Development and Feasibility of the Emergency Medical Services Hub for Northern Thai Older Adults: An Action Research Study

Boonyapat Shatpattananunt,* Wongchan Petpichetchian, Sopit Wiangosot, Kriangsak Pintatham, Buppar Viriyaratanakul

Abstract: Most older adults have unique needs and are suffering from chronic diseases. It is important to have quick and easy access to emergency medical services. Three-phase action research aimed to develop and assess the feasibility of implementing the Emergency Medical Service Hub for Older Adults Model in Upper Northern Thailand was conducted. In phase I and phase II, 27 emergency healthcare providers and 10 older adults were purposively recruited, and in phase III 16 emergency healthcare providers evaluated the feasibility of the model. The framework guided the study was based on action research methodology and six emergency medical services system functions. Data were collected via in-depth interviews, observation, and self-report of the implementation feasibility questionnaire. All research instruments were validated by three experts, yielded a content validity index of 0.80-1, and the reliability test of the implementation feasibility questionnaire revealed a Cronbach's alpha coefficient of 0.81. Data were analyzed using descriptive statistics and content analysis.

The final model consisted of six components: effective communication, registry and database, geographic information system, effective emergency medical service team, one-stop service emergency department for older adults, and continuum of care. Overall, the possibility of the model implementation was rated as high. The benefit and safety aspect of implementing the model was at the highest level, followed by its applicability. The use of the model is likely to benefit older adults. Effective implementation requires proper resource support and future study to examine the effectiveness of the model in a full-scale clinical trial is recommended.

Correspondence to: Boonyapat Shatpattananunt,* RN, PhD, Assistant Professor, Adult and Elderly Section, School of Nursing, Mae Fah Luang University. E-mail: boonyapat.sha@mfu.ac.th

Wongchan Petpichetchian, RN, PhD, Assistant Professor, College of Advanced Practice Nurse and Midwife, Thailand Nursing and Midwifery Council. E-mail: pwongcha@hotmail.com

Sopit Wiangosot, RN, MNS, Department of Emergency Medicine, Chiangrai Prachanukroh Hospital. E-mail: so.mam109@gmail.com

Kriangsak Pintatham, MD, Department of Emergency Medicine, Chiangrai Prachanukroh Hospital. E-mail: birdkriangsak@gmail.com

Buppar Viriyaratanakul, RN, MNS, Section, Community Section, School of Nursing, Mae Fah Luang University. E-mail: buppar.vir@mfu.ac.th

Introduction

Growth in aging populations is around the world, and Thailand is no exception. In 2021 Thailand entered a complete-aged society, defined as the proportion of those aged 60 and older exceeding 20% of the population, and in the next 20 years, it will enter a

super-aged society, defined as the proportion of those aged 65 and older exceeding 20% of the population.[1] Unfortunately, it is reported that most older adults are in poverty and will need collateral to live.[1] In 2019, the World Health Organization estimated that the average life expectancy of the Thai population is 75 years and healthy life expectancy is 67 years. Although many older people are socially bound and become incredibly valuable human resources, it is estimated that by 2027 there will be up to 300,000 older adults being stranded at home and 200,000 of them being bedridden.[2] A study in Thailand (from 2016 to 2018) showed that emergency department (ED) visits by older adults were more than one-quarter of all patients (28.67%). The mean age of older adults who visited ED was 72.69 years old. When compared to patients between 15 and 59 years old, the older adults had a higher visit rate per 1000 population, more hospitalizations, and more re-visits within seven days.[3]

An increasing number of older adults in society has inevitably increased healthcare demands, including healthcare costs and adequate skilled professionals.[4] Common health problems among older adults, who used emergency medical services requiring urgent medical attention, found in the US study were acute illnesses such as unconsciousness, acute heart attacks, arrhythmia, and shock.[5] Not only should emergency medical conditions be properly managed to save their lives, but also other aspects of aged care. As such, healthcare services, particularly emergency medical services provided for older adults, should be responsive to their unique needs, such as services that are easily accessible without requiring much assistance,[4] This type of service is essential for older adults who live in both urban and remote areas.

Emergency medical services (EMS) provide pre-hospital urgent care and/or transportation for those with serious illnesses or injuries, and a person in need (patient). In other words, the patient needs prompt medical attention. Effective EMS requires not only competent personnel, but also other support systems that facilitate quick and easy access. An ideal

EMS model for older adults is an EMS Hub that could integrate all requirements into one-stop services. In most cases, EMS Hub utilizes electronic communication (e.g., eHealth, telehealth, telemedicine) to support the EMS mission. For example, the telecardiology hub provides pre-hospital electrocardiogram (ECG) services to screen and manage persons with suspected acute coronary syndrome (ACS) in Italy.[6] EMS models specifically designed for older adults are necessary.

With the changing trend of population structure in Thai society, EMS development policy, research findings, and experiences of older adults using EMS services show that EMS services for older adults need to be developed in response to changing circumstances, particularly for those living in remote areas. Therefore, the research team recognized the importance of developing an EMS Hub for older adults. The EMS Hub, specially designed for older adults, connects the gap between the pre-hospital EMS services and services provided at the ED of the receiving hospital. This study was conducted in a tertiary care hospital in Chiang Rai province, situated in the upper-northern part of Thailand, where a large number of accident and emergency cases are reported Yearly,[7] and the hospital is responsible for emergency calls and serves as an emergency dispatch center of the province. Geographically, Chiang Rai is characterized by several mountain ranges making it difficult while reach and transport emergency cases. Beginning with a context analysis of strengths and weaknesses focused on the needs and opinions of older adults who had experienced using EMS and the involvement of emergency healthcare providers (E-HCPs) in developing the EMS Hub-OA model, it is expected that the developed EMS services for this vulnerable group would be likely feasible and efficient.

