้านที่มีคะแนนสูงสุดคือด้านความปลอดภัย ($\bar{x}$ = 4.21, S.D. = 0.42) ดังแสดงในตาราง 6

ตาราง 6 ระดับความพึงพอใจของบุคลากรสหวิชาชีพต่อนวัตกรรมระบบ รายด้านและภาพรวม (n = 120)

ด้าน	$\bar{x}$	S.D.	ระดับ	สถิติทดสอบ	p-value
ด้านความสะดวก	4.18	0.45	มาก	Z = -8.90	<.001*
ด้านความรวดเร็ว	4.12	0.45	มาก	Z = -8.78	<.001*
ด้านความปลอดภัย	4.21	0.42	มาก	Z = -9.39	<.001*
ด้านภาระงาน	4.16	0.39	มาก	Z = -9.18	<.001*
ภาพรวม (16 ข้อ)	**4.17**	**0.33**	**มาก**	**t = 21.51**	**<.001***

*มีนัยสำคัญทางสถิติ p-value <.05

อภิปรายผล

สถานการณ์และปัญหาของระบบเดิม ปัญหากระจายอยู่ทั้งสามขั้นตอนของกระบวนการใช้ยา การสั่งใช้ตามเงื่อนไขต่ำเพราะไม่มีกลไกควบคุม ณ จุดสั่งใช้ สอดคล้องกับปิยนุช จินดามาตย์[26] และ McKay และคณะ[27] ที่รายงานว่าอินซูลินเกี่ยวข้องกับความคลาดเคลื่อนที่ก่อให้เกิดอันตรายร้อยละ 11–16 การจ่ายปากกาซ้ำซ้อนที่พบมากที่สุดสอดคล้องกับ Najmi และคณะ[5] และ Rov-Ikpah และคณะ[28] ซึ่งมักเกิดเมื่อย้ายหอผู้ป่วย ส่วนภาระงานจ่ายยารายบุคคลและความเสี่ยงจากฉลากหลุดสอดคล้องกับอภิวัฒน์ ณ ลำพูน[11]

การพัฒนาและทดลองใช้นวัตกรรมระบบวงจร PAOR ที่มีผู้แทนครบทุกวิชาชีพทำให้เงื่อนไขการสั่งใช้ได้รับอนุมัติและตั้งระบบแจ้งเตือนได้จริง สอดคล้องกับนิธิกานต์ สายรัตน์ และตุลาการ นาคพันธ์[14] องค์ประกอบที่ 1 ใช้แนวคิดเดียวกับชุดคำสั่งใช้อินซูลินในระบบคอมพิวเตอร์[29] และระบบแจ้งเตือนให้เภสัชกรทบทวน[30] องค์ประกอบที่ 2 สอดคล้องกับการกระจายยาไว้ใกล้ผู้ป่วย[12] แต่ต่างจากระบบจ่ายยาแบบหนึ่งหน่วยที่มียาคืนจำนวนมาก[11] เนื่องจากการสำรองยาบนหอผู้ป่วยเพิ่มความเสี่ยงการหยิบยาผิด[27] องค์ประกอบที่ 3 และการนิเทศโดยเภสัชกรจึงเป็นกลไกสำคัญที่ทำให้มาตรการเกิดการปฏิบัติจริง

ผลลัพธ์ของนวัตกรรมระบบ การสั่งใช้ตามเงื่อนไขที่เพิ่มเป็นร้อยละ 93.89 สอดคล้องกับ Kensara และคณะ[29] และ Wood และคณะ[30] ซึ่งเป็นผลจากการคัดกรองสองจุด ณ จุดสั่งใช้และจุดจ่ายยา การเบิกยาลดลงร้อยละ 16.67 ใกล้เคียงกับ Rov-Ikpah และคณะ[28] แต่ไม่มีนัยสำคัญทางสถิติ เพราะมีข้อมูลเพียงช่วงละ 6 เดือนและเดือนแรกมีการกระจายยาสำรองเริ่มต้น ระยะเวลารอคอยยาที่ลดลงร้อยละ 81.66 สอดคล้องกับปัทมนันท์ รุ่งเรือง[12] โดยไม่ต้องลงทุนเครื่องอัตโนมัติ และอัตราความคลาดเคลื่อนที่ลดลงร้อยละ 66.42 ใกล้เคียงกับวรรณา นิธิไชโย[16] ส่วนความพึงพอใจด้านภาระงานต่ำสุดสะท้อนว่างานบางส่วนโอนไปที่หอผู้ป่วย จึงต้องกระจายภาระงานให้สมดุล[11,27]

ข้อจำกัดของการวิจัย การศึกษานี้ไม่มีกลุ่มควบคุม เงื่อนไขการสั่งใช้เริ่มมีผลในช่วงก่อนพัฒนาข้อมูลการเบิกยามีเพียงช่วงละ 6 จุดเวลา เหตุการณ์ความคลาดเคลื่อนมีจำนวนน้อยและอาจรายงานต่ำกว่าความจริง และไม่ได้ประเมินผลลัพธ์ทางคลินิก จึงควรตีความด้วยความระมัดระวัง

สรุปผลการวิจัย

นวัตกรรมระบบ “Sunpasit Insulin Smart Stock” ซึ่งประกอบด้วยการคัดกรองการสั่งใช้ยาตามเงื่อนไขแพทย์เฉพาะทาง ระบบยาสำรองบนหอผู้ป่วยที่คิดราคาเป็นยูนิต และมาตรการความปลอดภัยข้างเตียง ช่วยเพิ่มการสั่งใช้ยาตามเงื่อนไข ลดระยะเวลารอคอยยาและความคลาดเคลื่อนทางยาอย่างมีนัยสำคัญ ได้รับความพึงพอใจในระดับมาก และใช้ทรัพยากรเดิมของโรงพยาบาล จึงเป็นต้นแบบการบริหารจัดการยาราคาสูงที่มีความเสี่ยงสูงได้