Literature Review

Six EMS system functions include detection, reporting, response, on-scene care, care in transit, and transfer to definitive care.[8] One of the directions

for the development of the National Institute of Emergency Medicine's 20-year strategic plan (2018–2037) is to take care of older adults when there is an emergency illness and to promote people to have equal and inclusive access to EMS services.[9] A study of the situation of using EMS services among Thai older adults found that the number of EMS users was directly proportional to the increase in the number of older adults.[10] Studies conducted in Korea and Sweden demonstrated that older adults were more likely to be conveyed to the hospital.[11,12] The most common symptoms in older adults were circulatory, respiratory,[12,13] neurology, and trauma.[12] The majority of older adults were triaged at the "yellow" level (level 3-urgent). However, compared to patients aged 65 to 69, the number of patients aged 85 and older was triaged at a much lower level.[13] A study among older adults in four provinces in Thailand showed that 85% of the older adults perceived the need for EMS at a high level. The highest expectations of the older adults about EMS were that E-HCPs are able to reach the scene of an emergency and accurately assess the situation and that the emergency vehicle is safe.[14]

Although not all older people are frail, most who use EMS services and/or visit the ED are considered frail.[15] In addition to deteriorating conditions requiring urgency/emergency care, they also have other needs that require special attention, such as helping hands for basic activities of daily living. In a qualitative study conducted in England,[16] older people who were at least mildly frail, and/or their carers, reported negative experiences during their previous ED visits and indicated their reluctance to attend ED even though staff attitudes and manners were pleasant. Moreover, they reported a lack of help with eating, toileting, discomfort from long waits on hard trolleys or beds, etc., and some did not receive well respect. Another important concern was the provision of information and effective communication to reduce frustration and bewilderment. The findings of this study enlighten the necessity to offer better care to focus not only on medical conditions but also on the physical and emotional needs of older people during urgent/emergent periods of care.

Policy recommendations proposed by a group of researchers[17] were that Thailand should have EMS specifically designed for older adults. This should consist of three important systems, namely a registry system and database to identify the older adults at high risk, the geospatial system, and the continuous tracking and monitoring system. Other supporting facilities also need to be equipped to overcome the following challenges: inadequate effective information technology systems, insufficient equipment, and lack of resources and budgets.[17] As such, a study of EMS designed for older adults, particularly those living in the highlands of upper northern Thailand, should be constructed and pilot-tested to demonstrate whether it fits with local policy and organizational context together with support from all parties involved.[12]

Action research (AR) is a practice that changes how things are done. It is a spiral of planning (P), acting (A), observing (O), and reflecting (R), then re-planning, acting again, and so on.[18] Planning is determining the initial actions to transform practices, understandings of practices, and the environment under practice. Acting (enacting) is as we proceed, we will act and observe the behavior and effects of our modifications. Observing is the method via which we will gather evidence and document the changes we make. Reflecting is a process of looking back on what has occurred; in conversation with others, we examine and interpret critically what we have documented and the evidence that we have gathered, then re-planning our activities. Then, we execute our new strategy, observe what occurs, reflect on the evidence gained during this new round of investigation, re-plan, etc.[18] This study used a four-step AR framework: planning, acting, observing and reflecting (PAOR),[18] integrated with six EMS system functions: detection, reporting, response, on-scene care, care in transit, and transfer to definitive care[8] to help the development process of the model to be consistent with the local context as

much as possible **(Figure 1)**. Action research was chosen to gain collaboration among all parties involved and to ensure that the developed model would be contextually relevant.
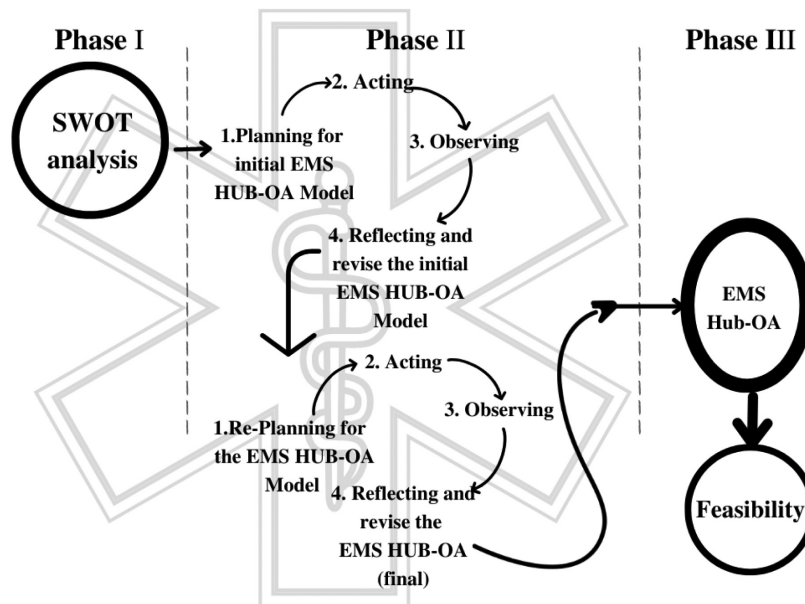

Figure 1. Research framework

Study Aim

To develop and assess the implementation feasibility of the EMS Hub for northern Thai older adults.

Methods

Design: This current study is a part of a large action research project which was divided into three phases: Phase I, analysis of the context of the current EMS by using a qualitative method of inquiry to conduct a SWOT analysis (strength, weakness, opportunity, and threat); Phase II, development of the EMS Hub-OA model by employing the PAOR steps of AR,[18] and Phase III, evaluation of the implementation feasibility of the EMS Hub-OA model by using both quantitative and qualitative data assessment. The detailed findings of Phase I were published in a Thai nursing journal.[19] This current paper presents only the key issues found in Phase I, the product of Phase II, and the findings of Phase III. Since there are no specific standard guidelines for reporting AR of this kind, the Consolidated Criteria for Reporting Qualitative Research (COREQ) was used.[20]

Sample and Setting: In Phase I, convenience sampling was used. There were 27 E-HCPs and 10 older adults, and in Phase II and III, 16 E-HCPs participated. For the included E-HCPs, they must have had at least six months of emergency medical practice and encountered caring for older adults who used emergency services at least six events. Those being transferred to another department during the study were excluded. The older adults were recruited based on the following inclusion criteria: 60 years of age or older, having experience as a user of EMS services at least once, being cognitively intact, having no life-threatening condition or critical illness during the study period, and being able to

communicate in Thai. Data were collected at the tertiary hospital in Chiang Rai, Thailand.

Ethical Considerations: This study was approved by the Institutional Review Board (IRB) of Chiangrai Prachanukroh Hospital, Thailand (Certificate of Approval No. CR 0032.102/38603). This study was conducted following the Declaration of Helsinki.[21] Eligible participants were approached by a research assistant to seek their willingness to participate in the study. After that, they were informed in advance about the purposes, the research processes, the usefulness of the research outcome; the assurance of privacy and confidentiality (without any personal identification, all data were treated as group information), the right to withdraw from the study, and the right of refusal to answer the questions or stopped answering anytime during the interviews. All participants provided written consent forms. During the interview sessions, if the participants felt exhausted, the researcher paused the interview until they were ready to continue. The researcher also quickly responded to older adult participants' requested needs.

Research Instruments: There were four instruments used for data collection. First, the SWOT Interview Guide was used to interview the E-HCPs participants to seek for their perceptions regarding strengths, weaknesses, opportunities, and threats of the current EMS operations for older adults (e.g., what do you think are weak points of the EMS services for the older people?). Second, the Perceptions and Needs Interview Guide was used to capture older adults' viewpoints based on their personal experiences using the EMS (e.g., based on your previous experience, what do you think about our emergency medical services? did the EMS personnel provide care according to your needs?). Third, the EMS Practice Observation Guide was developed to observe how well the six functions of the EMS operations were performed (e.g., how do the E-HCPs support the older adults during transfer to the ED?). Fourth, the Implementation Feasibility Questionnaire was developed to assess if the developed EMS Hub-OA model was feasible to implement in the real setting as perceived by the

E-HCPs. It comprised two parts: Part I has eight closed-ended items rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) that cover four aspects including 1) easiness of its implementation, 2) suitability with available resources, 3) readiness and cooperation of those involved, and 4) benefit and safety of patients (e.g., I can easily follow the instructions given in the EMS Hub-OA model, using the EMS Hub-OA model increases wasted resources, I was willing to use the EMS Hub-OA model, older adults would get benefits when I practice as suggested by the model). Part II is an open-ended question to explore issues related to problems, obstacles, and recommendations regarding the EMS Hub-OA implementation (e.g., please indicate whether you have encountered any problems or obstacles after implementing the EMS Hub-OA and provide suggestions for further improvement). All instruments, except one as indicated, were developed by the researchers.

The instruments were tested for content validity by three experts (two nurses specializing in older adults and a doctor specializing in EMS). The implementation feasibility questionnaire had a scale-level content validity index (S-CVI) of 0.80, and internal consistency reliability tested with the pilot sample yielded Cronbach's alpha coefficient of 0.80. The qualitative instruments were tried out by interviewing and observing two E-HCPs who had similar qualifications to the actual participants to ensure they were accurate, appropriate, practical, and comprehensible.

Implementation and Data Collection: Three-phase implementation and data collection took place after ethics approval was attained as follows:

Phase I: Context analysis. The interview was performed with 27 E-HCPs and 10 older adults by the researchers (BS and SW) who had experience in conducting qualitative research and AR and had no intimate relationship or influence on the welfare of the participants. The participants were appointed for individual, face-to-face interviews that lasted approximately 45 to 60 minutes. This was done until the data were saturated

when there was no new information. Interviews were digitally recorded and subsequently transcribed verbatim. The quality of patient care was observed using non-participatory, semi-structured observation regarding EMS services for older adults. Immediately after every interview was finished, the interviewer began to write some basic field notes. Data collection took place in the ED of the study hospital.

Phase II: Development. The following AR steps were conducted: planning, acting, observing, and reflecting (PAOR cycle).[18] Two PAOR cycles were performed. The first cycle is as follows:

Planning I: The researchers conducted a review of the documents related to the EMS system for older adults and held a 3-hour brainstorming meeting between the research team and 16 E-HCPs to 1) share the findings from Phase I and 2) collaboratively construct the initial EMS Hub-OA model. Necessary implementation materials were prepared. These included an implementation manual of the EMS Hub-OA model and its related documents and a poster displaying key points of the model for easy use as a reminder.

Acting I: The initial EMS Hub-OA was implemented. Before its implementation, the researchers explained the detailed descriptions of the initial EMS Hub-OA model to the E-HCPs, followed by a 3-month implementation of the model. The research team members provided consultation to the E-HCPs working at the study site as deemed necessary.

Observing I: The researchers observed the actual practices of the E-HCPs. This was done during the "acting" step and continued for another month during the "observing" step to ensure that the participants had adopted the model into their usual practices. Observed data were analyzed qualitatively by using a simple content analysis method. The common practices partially adopted or unable to be adopted were identified.

Reflecting I: The researchers organized the meeting with the E-HCPs. The findings from the "acting" step were presented and discussed. This step was critical as it provided input to a revision of the EMS Hub-OA model in the following steps.

The second cycle of AR began with a re-planning (planning II) to improve the EMS Hub-OA model so that it was more appropriate and practical in a real-world situation (context-specific). Similar steps to the first PAOR cycle were conducted, resulting in the final EMS Hub-OA model. The whole period from cycle 1 to cycle 2 AR was eight months.

Phase III: Evaluation. The feasibility of implementing the EMS Hub-OA model was examined in terms of easiness of the EMS Hub-OA model implementation, suitability with available resources, readiness and cooperation of stakeholders, and the benefits and safety of older adults. A total of 16 E-HCPs participated.

Data analyses:

1. Quantitative data were analyzed using descriptive statistics. Categorical variables were expressed in frequency and percentage. Continuous variables were presented with median (Mdn) and interquartile range (IQR) due to the non-normal distribution of the data.

2. Qualitative data obtained from interviews and observations were analyzed using a simple content analysis method.[22] Transcripts from the participants were read line-by-line. After that, codes were generated. Similar codes were grouped into sub-themes and themes, respectively. Data-driven narrative issues representing strengths, weaknesses, opportunities, and threats were formulated, and the participant's voices were counted for each issue. This analysis was performed manually.

Rigor and trustworthiness: Throughout this context-specific AR study, issues related to credibility, dependability, transferability, and confirmability[22] were maximized as much as possible as follows:

Credibility: the researchers built relationships with all participants in order to build trust so that the accuracy of the data could be achieved. Moreover, prolonged engagement and persistent observations with the participants within the research field were used. The research finding was shared and re-checked with the research team. Interpretation of research data was ascertained between the participants and the researchers.

Dependability: The researchers clearly described the research process from the beginning to the reporting. Research tools, methodology, and findings are relevant.

Transferability: Description was undertaken to obtain more detail of the context. Purposive sampling was selected to obtain complete information, with which the findings can then be implemented in other EDs with similar contexts and policies.

Conformability: At every stage of the study, clear data and evidence were analyzed, which can be authenticated and the researchers conducted the study strictly following the action research steps.