ข้อเสนอแนะ

1. ข้อเสนอแนะในการนำผลการวิจัยไปใช้ คณะกรรมการเภสัชกรรมและการบำบัดควรกำหนดนวัตกรรมระบบเป็นแนวปฏิบัติมาตรฐาน ขยายผลสู่อินซูลินแอนะล็อกชนิดอื่นและยาบัญชี ง. รายการอื่น พัฒนาโปรแกรมตัดยากลับบ้านอัตโนมัติใน IPserv กำหนดบทบาทของแพทย์ เภสัชกร และพยาบาลใน SOP และบรรจุหลักปากกาหนึ่งด้ามต่อผู้ป่วยหนึ่งรายในการปฐมนิเทศพยาบาลใหม่

2. ข้อเสนอแนะในการวิจัยครั้งต่อไป ควรมีกลุ่มเปรียบเทียบ ติดตามผลอย่างน้อย 12 เดือน ศึกษาผลลัพธ์ทางคลินิก เช่น ภาวะน้ำตาลในเลือดต่ำและสูง และวิเคราะห์ต้นทุนประสิทธิผลเทียบกับระบบจ่ายยาแบบหนึ่งหน่วยหรือตู้จ่ายยาอัตโนมัติ

กิตติกรรมประกาศ

ขอขอบคุณผู้อำนวยการโรงพยาบาลสรรพสิทธิประสงค์ คณะอนุกรรมการกลุ่มยาย่อยโรคต่อมไร้ท่อ หัวหน้ากลุ่มงานเภสัชกรรม แพทย์ เภสัชกร เจ้าพนักงานเภสัชกรรม พยาบาลวิชาชีพ และนักวิชาการคอมพิวเตอร์ ที่ให้ความร่วมมือในทุกขั้นตอน และผู้ทรงคุณวุฒิที่ตรวจสอบคุณภาพเครื่องมือการวิจัย

เอกสารอ้างอิง

1. International Diabetes Federation. IDF diabetes atlas. 11th ed. Brussels: International Diabetes Federation; 2024. Available from: https://diabetesatlas.org/
2. Institute for Safe Medication Practices. ISMP list of high-alert medications in acute care settings [Internet]. 2024. Available from: https://www.ismp.org/recommendations/high-alert-medications-acute-list
3. World Health Organization. Medication without harm: WHO global patient safety challenge on medication safety [Internet]. Geneva: World Health Organization; 2017. Available from: https://www.who.int/initiatives/medication-without-harm
4. U.S. Food and Drug Administration. FDA drug safety communication: FDA requires label warnings to prohibit sharing of multi-dose diabetes pen devices among patients [Internet]. 2015. Available from: https://www.fda.gov/drugs/drug-safety-and-availability/fda-drug-safety-communication-fda-requires-label-warnings-prohibit-sharing-multi-dose-diabetes-pen
5. Najmi U, Haque WZ, Ansari U, Yemane E, Alexander LA, Lee C, et al. Inpatient insulin pen implementation, waste, and potential cost savings: a community hospital experience. J Diabetes Sci Technol. 2021;15(4). Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8258519
6. เริงฤดี ปธานวนิช, วิชัย เอกพลากร. การสำรวจสุขภาพประชาชนไทยโดยการตรวจร่างกาย ครั้งที่ 7 พ.ศ. 2567–2567. นนทบุรี: สถาบันวิจัยระบบสาธารณสุข; 2567. เข้าถึงได้จาก: http://hdl.handle.net/11228/6360

7. เกียรติภูมิ วงศ์รจิต. การใช้ยาอย่างสมเหตุผล (Rational Drug Use) – RDU และ AMR [เอกสารนำเสนอ]. นนทบุรี: กระทรวงสาธารณสุข; 2560. เข้าถึงได้จาก: https://phdb.moph.go.th/main/upload/web_news_files/rdu%20ประชุม%20สธ%203%20feb%2060_2017-02-03-024006.pdf
8. อนัญญา สองเมือง, ธนัฏชา สองเมือง. การเปรียบเทียบผลลัพธ์และต้นทุนของการใช้ปากกาและเข็มฉีดยาสำหรับอินซูลินชนิดผสม 70/30 ในผู้ป่วยเบาหวานชนิดที่ 2. วารสารเภสัชกรรมโรงพยาบาล. 2565;32(3):202–17.
9. ชณัฏฐา เรืองสุทธิภาพ. ประสิทธิผลของการดูแลผู้ป่วยเบาหวานให้เข้าสู่ระยะสงบ อำเภอพิบูลมังสาหาร. วารสารสิ่งแวดล้อมศึกษาการแพทย์และสุขภาพ. 2567;9(2):323–30.
10. กลุ่มงานเภสัชกรรม โรงพยาบาลสรรพสิทธิประสงค์. รายงานปริมาณการเบิกจ่ายและมูลค่ายา Novomix® จากโปรแกรม IPserv และรายงานยาคงคลัง ปีงบประมาณ 2566–2567 [ข้อมูลไม่ได้ตีพิมพ์]. อุบลราชธานี: โรงพยาบาลสรรพสิทธิประสงค์; 2567.
11. อภิวัฒน์ ณ ลำพูน. ผลลัพธ์ของการพัฒนาระบบจ่ายยาแบบหนึ่งหน่วยที่หอผู้ป่วยวิกฤต โรงพยาบาลแม่สาย จังหวัดเชียงราย. วารสารสำนักงานสาธารณสุขจังหวัดเชียงราย. 2567;1(1):46–60.
12. ปัทมนันท์ รุ่งเรือง. การพัฒนาระบบการจ่ายยาด่วนด้วยเครื่องจัดยากึ่งอัตโนมัติบนหอผู้ป่วยวิกฤต โรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติ. TUH Journal Online. 2566;8(3):97–104.
13. ยืนยง ไชยยงค์. การประยุกต์ใช้ DOWNTIME และ ECRS ในระบบจ่ายยาผู้ป่วยใน โรงพยาบาลร้อยเอ็ด. ศรีนครินทร์เวชสาร. 2567;40(1):73–82.
14. นิธิกานต์ สายรัตน์, ตุลาการ นาคพันธ์. การพัฒนาระบบการจัดการยาที่ต้องมีความระมัดระวังในการใช้สูงในผู้ป่วยที่นอนรักษาตัวในโรงพยาบาล โรงพยาบาลท่าตูม อ.ท่าตูม จ.สุรินทร์. วารสารสิ่งแวดล้อมศึกษาการแพทย์และสุขภาพ. 2567;9(4):654–60.
15. Kemmis S, McTaggart R, Nixon R. The action research planner: doing critical participatory action research. Singapore: Springer; 2014. doi:10.1007/978-981-4560-67-2
16. วรรณา นิธิไชโย. วิเคราะห์ผลการพัฒนาระบบงานบริการจ่ายยาผู้ป่วยในแผนกอายุรกรรม โรงพยาบาลมหาราชนครศรีธรรมราช. มหาราชนครศรีธรรมราชเวชสาร. 2567;9(1):1–13.
17. กลุ่มงานเภสัชกรรม โรงพยาบาลสรรพสิทธิประสงค์. บันทึกข้อความ ที่ อบ 0033.123/25 เรื่อง ขอปรับเงื่อนไขการสั่งจ่ายยา Insulin aspart/insulin aspart protamine (Novomix®) ลงวันที่ 7 กันยายน 2566 [เอกสารไม่ได้ตีพิมพ์]. อุบลราชธานี: โรงพยาบาลสรรพสิทธิประสงค์; 2566.
18. กลุ่มงานเภสัชกรรม โรงพยาบาลสรรพสิทธิประสงค์. บันทึกข้อความ ที่ อบ 0033.123/1048 เรื่อง ปรับรายการยาสำรองบนหอผู้ป่วย (Stock Ward) ของหอผู้ป่วยในอาคาร 8 และ 9 ลงวันที่ 14 พฤศจิกายน 2566 [เอกสารไม่ได้ตีพิมพ์]. อุบลราชธานี: โรงพยาบาลสรรพสิทธิประสงค์; 2566.
19. Chow SC, Shao J, Wang H. Sample size calculations in clinical research. 2nd ed. Boca Raton (FL): Chapman & Hall/CRC; 2008.
20. Cochran WG. Sampling techniques. 3rd ed. New York: John Wiley & Sons; 1977.
21. Novo Nordisk. NovoMix 30 FlexPen 100 units/ml suspension for injection in pre-filled pen: summary of product characteristics [Internet]. 2022. Available from: https://www.medicines.org.uk/emc/product/1600/smpc
22. National Coordinating Council for Medication Error Reporting and Prevention. NCC MERP index for categorizing medication errors [Internet]. 2001. Available from: https://www.nccmerp.org/types-medication-errors
23. Best JW. Research in education. 3rd ed. Englewood Cliffs (NJ): Prentice-Hall; 1977.
24. Elo S, Kyngäs H. The qualitative content analysis process. J Adv Nurs. 2008;62(1):107–15.

25. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191–4.
26. ปิยนุช จินดามาตย์. การพัฒนาการสั่งใช้ยาและจ่ายยา แนวทางการติดตาม การเฝ้าระวังการใช้ยาความเสี่ยงสูงโดยใช้เทคโนโลยีให้มีการสื่อสารเชื่อมโยงกัน เพื่อลดความคลาดเคลื่อนทางยาและการเกิดอาการไม่พึงประสงค์จากยา ในโรงพยาบาลภูเขียวเฉลิมพระเกียรติ จังหวัดชัยภูมิ. วารสารโรงพยาบาลนครพนม. 2567;12(2).
27. McKay C, Schenkat D, Murphy K, Hess E. Review of medication error sources associated with inpatient subcutaneous insulin: recommendations for safe and cost-effective dispensing practices. Hosp Pharm. 2022;57(6):689–96. doi:10.1177/00185787221095771
28. Rov-Ikpah E, et al. Reducing multidose insulin pen waste in inpatient adult units [poster abstract P-600]. Presented at: Association of Diabetes Care & Education Specialists Annual Conference (ADCES24); 2024 Aug 9–12; New Orleans, LA.
29. Kensara RE, Ismail S, Aseeri M, Hasan H, Al Rahimi J, Zarif H, et al. The impact of the implementation of computerized insulin order sets for the control of hyperglycemia in hospitalized cardiac patients. Cardiovasc Endocrinol Metab. 2024;13(1):1–7. doi:10.1097/XCE.0000000000000296
30. Wood M, Moses J, Andrade DC, De la Cova M, Parmar J, Middlebrook G, et al. Pharmacy stewardship to reduce recurrent hypoglycemia. J Am Pharm Assoc. 2023;63(6):1813–20. doi:10.1016/j.japh.2023.09.002

RESEARCH ARTICLE

Development of a Nursing Care Model for End-Stage Liver Cancer Patients in the Service Area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province

Papatchaya Prathumwan[1]*

[1]Registered Nurse, Professional Level, Public Health Services Unit, Family Practice Department, Ban Non Rang Subdistrict Health Promoting Hospital, Khon Kaen Provincial Administrative Organization, Mueang District, Khon Kaen Province *Corresponding author

☐ **Received:** 13 October 2026 ✓ **Revised:** 15 October 2026 ☑ **Accepted:** 18 October 2026

Citation: Prathumwan P. Development of a nursing care model for end-stage liver cancer patients in the service area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province. Thai Health Sciences Frontiers. 2026;1(3):73-86.

Abstract

This action research aimed to develop a nursing care model for end-stage liver cancer patients, compare quality of life, pain, and family anxiety before and after implementation, and examine care outcomes and satisfaction in the service area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province. The study applied the palliative care concept, Watson's Theory of Human Caring, and one PDCA cycle from November 2024 to March 2025. Participants were 12 health personnel and village health volunteers, and 8 end-stage liver cancer patients referred from Khon Kaen Hospital for home care. Instruments, validated by three experts, included the model, a focus group guideline, and assessments of quality of life, pain, family anxiety, model appropriateness, and satisfaction. Data were analyzed using content analysis, descriptive statistics, the paired t-test, and the Wilcoxon signed-rank test.