Findings

Phase I: Context analysis: Ten participating older adults using EMS services were seven females and three males with ages ranging from 61 to 87 years (Mdn = 67.50, IQR = 10). Most of them knew the hotline, toll-free number, 1669 (n = 9), but they were unable to use the phone properly (n = 9). They were unsure of their illness, so they hesitated to call to avoid answering questions they could not answer (n = 7). In addition,

the environment and surrounding area of the house had changed, so they found it difficult to describe the location of the house and were afraid of answering questions asked by the E-HCPs (n = 6). The E-HCPs provided emergency services promptly, which they were satisfied with and reported having no additional harm during transfer (n = 2). They reported that the E-HCPs provided holistic care (n = 8). However, the following recommendations were made. In the ED, there should be a special zone for older adults separated from other patients, especially trauma patients (n = 4); the E-HCPs should communicate and explain treatment regimens as well as laboratory or special investigation results during the waiting period (n = 6). In addition, there should be special parking spaces available for older adults attending ED (n = 2).[19]

Twenty-seven E-HCPs participating in Phase I had worked for one year to 21 years with a median of 8 years (IQR = 11). Their age ranged from 22 to 58 years with a median of 31 years (IQR = 13). Two-thirds earned a baccalaureate degree in nursing, received trauma and EMS training courses, and were certified as emergency nurses (n = 18, 66.7%). The SWOT analysis revealed key issues **(Table 1)**.

Table 1. A SWOT analysis

Strengths	Weaknesses
S1: E-HCPs have strong knowledge, skill, and experience to access and care for older adults (*n* = 13).	W1: Weak communication infrastructure between emergency dispatch center and the older adults or family members who are not present at the same location with the older adults and unclear address (*n* = 10).
S2: A triage nurse is available 24 hours (*n* = 10).	
S3: 2 E-HCPs teams/shift (*n* = 7)	W2: Ambulance drivers have difficulty in locating rural residences without exact addresses (*n* = 5).
S4: 24-hour services and consultation with doctor and nurse specializing in EMS (*n* = 7)	
S5: A brand-new ED area, secure, clean, and adequate medical equipment. The ED is connected to the dispatch center, transfer unit, X-ray, outpatient dispensing unit, cashier, and patient toilets (*n* = 5).	W3: Inadequate manpower to distribute the emergency response workload fairly (*n* = 4)
	W4: Nonspecific treatment zone in ED for the older adult (*n* = 3)
S6: Multiple channels of reporting (*n* = 4)	W5: Sometimes, the coordination of older adults' health insurance check was done incorrectly then transferred patients to the wrong hospital (*n* = 3).
S7: Check the scene for safety before approaching an emergency situation (*n* = 4)	

Table 1. A SWOT analysis (Cont.)

Strengths	Weaknesses
S8: On-scene care, there are co-ordinance with the emergency dispatch center and doctors for consultancy at all time ($n = 4$).	W6: Ambulance drivers are not familiar with the route to older adults' house ($n = 3$).
S9: Fast-track management care system such as multiple trauma, acute myocardial infarction and stroke patients	

Opportunities	Threats
O1: The VHVs ($n = 6$)	T1: Some areas without or unstable cell phone coverage ($n = 8$)
O2: Establishment of the "Member club" project to strengthen VHVs' capacity ($n = 3$)	T2: The remote or highland area is hard to reach by ambulance. As a result, it affects EMS delay time ($n = 4$).
O3: Thai government focuses on older adult welfare ($n = 3$).	T3: The ambulance delays due to traffic jams ($n = 4$).
O4: Received funding for the purchase of ambulance equipment ($n = 3$)	

Phase II: The results from Phase I were used to develop the EMS Hub-OA model. Participation and feedback from the participants influenced the development of the model at every stage of the AR procedure (**Table 2**). The EMS Hub-OA model consists of six components (**Figure 2**). The following findings show how the data supported the development of the model.

Table 2. Progress of each model component throughout the AR process

Topic	Cycle I	Cycle II
Effective communication	Present but incomplete in part of encourage community involvement in EMS.	Complete
Registry and databased	Present but incomplete in part of coordinate the healthcare benefits and insurance division	Add the information about the medical record of the older adults readily accessible before arrival at the ED
Geographic information system	Present but incomplete in part of systematically inputting a map of the older adults' location	This section requires continuous development and updating.
Effective EMS team	Present but incomplete; Add more focus on older adults' mental state and panic over the illness	Complete
One-stop service ED for older adults	Not present	Complete; There are crucial service facilities besides the ED.
Continuum of care	Present but incomplete	Add information for linking older adult care to the secondary/primary hospitals to the patient referral form

Effective Communication (EC): Effective communication is an important component of the initial decision to offer EMS and subsequent necessary care to older adults. The E-HCPs accepted that communication with older adults and other people in the community is essential, according to the views of the E-HCPs, *"The village health volunteers (VHVs) have an important role in detecting and reporting any emergency health-related situations... The community plays an important part in caring for older adults. Consequently, community engagement must be incorporated into the model."* (E-HCPs, Cycle I)

The following actions were assembled: 1) provide a short, concise, easy-to-understand telephone question format; 2) prepare communication equipment ready for use; 3) prepare a backup communication system that can communicate in many ways using a centralized system of the hospital without personal telephone service charge; 4) communicate with older adults and relatives in a clear, louder tone than usual, easy-to-understand, and polite manner; 5) explain to older adults and relatives about their level of triage classification and provide information regarding treatment regimens, laboratory or investigating findings, and approximate waiting time for the next events (e.g., taking chest X-rays, consulting other medical specialists, etc.); and 6) encourage community involvement in EMS, where members of the hospital's member club or VHVs assist in assessing incidents and reporting incidents via 1669.

Registry and Database (RD): A registry platform and database were made available for effective communication among healthcare team members within the hospital and outside the hospital network. Participants stated, *"If the patient healthcare cost was not covered by the Universal Coverage Schema, it is very essential to quickly determine where and how they could get benefits from so that the decision for the right interfacility transfer could be made,"* (E-HCPs, Cycle I) and *"In Cycle I, there was a delay in preparing the patient's past medical history. This could be done*

in advance to enhance prompt treatment and care. If there was no previous medical record, previous visits to another hospital should be sought and the past medical history should be obtained." (E-HCPs, Cycle II)

The following actions were assembled: 1) use online registration and database of the older adults to enhance convenient search and on-time review of patient's past medical history, 2) coordinate the healthcare benefits and insurance division to verify healthcare coverage for older adults before arrival or starting treatments, and 3) make the older adult's medical record readily available before arrival to ED for further advance treatments.