The developed NONRANG Model comprised five components: holistic needs assessment, family-centered care planning, palliative nursing activities, multidisciplinary and community coordination, and continuous monitoring with bereavement care. Experts rated its appropriateness at the highest level (mean±S.D. = 4.47±0.38). After implementation, the mean quality of life score increased from 52.38±7.14 to 71.25±5.83 (p-value <0.001), the mean pain score decreased from 6.25±1.28 to 2.88±1.13 (p-value = 0.011), and the mean family anxiety score decreased from 8.13±1.46 to 3.75±1.28 (p-value <0.001). All patients received continuous care until the end of life, and 7 of 8 (87.50%) died peacefully at home as desired. Six of 8 caregivers (75.00%) demonstrated good caregiving skills, and overall satisfaction was at the highest level (mean±S.D. = 4.51±0.42). The NONRANG Model was associated with reduced pain, improved quality of life, and peaceful death at home, and can serve as a guideline for

subdistrict health promoting hospitals in similar rural contexts. Further studies with larger samples and a comparison group are recommended.

Keywords: End-stage liver cancer, Palliative care, Nursing care model, Action research

Introduction

Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver and a leading cause of cancer death worldwide, particularly in Southeast Asia.[1]

In Thailand, liver cancer has one of the highest incidences in the country, especially in the northeastern region, where the prevalence of liver fluke infection and cholangiocarcinoma is high. The main risk factors include chronic hepatitis B and C virus infection, cirrhosis, chronic alcohol consumption, and fatty liver disease.[2] Most patients are diagnosed at an advanced or end stage because early-stage disease is often asymptomatic, which limits the chance of curative treatment.[3] Under the Barcelona Clinic Liver Cancer (BCLC) staging system, patients at stage D, or the terminal stage, are managed primarily with palliative care.[2]

End-stage liver cancer has complex clinical features, including liver failure, ascites, gastrointestinal bleeding, hepatic encephalopathy, and rapid weight loss. Patients at this stage have a median survival of less than 6 months and require intensive palliative care.[2] Pain is the most common and most severe symptom; more than 70.00% of patients with end-stage cancer experience moderate to severe pain, which directly affects their quality of life and ability to perform activities of daily living.[4] The burden of the disease affects not only patients but also causes psychological and economic stress for families, and primary caregivers have been found to carry a high caregiving burden and a higher risk of depression than the general population.[5]

Palliative care is holistic care that aims to relieve suffering and promote the quality of life of patients facing life-threatening illness and their families. It covers symptom control, pain relief, and psychological, social, and spiritual support.[6] The Ministry of Public Health has made palliative care part of the health service system at every level, including primary care units such as subdistrict health promoting hospitals (SHPHs), with nurses playing a key role in assessing symptoms, counseling families, and coordinating referrals when necessary.[7] In addition, most end-stage liver cancer patients in Thailand wish to die at home surrounded by their families,[8] and studies have shown that community-based palliative care provided by registered nurses improves the quality of life of terminally ill

cancer patients and reduces emergency department visits and hospital admissions.[9]

Furthermore, Watson's Theory of Human Caring, which emphasizes caring for patients as valued human beings and building caring relationships between nurses, patients, and families,[10] and the PDCA (Plan-Do-Check-Act) quality cycle[11] provide appropriate frameworks for developing end-of-life care systems in the community in a systematic and continuous manner.[12]

Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province, under the Khon Kaen Provincial Administrative Organization, is a primary care unit serving a rural community in northeastern Thailand, an area with a high prevalence of liver cancer. Most end-stage liver cancer patients in the area are referred from Khon Kaen Hospital for continuing care at home. However, care in the past has lacked a systematic nursing care model suited to the community context. Most personnel are more accustomed to referring patients to hospital than to providing continuing care at home, primary caregivers lack the knowledge and skills to manage symptoms, access to opioid analgesics at home is limited, and local cultural beliefs that avoid talking about death make advance care planning difficult. Although palliative care models have proven effective in tertiary hospitals, an appropriate nursing care model for communities at the SHPH level is still lacking. There are 1 2 patients with cholangiocarcinoma, liver cancer, or terminal illness in the service area.

Given this background and significance, the researcher developed a nursing care model for end-stage liver cancer patients by applying the palliative care concept, Watson's Theory of Human Caring, and the Ministry of Public Health guidelines through an action research process following the PDCA cycle, in collaboration with a multidisciplinary team, families, and community networks. The aim was to ensure that patients receive comprehensive care in all dimensions, have their suffering relieved, and die peacefully at home, and to provide information for developing palliative care systems in primary care units with similar contexts.

Research Objectives

1. To study the situation and develop a nursing care model for end-stage liver cancer patients in the service area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province

2. To compare quality of life, pain level, and family anxiety before and after implementing the nursing care model for end-stage liver cancer patients

3. To examine care outcomes and the satisfaction of patients and families with the nursing care model for end-stage liver cancer patients

Methods

This study was action research following one cycle of the PDCA (Plan-Do-Check-Act) quality cycle,[11,12] conducted from November 2024 to March 2025, a total of 5 months, and divided into 4 phases. Phase 1, Plan: the situation was studied using patient registers in the Java Health Center Information System (JHCIS) database of the subdistrict health promoting hospital and referral records from Khon Kaen Hospital, focus groups were held with health personnel and village health volunteers (VHVs), and a draft nursing care model was developed (November 2024).

Phase 2, Do: the sample was selected, pre-implementation data were collected, and the nursing care model was implemented continuously with the patients (November 2024-February 2025).

Phase 3, Check: post-implementation data were collected, outcomes were compared, and satisfaction was evaluated (February-March 2025); and

Phase 4, Act: strengths and areas for improvement were analyzed, a complete model implementation manual was prepared, and the research findings were disseminated (March 2025).

Population

The population consisted of end-stage liver cancer patients living in the service area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province, and the health personnel and VHVs working in the service area.

Sample

The sample was divided into 2 groups. Group 1 comprised 12 health personnel and VHVs in the service area, who served as informants during the situation analysis and model development phases. Group 2 comprised 8 end-stage liver cancer patients referred from Khon Kaen Hospital for continuing home care, who were included in the evaluation phase. Participants were selected by purposive sampling.

Inclusion Criteria

Diagnosed by a physician with end-stage liver cancer; residing in the service area of Ban Non Rang SHPH; having a primary caregiver in the family; able to communicate in Thai; and the patient or legal representative voluntarily consented to participate in the study.

Exclusion Criteria

Moving out of the service area during the study, or the patient or family requesting to withdraw from the study.

Research Instruments

1. Instrument for conducting the research was the NONRANG Model, a nursing care model for end-stage liver cancer patients developed by the researcher from the

situation analysis, focus groups, and a review of the palliative care concept,[6] Watson's Theory of Human Caring,[10] and the Ministry of Public Health palliative care guidelines.[7] The model consists of a 5-step nursing process:

Step 1 : Holistic Needs Assessment, assessing distressing physical symptoms and psychological, social, and spiritual needs, and recording the Pain Score, ability to perform activities of daily living (ADL), and the Palliative Performance Scale (PPS).

Step 2: Family-Centered Care Planning, setting care goals and preparing an advance care plan (Advance Care Planning).

Step 3 : Palliative Nursing Activities, consisting of 5 main activities: management of distressing symptoms and pain; education and skills training for primary caregivers; psychological and spiritual care; weekly home visits by the multidisciplinary team; and continuous telephone follow-up and coordination with VHVs.

Step 4 : Multidisciplinary and Community Coordination among the SHPH, the parent hospital, VHVs, and families; and

Step 5 : Continuous Monitoring and Bereavement Care. If distressing symptoms do not subside, practitioners return to revise the nursing plan and repeat the activities, providing continuous care until the end of the patient's life.

2. Data collection instruments consisted of: 1) a patient general information form covering sex, age, education level, occupation, and duration of illness, together with a clinical record form (Pain Score, ADL, and PPS); 2) a focus group guideline for analyzing problems, limitations, and needs for model development; 3) a patient quality of life assessment developed by the researcher, consisting of 25 items with a total score of 0-100, classified into 3 levels: poor (0.00-40.99), moderate (41.00-60.99), and good (61.00-100.00); 4) a pain assessment (Pain Score) using a 0-10 numeric rating scale, classified as no pain (0), mild pain (0.01-3.99), moderate pain (4.00-6.99), and severe pain (7.00-10.00); 5) a family anxiety assessment using a 0-10 numeric rating scale, with higher scores indicating greater anxiety; 6) a model appropriateness assessment for experts; and 7) a patient and family satisfaction questionnaire on the nursing care model, using a 5-point rating scale with a passing criterion of a mean score of 3.50 or higher, with mean scores interpreted at 5 levels: 1.00-1.80 lowest, 1.81-2.60 low, 2.61-3.40 moderate, 3.41-4.20 high, and 4.21-5.00 highest. In addition, care outcomes were assessed using a primary caregiver skills assessment tool with criteria for a "good level" and a place-of-death record form.

3. Instrument quality testing: the nursing care model and all instruments were reviewed by 3 experts for content validity and appropriateness. The Index of Item-Objective Congruence (IOC) ranged from 0.67 to 1.00, with an overall IOC of 0.79, and the

instruments were revised according to the experts' suggestions before actual use. The quality of life assessment, family anxiety assessment, and satisfaction questionnaire were then tried out with 10 terminally ill cancer patients and families with characteristics similar to the sample in a nearby area, yielding Cronbach's alpha coefficients of 0.86, 0.82, and 0.89, respectively.

Data Collection

The researcher collected pre-implementation data in Phase 2 and post-implementation data in Phase 3 (February-March 2025) using the quality of life assessment, the pain assessment, and the family anxiety assessment. Satisfaction was assessed in Phase 3. Data were collected from end-stage patients, with the timing of post-implementation measurement recorded relative to the date of death, along with the number of patients with complete pre- and post-implementation data for all variables.

Data Analysis

1. General data of the sample were analyzed using frequency, percentage, arithmetic mean ($\bar{x}$), and standard deviation (S.D.). Qualitative data from the focus groups for model development were analyzed using content analysis.

2. Mean scores for quality of life, pain level, and family anxiety before and after implementing the nursing care model were compared using the paired t-test for normally distributed data and the Wilcoxon signed-rank test for non-normally distributed data. Normality was tested with the Shapiro-Wilk test, and the test results, mean differences with 95% confidence intervals (CI), and effect sizes were reported. The level of statistical significance was set at $\alpha = 0.05$.

3. Care outcomes, namely receiving continuous care until the end of life, dying at home as desired, and the caregiving skills of primary caregivers, were analyzed using frequency, percentage, and Clopper-Pearson 95% confidence intervals for proportions. Model appropriateness and satisfaction were analyzed using mean and standard deviation.

Research Ethics

The researcher protected the rights of participants by explaining the objectives, research procedures, and expected benefits to patients and families in advance. Participants had the right to accept or refuse participation and to withdraw from the study at any time without any effect on their access to public health services. Communication about end-of-life care was conducted with sensitivity and respect for the beliefs of patients and families. All data were kept

confidential using codes instead of real names, and the results were presented in aggregate for academic purposes only.

Results

1. General Characteristics of the Sample

Of the 8 end-stage liver cancer patients in the sample, most were male (5 patients, 62.50%). The mean age was 61.38±8.24 years (minimum 60 years, maximum 78 years). Most had completed primary education (6 patients, 75.00%) and worked as farmers or general laborers (7 patients, 87.50%). The mean duration of illness from diagnosis to the end stage was 8.25±3.11 months, as shown in Table 1.