Geographic Information System (GIS): Establishing a geographic information system enabled several advantages. A participant stated, *"Each patient's house location map should be made available in the information system, together with recognizable landmarks for easy access in the future."* (E-HCPs, Cycle II)

The following actions were assembled: 1) timely navigating to the patient's location by using information technology, such as global positioning system (GPS) navigation in ambulances; 2) systematically inputting a map of the older adult's house location to increase accuracy and timely access to their house in the future.

Effective EMS Team (E-EMS): EMS team capacity building should be done. E-HCPs reported that *"Most older people we've seen are in acute conditions. We mainly focus on their physical status. In fact, they are very anxious. We should pay attention to their mental status too."* (E-HCPs, Cycle I)

The following actions were assembled: 1) regularly training the E-HCPs to gain knowledge and understanding about caring for older adults with emergencies, including physical illnesses and focusing on their fearful mental states and panic over the illness; 2) establishing the mentoring system by applying skill-mixed assignments where highly experienced staff could mentor less experienced ones or new graduates.

One-Stop Service ED for Older Adults (OSSED-OA): Older adults are vulnerable physically and mentally. Providing a one-stop service help lessen negative impacts on them. This component did not appear in Cycle I. The E-HCPs stated, *"Some of the older adults who came to our ED had dementia and knee osteoarthritis. They have to walk/move from here to there to get access to other places/departments, for example, to the pharmacy department to get the medicine. This is so inconvenient;" "in the future, we'll have a new building, so it would be better to arrange essential services in the same area."* (E-HCPs, Cycle II)

The following actions were employed: 1) organizing a zone for older adults away from those patients with horrifying conditions such as bleeding, wounds, wailing with pain, etc., and easily accessible to toilets; 2) promptly responding to a bell ringing for help; 3) facilitating other related services such as X-ray, outpatient dispensing unit, the cashier and insurance, etc.

Continuum of Care (COC): Most older adults receiving EMS require a continuum of care due to multifaceted physiological, psychological, and social conditions. In Cycle I, continuous care appeared to be focused on ED only, but most older adults had chronic diseases and needed a continuum of care at the community or home. As the E-HCPs mentioned, *"We have a system for referring the patient back to receive care at home by a sub-district health promoting hospital or a community hospital."* (E-HCPs, Cycle II)

The following actions were in place: 1) frequent reassessment and monitoring after triage, especially for those who have communication problems and cognitive impairments; 2) linking the care of the older adult to the primary/ secondary hospital via the patient referral form.
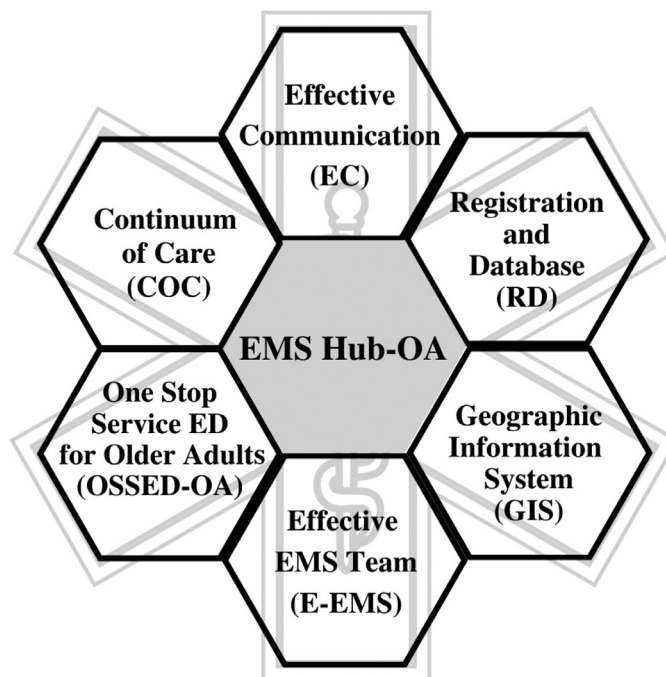

Figure 2. The emergency medical services hub for older adults (EMS Hub -OA)

Phase III: Feasibility study results are as follows: Among 27 E-HCPs of the first phase, 16 (59.25%) were available and agreed to participate in this phase. The majority were female (n = 12, 75%), with a median age of 35.5 years (IQR = 12). Nearly two-thirds were certified emergency nurses (n = 10, 62.5%), followed by paramedics (n = 3, 18.8%), emergency medical technicians (EMT) (n = 2, 12.5%) and registered nurse (n = 1, 6.3%). All but one earned a bachelor's degree (n = 15, 93.8%) with work experience in trauma and emergency of 11.50 years (IQR = 12).

The overall feasibility score of the EMS Hub-OA model was high (Mdn = 3.63, IQR = 0.35). Among four aspects, the participants rated that using the EMS Hub-OA model would bring about the benefit and safety of the patients at the highest score (Mdn = 4.33, IQR = 1), followed by the easiness of its implementation (Mdn = 4, IQR = 1), readiness and cooperation of those involved (Mdn = 3.35, IQR = 1), and suitability with available resources (Mdn = 2.25, IQR = 1).

Discussion

A limitation of accessibility to healthcare services for older adults exists in many developing countries, including Thailand, where it is mandatory by the Older Persons Act B.E. 2546 (2003) that older adults have the right to receive fast-track and convenient services.[23] In reality it is not always the case when it comes to EMS for older adults. In this current study, we found that most older adults knew the hotline, toll-free number 1669, which is a phone number assigned to the national and regional dispatch center in Thailand, similar to another study that found 99.4% of patients and relatives who used these services knew this phone number and those who did not know did not use the EMS.[24] However, communication failure might be the result of both noncompliance with the fundamental principles of communication and technical issues, such as inadequate communication between different services, mobile phone network failure,[25] and cognitive impairments with or without low health literacy of frailty older adults, which can result in a loss of confidence in reporting the incident during emergencies.[26]

The older adults and relatives who used the EMS in Phase I reported their experiences using the EMS[19] and ED similar to a mixed methods study conducted in Ireland[27] and the previous Thai study.[17] They reported having a positive response to prompt services and were satisfied with the safe transfer. However, since there is only a small number of E-HCPs in proportion to the number of patients especially when there is a high number of patients in the ED, effective communication between patients and E-HCPs may be lost.

The E-HCPs play a role in providing emergency care for older adults. The SWOT analysis revealed that the E-HCPs' performance was efficient in both knowledge and practical abilities, demonstrating that tertiary care institutions can provide care to a range of age groups. In particular, more older adults come to use the service which ranges from mild to severe illnesses. Most E-HCPs had extensive experience and training in emergency care for adult patients, allowing them to adapt their knowledge to older adult care, despite certain dissimilarities. The training has been an important part in enabling E-HCPs to be able to apply knowledge to triage and giving good care to patients.[28] Weakness was mostly observed while calling the emergency response system between the emergency dispatch center and older adults or family members who were not present at the same location as older adults and were given an unclear address. There have been noted similar discoveries. The followings have all been noted: a communication barrier and calls from third parties.[29]

For opportunities, the VHVs play an important role in EMS for older adults, such as calling EMS, informing the older adult's house location, reaching the scene faster than the EMS, and providing on-scene first aid while waiting for the arrival of an ambulance.[30]

All age groups were cared for by VHVs, and older adults may look for help if they required further healthcare services.[31] The location where cell phone reception is spotty or nonexistent was reported as a threat. Chiang Rai's landscape of mountains and valleys is a significant impediment to cell phone signal blockage. The communication breakdown between the response team and the dispatch center results in mortality and preventable injuries.[32]

The EMS Hub-OA model was developed in accordance with the key issues found in Phase I. The first component, EC is important in delivering high-quality care. It is challenging for the dispatch center, especially during a stressful situation, and much harder when dealing with an older adult who has hearing loss. The most beneficial thing the dispatch center can do for a patient is to communicate with a calm, kind, clear, and concise message. According to the study, older adults expected the E-HCPs at the dispatch center to answer the phone with a clear voice, polite manner, and simple language and to provide pertinent medical advice.[14]

RD is electronic medical records of older adults. This offers details on a patient's medical history, past and present prescribed medications, allergy history, family history, and any other relevant information that could be required to correctly diagnose and treat an older adult. It is helpful for multidisciplinary team communication or handoff. Moreover, each time an older adult visits ED, it is simple to get and update a medication list.[33] Having this registry and database system with information technology could help close gaps in information exchange.[34] However, there is a challenge to maintain and keep up-to-date information on the patient. It requires adequate infrastructure and well-trained technicians to support this system to work efficiently.

GIS is a computer-based tool for mapping and analyzing earthly objects and events. The most common usage is the analysis of traffic data to determine the best route to the hospital after mapping the quickest, most practical path to the scene and calculating the distance between sets of origin (the hospital) and destination (older adult's location). GIS is also used to determine the location and mapping of places and apply to healthcare services. In a study conducted in Maryland, GIS technologies were employed to exploit spatial data in attracting older adults among those with dementia living in the community.[35] Recently, another study utilized the GIS methodology to identify the healthcare facilities in Ubon Ratchathani, Thailand.[36]

E-EMS is a regular training and mentoring system of the E-HCPs. The tacit knowledge is acquired via practical, task-specific training. Research has shown that cross-training on the medical team impacts effective team collaboration and significant improvement in knowledge.[37]

OSSED-OA is one of the services that provides total care by the ED staff to ensure older adults received service quickly and conveniently. In addition, the study found that one-stop health services showed good outcomes such as patients' satisfaction and average clinical and payment times were both significantly shortened.[38]

COC is the E-HCPs follow-up assessment and re-assessment of an older adult's signs and symptoms starting at the scene until discharge from ED. The study showed the impact of assessment team intervention for older adults in ED. Reduction in hospital length of stay and cost savings are two effects of this intervention.[39] However, continuum care is still insufficient, though the information transfer between hospitals is still a challenge, particularly for patients who need ongoing care at home but are alone. It is therefore important for E-HCPs, especially ED nurses to pay attention to collaborating with the hospital referral center to ensure that older adult patients would be continually followed up and cared for by community or district resources.

Overall, the feasibility of the EMS Hub-OA model was found to be high. When classified by individual aspects, in terms of benefits, the safety of older adults, difficulty in implementation, and the

readiness and cooperation of the stakeholders had a high score. While the suitability of the resource is valuable, this was rated at a moderate level. The EMS Hub-OA model accounts for the physical alterations of older adults who have unique medical requirements.[40] It could be challenging to adhere to the model because the E-HCPs provide services to all older adults, making it challenging to become familiar with questions or certain behavioral adjustments to care for them. However, the E-HCPs are ready and willing to implement this model.

Limitations

The results of this study were context-specific to a tertiary care hospital in the upper north of Thailand. The results of this study can be referenced and transferred to other hospitals that have similar organizational context and policy unless otherwise, it requires further adjustment and evaluation of its implementation. Some interview sessions conducted in the ED surrounding environment may contribute to participants' responses which the researchers had tried to reduce distraction by arranging separate areas. Apart from this, a full-scale clinical trial and a follow-up study using a longitudinal study design are recommended.

Conclusion

In summary, older adults represent a large number of EMS users and ED visits. Prompt responses to their urgent/emergent healthcare and other specific needs would result in life-saving and overall welfare. The EMS-Hub OA model developed in this study was specially designed and tested to be feasible to implement in a real setting of a tertiary hospital in Thailand. The model emphasizes the importance of effective communication, registry and database, geographic information system, effective EMS team, one-stop service, and continuum of care.

Implications and Recommendations

1. For practice, the EMS Hub-OA model should be continually implemented with close monitoring and evaluation of whether it would have impacts on the outcomes of care. Modification may be needed when applied to other hospitals that have different contexts. ED nurses who work in the EMS team and ED should provide care according to the EMS-Hub OA model.

2. For policymakers, as manpower, emergency equipment supplies and good-conditioned vehicles are of importance, and a provision of continuous training and an increasing number of qualified EMS teams (EMS medical specialists, emergency nurse practitioners, EMTs, and others) should be executed.

3. For research, information technology systems should be developed to help older adults to gain easier access to EMS, such as establishing a platform for information sharing between different levels of the hospitals. In addition, there should be a program to promote community and family participation in continuing care for older adults from the scene to after discharge from the hospital.