Table 1 General characteristics of the sample of end-stage liver cancer patients in the service area of Ban Non Rang Subdistrict Health Promoting Hospital (n = 8)

Characteristics	Number	Percentage
1. Sex		
Male	5	62.50
Female	3	37.50
2. Age (years)		
Mean age 61.38±8.24 years; minimum 60 years, maximum 78 years		
3. Education level		
Primary education	6	75.00
Secondary education or higher	2	25.00
4. Main occupation		
Farmer and general laborer	7	87.50
Trading	1	12.50
5. Duration of illness from diagnosis to end stage		
Mean duration 8.25±3.11 months		

2. Results of the Development of the Nursing Care Model for End-Stage Liver Cancer Patients

2.1 Situation and care problems The situation analysis of patient registers, referral records, and focus groups with 12 health personnel and VHVs identified 4 key problems: 1) most personnel were more accustomed to referring end-stage cancer patients to Khon Kaen Hospital than to providing continuing care at home, and there were no clear nursing guidelines at the SHPH level; 2) primary caregivers, mostly elderly spouses or children with full-time jobs, lacked the knowledge and skills to manage

symptoms at home; 3) obtaining opioid analgesics for patients at home involved complex procedures and legal restrictions; and 4) local beliefs and culture that avoid talking about death made advance care planning difficult.

2.2 Nursing care model Based on this analysis, the NONRANG Model was developed, consisting of 5 main components: holistic needs assessment, family-centered care planning, palliative nursing activities, multidisciplinary and community coordination, and continuous monitoring with bereavement care, together with 1 practice manual for SHPH staff.

2.3 Appropriateness of the model Three experts, using the model appropriateness assessment form, rated the appropriateness of the model at the highest level ($\bar{x}$±S.D. = 4.47±0.38).

3. Comparison of Quality of Life, Pain Level, and Family Anxiety Before and After Implementing the Nursing Care Model

After implementing the NONRANG Model, the mean overall quality of life score of the sample increased from 52.38±7.14, a moderate level, to 71.25±5.83, a good level (mean difference = 18.87, 95% CI = 14.77-22.97, t = 10.89, df = 7, p-value <0.001). The pain score decreased from 6.25±1.28, a moderate level, to 2.88±1.13, a mild level (Z = -2.53, p-value = 0.011), and the family anxiety score decreased from 8.13±1.46 to 3.75±1.28 (mean difference = -4.38, 95% CI = -5.37 to -3.39, t = -10.41, df = 7, p-value <0.001), as shown in Table 2.

Table 2 Comparison of mean scores for quality of life, pain level, and family anxiety before and after implementing the NONRANG Model (n = 8)

Variable	Before $\bar{x}$±S.D. (level)	After $\bar{x}$±S.D. (level)	$\bar{d}$	Test statistic (t/Z)	p-value
Overall quality of life	52.38±7.14 (moderate)	71.25±5.83 (good)	18.87	t = 10.89	<0.001*
Pain level (0-10)	6.25±1.28 (moderate)	2.88±1.13 (mild)	-3.37	Z = -2.53	0.011*
Family anxiety	8.13±1.46	3.75±1.28	-4.38	t = -10.41	<0.001*

*Statistically significant at p-value <.05

4. Care Outcomes and Satisfaction with the Nursing Care Model

All 8 patients (100.00%; 95% CI 63.06-100.00) received continuous care until the

end of life; 7 patients (87.50%; 95% CI 47.35-99.68) died peacefully at home as desired by the patients and families; and 6 primary caregivers (75.00%; 95% CI 34.91-96.81) demonstrated good caregiving skills, as shown in Table 3. Overall satisfaction of patients and families with the nursing care model was at the highest level ($\bar{x}$±S.D. = 4.51±0.42), exceeding the set criterion (a mean of 3.50 or higher), as shown in Table 4.

Table 3 Care outcomes of end-stage liver cancer patients under the NONRANG Model (n = 8)

Care outcome	Number	Percentage (95% CI)
1. Received continuous care until the end of life	8	100.00 (63.06-100.00)
2. Died peacefully at home as desired by the patient and family	7	87.50 (47.35-99.68)
3. Primary caregiver demonstrated good caregiving skills	6	75.00 (34.91-96.81)

Table 4 Appropriateness of the nursing care model and satisfaction of patients and families with the NONRANG Model

Item	$\bar{x}$	S.D.	Interpretation
1. Appropriateness of the nursing care model (experts, n = 3)	4.47	0.38	Highest
2. Satisfaction of patients and families (n = 8)	4.51	0.42	Highest

Discussion

The development results showed that the NONRANG Model was rated by experts as appropriate at the highest level. This may be related to a development process grounded in an analysis of the actual local situation, including patient registers, referral records, and focus groups with health personnel and VHVs, combined with the application of the palliative care concept and the Ministry of Public Health guidelines, which produced components that respond to the problems and context of a rural community. This is consistent with a study that found that applying the PDCA cycle to develop a care model for end-stage cancer patients in the community made the care process more systematic and enabled patients to receive continuous and comprehensive care,[12] and

with a study that found that SHPHs that systematically applied the Ministry of Public Health guidelines provided more comprehensive care to end-stage cancer patients.[13]

Regarding quality of life, after implementing the nursing care model, the patients' overall quality of life score increased from a moderate to a good level. This may be related to the model beginning with a holistic needs assessment covering physical, psychological, social, and spiritual dimensions and care planning together with families, so that care responded to the needs of each patient. This is consistent with a study that found that holistic home care for end-stage cancer patients improved overall quality of life scores,[14] and that community-based palliative care covering symptom management, psychological support, and family participation meaningfully improved the quality of life of end-stage cancer patients.[9,15]