Acknowledgments

Reference

1. Sangsaraphun V. Aging society & Thai society's challenges [Internet]. 2018 [cited 2022 July 15]. Available from: http://www.fpo.go.th/eresearch/getattachment/bd8079 23-e845-4875-a9b1-ef946538784c/9178.aspx

2. Buaubol K. What will change...when Thailand becomes a longevity society. TDRI. 2019;34(4):4-9 (in Thai).

3. Lumjeaksuwan M, Patcharasopit S, Seksanpanit C, Sritharo N, Aeampuck A, Wittayachamnankul B. Trend of emergency department visits among the elderly in Thailand. WHO South-East Asia J Public Health. 2022;10(1):25-8.

4. Kumsuchat S. Health problems and health care needs among Thai elderly: policy recommendations. J Med Health Sci. 2017;26:1156–64 (in Thai).

5. Duong HV, Herrera LN, Moore JX, Donnelly J, Jacobson KE, Carlson JN, et al. National characteristics of emergency medical services responses for older adults in the United States. Prehosp Emerg Care. 2018;22:7–14. doi: 10.1080/10903127.2017.1347223.

6. Brunetti ND, Gennaro LD, Dellegrottglie G, Amoruso D, Antonelli G, Biase MD. A regional prehospital electrocardiogram network with a single telecardiology "hub" for public emergency medical service: technical requirements, logistics, manpower, and preliminary results. Telemed J E Health. 2011;17(9):727–33. doi: 10.1089/tmj. 2011.0053.

7. Bureau of highway safety department of highways ministry of transport. Traffic accident on National highways in 2020 [Internet]. 2020 [cited 2022 July 15]. Available from: http://bhs.doh.go.th/files/accident/63/report_accident_ 2563.pdf

8. Schooley S, Horan TA. Emergency digital technologies in emergency medical services: considerations and strategies to strengthen the continuum of care [Internet]. 2015 [cited 2022 July 15]. Available from: https://www.ems.gov/ pdf/advancing-ems-systems/Reports-and-Resources/ Emerging_Digital_Tech_In_EMS.pdf

9. National Institute for Emergency Medicine. National Institute for Emergency Medicine twenty-year strategic plan (2018-2037) [Internet]. 2020 [cited 2022 July 15]. Available from: https://www.niems.go.th/1/Ebook/ Detail/1170?group=36

10. Tanuchit S, Chinnacom D, Malathong N, Doungthipsirikul S, Tantivass S. Recommendations for emergency medical service for the elderly in Thailand. JPR2R, 2019;57–68.

11. Lee SB, Oh JH, Park JH, Choi SP, Wee JH. Difference in youngest-old, middle-old, and oldest-old patients who visit the emergency department. Cli Exp Emerg Med. 2018;5(4), 249–55.

12. Hjalmarsson A, Holmberg M, Asp M, Ostlund G, Nilsson KW, Kerstis B. Characteristic patterns of emergency ambulance assignments for older adults compared with adults requiring emergency care at home in Sweden: a total population study. BMC Emerg Med, 2020;20:1-12.

13. Forsgarde ES, Elmqvist, C, Fridlund B, Svensson A, Andersson R, Roost M. Patients' age ≥ 65 years dispositions during ambulance assignments, including factors associated with non-conveyance to hospital: a longitudinal and comparative study. BMJ. 2020;1-7. doi: 10.1136/ bmjopen-2020-038885.

14. Silawan T, Khansakorn N, Laothong U. Factors influencing perceived needs for emergency medical services among elderly patients from four provinces in Thailand. Southeast Asian J Trop Med Public Health. 2019;50(5):925–34.

15. Choutko-Joaquim S, Tacchini-Jacquier N, D'Alessio GP, Verloo H. Associations between frailty and delirium among older patients admitted to an emergency department. Dement Geriatr Cogn Disord Extra. 2019;9(2):236–49.

16. Regen E, Phelps K, van Oppen JD, Riley P, Lalseta J, Martin G, et al. Emergency care for older people living with frailty: patient and carer perspectives. Emerg Med J. 2022;39:726-32. doi: 10.1136/emered-2022- 212420.

17. Khansakorn N, Silawan T, Rawiworrakul T, Kittiphichai V, Laothong U. The study on emergency medical service for the elderly. Research report [Internet]. 2016 [cited 2022 July 15]. Available from: https://www.niems. go.th/1/upload/migrate/file/2559112915274630 47_276dqvbz2kfisI9b.pdf

18. Kemmis S, McTaggart R, Nixon R. The action research planner: doing critical participatory action research [Internet]. 2014 [cited 2022 Oct 1]. Available from: https://link.springer.com/book/10.1007/978-981- 4560-67-2

19. Shatpattnanunt B, Wiangosot S, Pintatham K. Elderly patients' experience in using emergency medical service at a tertiary hospital, Upper Northern Thailand. Songklanagarind J Nurs. 2018;38(3):102-15 (in Thai).

20. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;9(6):349-57.

21. World Medical Association. World medical association declaration of Helsinki: ethical principles for medical research involving human subjects [Internet]. 2000 [cited 2022 July 15]. Available from: https://www.who.int/ bulletin/archives/79(4)373.pdf

22. Holloway I, Wheeler S, Qualitative research in nursing and healthcare 3rd ed. Oxford: Blackwell; 2010.

23. Ministry of Social Development and Human Security. The Older Persons Act B.E. 2546. Bangkok: National Office of Buddhism Publisher [Internet]. 2007. [cited 2022 July 15]. Available from: http://thailaws.com/law/t_laws/tlaw0405.pdf

24. Ponsen K. Sirisamutr T. Wachiradilok P. The situation of using emergency medical services at the emergency department of emergency patients in Thailand. J Health Ed. 2018;41(2):51-63 (in Thai).

25. Cauwer HD, Barten D, Willems M, Mieren GV, Somville F. Communication failure in the prehospital response to major terrorist attacks: lessons learned and future directions. Eur J Trauma [Internet]. 2022. [cited 2022 Oct 13] Available from: https://doi.org/10.1007/s00068-022-02131-6

26. Geboers B, Uiters E, Reijneveld SA, Jansen CJM, Almansa J, Nooyens ACJ, et al. Health literacy among older adults is associated with their 10-years' cognitive functioning and decline – the Doetinchem cohort study. BMC Geriatrics. 2018;18:1-7.

27. Mwakilasa MT, Foley C, O'Carroll T, Flynn R, Rohde D. Care experiences of older people in the emergency department: a concurrent mixed-methods study. J Patient Exp. 2021; 8:1-8. doi: 10.1177/23743735211065267.