Regarding pain, the pain score decreased from a moderate to a mild level (a reduction of 3.37 points). Possible contributing factors include regular pain assessment during weekly home visits, coordination with physicians and pharmacists at Khon Kaen Hospital to obtain and adjust opioid analgesics in a timely manner as symptoms changed, and educating primary caregivers on medication administration and non-pharmacological pain management. This is consistent with cancer pain management guidelines that emphasize reassessment and symptom-based dose adjustment,[4] and with a study that found that a home-based pain management program led by community nurses reduced pain scores and improved patients' sleep quality.[16]

Regarding family anxiety and primary caregiver skills, the family anxiety score decreased, and 75.00% of primary caregivers demonstrated good caregiving skills. This may be related to the model's application of Watson's Theory of Human Caring to build caring relationships with patients and families, together with individualized preparation of primary caregivers and continuous telephone follow-up, which gave families confidence and a source of support when symptoms changed. This is consistent with a study that found that nursing based on Watson's Theory of Human Caring increased psychological and spiritual comfort and reduced anxiety among end-stage cancer patients,[17] and that a competency-building program for caregivers of end-stage cancer patients in the community increased caregivers' knowledge and skills and reduced their caregiving burden.[18]

Regarding end-of-life care outcomes, all patients received continuous care until the end of life, and 87.50% died peacefully at home as desired. This may reflect that coordination among the multidisciplinary team and community networks, including the

SHPH, the parent hospital, VHVs, and families, can create a continuous and connected care system at the primary care level, although these data come from only 8 patients. This is consistent with the wish of most end-stage liver cancer patients in Thailand to die at home,[8] and with a study that found that community care for end-stage cancer patients by SHPH nurses together with VHVs provided continuous care and reduced unnecessary hospital referrals.[19]

Regarding satisfaction, patients and families were satisfied with the nursing care model overall at the highest level. This may be related to the model being designed to fit the lifestyles and beliefs of rural communities in northeastern Thailand, with home visits and follow-up through multiple channels, and communication about end-of-life care conducted with respect and sensitivity. This is consistent with a study that found that families of end-stage cancer patients who received home care from community nursing teams reported high satisfaction with care,[20] and that end-stage liver cancer patients who received systematic palliative care were more satisfied with their care than those who did not receive this type of care.[21]

However, this study had several limitations: 1) the sample was small, with only 8 patients, resulting in low statistical power and wide confidence intervals; 2) it was a single-group study without a comparison group, confounding variables were not controlled, and only one PDCA cycle was conducted, so the outcomes may have been influenced by other factors, such as treatment at the parent hospital, the natural course of the disease, and regression to the mean; the findings therefore represent pre-post changes rather than the effectiveness of the model; 3) end-stage patients who deteriorated rapidly or died before post-implementation measurement may not have been included (survivor bias); 4) multiple variables were tested; and 5) the JHCIS system does not yet have specific codes and indicators for palliative care at the SHPH level, so recording and monitoring required additional forms.

Conclusion

The findings can be summarized according to the objectives as follows: 1) a nursing care model for end-stage liver cancer patients, the NONRANG Model, was developed, consisting of 5 main components, and was rated by experts as appropriate at the highest level; 2) after implementing the model, quality of life scores increased, while pain and family anxiety scores decreased with statistical significance; and 3) all 8 patients received continuous care until the end of life, 7 died peacefully at home, and patients and families were satisfied at the highest level. These are pre-post changes in a small sample without a comparison group.

Recommendations

1. Recommendations for Applying the Research Findings

1.1 Subdistrict health promoting hospitals under the Khon Kaen Provincial Administrative Organization with similar contexts should adopt and scale up the NONRANG Model and its practice manual, adapting them to the resources and context of each area.

1.2 The Khon Kaen Provincial Administrative Organization and local administrative organizations should: 1) integrate policies and budgets for end-of-life care into local development plans; 2) develop a palliative patient monitoring database within the JHCIS system; and 3) build collaborative networks with parent hospitals to ensure smooth referral and access to opioid analgesics at home.

1.3 Registered nurses and multidisciplinary teams in SHPHs should continuously develop their knowledge and skills in palliative care, communication about end-of-life care, and advance care planning, while respecting the beliefs and local culture of patients and families.

1.4 The capacity of primary caregivers and VHVs should be continuously developed, including home caregiving skills, recognizing warning signs that must be reported to staff, and supporting families after bereavement, to make the community care system strong and sustainable.

2. Recommendations for Future Research

2.1 Future research should increase the sample size, use a research design with a comparison group, conduct multiple PDCA cycles, and follow up for longer than 1 year to evaluate the continuity and sustainability of the nursing care model at the SHPH level.

Acknowledgements

The author would like to thank the Director of Ban Non Rang Subdistrict Health Promoting Hospital, the Khon Kaen Provincial Administrative Organization, and the Khon Kaen Provincial Human Research Ethics Committee for permitting, approving, and supporting this research. Thanks are also extended to the physicians, nurses, and pharmacists of Khon Kaen Hospital, and to the health personnel and village health volunteers in the service area who helped care for the patients and develop the nursing care model. The author is grateful to all patients and families who willingly participated in this study, and to the three experts who kindly provided guidance on model development and reviewed the quality of the research instruments.

References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021;71(3):209-49.

2. Thai Association for the Study of the Liver. Thai guideline for the diagnosis and management of hepatocellular carcinoma. 3rd ed. Bangkok: Thai Association for the Study of the Liver; 2023. (in Thai)

3. Thithapan W, Wannakrairot S, Sukpongthai N. Situation and risk factors of liver cancer in northeastern Thailand. Thai Cancer J. 2022;42(1):12-23. (in Thai)

4. Swarm RA, Paice JA, Anghelescu DL, Are M, Bruce JY, Buga S, et al. Adult cancer pain, version 3.2019, NCCN clinical practice guidelines in oncology. J Natl Compr Canc Netw. 2019;17(8):977-1007.

5. Intaraksa T, Siriwanbut P, Theerawiwat M. Caregiving burden among caregivers of terminally ill cancer patients in the community. J Nurs Health Care. 2023;41(2):88-97. (in Thai)

6. World Health Organization. Palliative care [Internet]. Geneva: World Health Organization; 2020 [cited 2026 Oct 16]. Available from: https://www.who.int/news-room/fact-sheets/detail/palliative-care

7.Department of Medical Services, Ministry of Public Health. Palliative care guideline for health personnel. Bangkok: The Agricultural Cooperative Federation of Thailand Printing House; 2021. (in Thai)

8. Sihirunwong A, Sinsuksai N, Rawiworrakul T. Needs and expectations of end-stage liver cancer patients regarding death at home. Thai J Nurs. 2022;38(2):56-69. (in Thai)

9. Homnan S, Thaiyapirom N, Ucharattana P. Effects of community-based palliative care by registered nurses on quality of life of terminally ill cancer patients. J Nurs Health Care. 2023;41(4):123-36. (in Thai)

10. Watson J. Nursing: the philosophy and science of caring. Rev ed. Boulder (CO): University Press of Colorado; 2008.

11. Deming WE. Out of the crisis. Cambridge (MA): Massachusetts Institute of Technology; 1986.

12. Suksaen S, Wongkaew O, Theerawiwat M. Development of a care model for terminally ill cancer patients in the community using the PDCA cycle. J Public Health Health Sci. 2023;6(3):101-15. (in Thai)

13. Daengduang P, Saiyot A, Phaengkaset R. Outcomes of implementing the Ministry of Public Health palliative care guideline in subdistrict health promoting hospitals. Prov Public Health Off J. 2023;14(2):89-102. (in Thai)

14. Tulaphan J, Thawornwattana S, Phokhakul W. Effects of holistic care on quality of life of terminally ill cancer patients at home. J Nurs Sci Health. 2023;46(3):112-24. (in Thai)

15. Chayawan K, Promphakdee R, Jaikarun S. Effects of a community-based palliative care program on quality of life of terminally ill cancer patients. J Nurs Health. 2024;18(1):45-57. (in Thai)

16. Limamnuaylap S, Panyathorn K, Sukharom A. A home-based pain management program for terminally ill cancer patients by community nurses. J Nurs Health. 2024;18(2):88-101. (in Thai)

17. Awicha R, Atsanthia J, Wannakhao S. Effects of nursing care based on Watson's theory of human caring on comfort of terminally ill cancer patients. J Nurs Sci Khon Kaen Univ. 2023;46(2):34-47. (in Thai)

18. Namfon N, Chanjamsai U, Chukaew P. Effects of a caregiver competency enhancement program for terminally ill cancer patients in the community. J Public Health Burapha Univ. 2024;19(1):33-46. (in Thai)

19. Thongcharoen W, Boonprakong T, Kiatkamjornwong S. A community care program for terminally ill cancer patients by subdistrict health promoting hospital nurses and village health volunteers. J Community Nurs. 2024;21(2):55-70. (in Thai)

20. Chalothorn N, Rawiworrakul T, Sinsuksai N. Effects of home-based care for terminally ill cancer patients on comfort and family satisfaction. Thai J Nurs. 2023;39(4):78-91. (in Thai)

21. Chansawang W, Theerarungsikul N, Areeuea S. Satisfaction of end-stage liver cancer patients with palliative care. J Clin Nurs. 2024;35(1):21-33. (in Thai)

Thai Health Sciences Frontiers
(THSF)

Volume 1, Issue 3
September – December 2026

Call for Papers

Thai Health Sciences Frontiers welcomes academic and research articles in the health sciences from all professions, connecting knowledge to real-world practice in clinical settings, community hospitals, and primary health care systems. Articles must not have been previously published or be under consideration by another journal.

SCOPE

- Nursing
- Medicine
- Pharmacy
- Physical Therapy
- Community Public Health
- Primary Health Care
- Development of Patient Care Models
- Research and Development (R&D)
- Innovations for Real-World Clinical Practice

ARTICLE TYPES

01 Original Research Article
02 Academic Article
03 Review Article
04 Case Report

Maximum length 15 A4 pages, including tables, figures, and references

PUBLICATION SCHEDULE

3 issues per year (every 4 months)

Jan – Apr	May – Aug	Sep – Dec

SUBMISSION PROCESS

01 Submit manuscript
Submit a Word file using the template, together with the submission form, by e-mail

02 Initial screening
Check fit with the journal's scope, then submit to the ThaiJO system

03 Peer review
At least 3 expert reviewers, double-blind

04 Acceptance and publication
Pay the fee; published as Open Access

Publication Fee

APC

Thai-language article THB 4,500
English-language article THB 6,500
Charged only after the article is accepted

Research Ethics

Research involving human subjects must include a copy of the project's human research ethics certificate of approval (COA).

Contact the Journal

E-mail:
keydatacorp@gmail.com
Tel. 064-314-6622
Key Data Company Limited



THAI HEALTH SCIENCES FRONTIERS

HEALTH SCIENCES RESEARCH & INNOVATION

An open-access academic journal that connects knowledge to real-world practice in clinical settings, community hospitals, and primary health care systems. It is a forum for exchanging knowledge and building an academic network among health professionals of all disciplines in Thailand.

A double-blind peer-reviewed, open-access journal for health sciences research and innovation in Thailand.

3+	OA	3	TH|EN
Double-blind	**Open Access**	**Triannual**	**Bilingual**
At least 3 expert reviewers	Every article free to read	3 issues per year, every 4 months	Thai and English

SCOPE

- Nursing
- Medicine
- Pharmacy
- Physical Therapy
- Community Public Health
- Primary Health Care
- Development of Patient Care Models
- Research and Development (R&D)
- Innovations for Real-World Clinical Practice

Vol. 1 No. 3 September – December 2026

PUBLISHER: KEY DATA COMPANY LIMITED

E-mail: keydatacorp@gmail.com | Tel. 064-314-6622

ThaiJO: he05.tci-thaijo.org/index.php/THSF

ISSN 3088-4020 (Online)

ISSN 3088-4020

9 773088 402004