28. Rhew DC, Letvak S, McCoy TP. The effects of an educational intervention on emergency nurses' attitude, knowledge, and care behaviors toward older adults. BJSTR. 2017;1(7):1-7.

29. Holmstrom IK, Kaminsky E, Lindberg Y, Spangler D, Winblad U. The perspectives of Swedish registered nurse about managing difficult calls to emergency medical dispatch centres: a qualitative descriptive study. BMC Nursing. 2021;(20):1-8. doi: 10.1186/s12912-021-00657-5.

30. Ramsell E, Pilemalm S, Granberg TA. Using volunteers for emergency response in rural areas – Network collaboration factors and IT support in the case of enhanced neighbors [Internet]. 2017 [cited 2022 July 16]. Available from: https://www.diva-portal.org/smash/get/diva2:1148869/FULLTEXT01.pdf

31. Jiaviriyaboonya P. Anthropological study of village health volunteers' (VHVs') socio-political network in minimizing risk and managing the crisis during COVID-19. Heliyon. 2022;8:1-8.

32. Khaled ZEL, Mcheick H. Case studies of communications systems during harsh environments: a review of approaches, weaknesses, and limitations to improve quality of service. IJDSN. 2019;15(2):1-22.doi:10.1177/1550147719829960.

33. Hoover, R. Benefits of using an electronic health record. Nurs Crit Care. 2017;12(1):9-10. doi: 10.1097/01. CCN.0000508631.93151.8d.

34. Meisel ZF, Shea JA, Peacock NJ, Dickinson ET, Paciotti B, Bhatia R, et al. Optimizing the patient handoff between emergency medical services and the emergency department. Ann Emerg Med. 2015;65(3):310-7. doi: 10.1016/j. annemergmed.2014.07.003.

35. Scerpella DL, Adam A, Marx K, Gitlin LN. Implications of geographic information system (GIS) for targeted recruitment of older adults with dementia and their caregiver in the community: a retrospective analysis. Contemp Clin Trials Commun. 2019;14:1-6. doi: 10.1016/j.conctc.2019. 100338.

36. Sritart H, Tuntiwong K, Miyazaki H, Taertulakarn S. Disparities in healthcare services and spatial assessments of mobile health clinics in the border regions of Thailand. Int J Environ Res Public Health. 2021;18:1-24.

37. Hedges AR, Johnson HJ, Kobulinsky LR, Estock JI, Eibling D, Seybert AI. Effects of cross-training on medical teams' teamwork and collaboration: use of simulation. Pharmacy. 2019;7(13):1-10. doi: 10.3390/pharmacy7010013.

38. Xia Y, Cao-Yun Z, Chen Y. Practice and effect of one-stop service of dental clinic for old people. Shanghai Journal of Stomatology. 2018;27(3):433-5. (in Chinese).

39. Keene SE, Cameron-Comasco L. Implementation of a geriatric emergency medical assessment team decreases hospital length of stay. Am J Emerg Med. 2022;55:45-50.

40. Duong H, Herrera LN, Moore JX, Donnelly J, Jacobson KE, Carlson JN, et al. National characteristics of emergency medical service response for older adults in the United States. Prehosp Emerg Care. 2018;22(1):7-14.

การพัฒนาและประเมินความเป็นไปได้ของจุดรวมบริการการแพทย์ฉุกเฉินสำหรับผู้สูงอายุภาคเหนือของประเทศไทย: การวิจัยเชิงปฏิบัติการ

บุญญาภัทร ชาติพัฒนานันท์* วงจันทร์ เพชรพิเชฐเชียร โสพิศ เวียงโอสถ เกรียงศักดิ์ ปินตาธรรม
บุบผา วิริยรัตนกุล

บทคัดย่อ: ผู้สูงอายุส่วนใหญ่มีความต้องการเฉพาะและทรมานจากโรคเรื้อรัง การเข้าถึงบริการการแพทย์ฉุกเฉินที่รวดเร็วและสะดวกจึงสำคัญ การวิจัยเชิงปฏิบัติการ 3 ระยะมีวัตถุประสงค์เพื่อพัฒนาและประเมินความเป็นไปได้แบบจำลองจุดรวมบริการการแพทย์ฉุกเฉินสำหรับผู้สูงอายุในภาคเหนือตอนบนของประเทศไทย ระยะที่ 1 และ 2 กลุ่มตัวอย่างเจ้าหน้าที่การแพทย์ฉุกเฉิน 27 ราย และผู้สูงอายุ 10 ราย คัดเลือกแบบเจาะจง และระยะที่ 3 เจ้าหน้าที่การแพทย์ฉุกเฉิน 16 รายประเมินความเป็นไปได้ในการใช้แบบจำลอง กรอบแนวคิด คือ กระบวนการวิจัยเชิงปฏิบัติการและหกระยะของบริการการแพทย์ฉุกเฉิน เก็บรวบรวมข้อมูลโดยการสัมภาษณ์เชิงลึก สังเกต และประเมินความเป็นไปได้ของการใช้แบบจำลอง ตรวจสอบคุณภาพเครื่องมือวิจัยโดยผู้ทรงคุณวุฒิได้ค่าดัชนีความตรงตามเนื้อหา 0.8-1 และค่าความเที่ยงของแบบสอบถามความเป็นไปได้โดยสัมประสิทธิ์แอลฟาของครอนบาค 0.81 วิเคราะห์ข้อมูลโดยสถิติพรรณนาและการวิเคราะห์เชิงเนื้อหา

แบบจำลองสุดท้ายมีหกองค์ประกอบ คือ การสื่อสารอย่างมีประสิทธิภาพ ทะเบียนและฐานข้อมูล ระบบข้อมูลสารสนเทศทางภูมิศาสตร์ ทีมบริการการแพทย์ฉุกเฉินที่มีประสิทธิภาพ ห้องฉุกเฉินแบบครบวงจรสำหรับผู้สูงอายุ และความต่อเนื่องของการดูแล ภาพรวมความเป็นไปได้ในการใช้แบบจำลองอยู่ในระดับสูง ประโยชน์และความปลอดภัยของผู้สูงอายุมีค่าสูงสุด รองลงมาคือ ความเหมาะสมต่อการใช้งาน แบบจำลองน่าจะเป็นประโยชน์ต่อผู้สูงอายุ การใช้ที่มีประสิทธิภาพควรได้รับการสนับสนุนทรัพยากร และควรประเมินประสิทธิภาพของแบบจำลองในคลินิกอย่างเต็มรูปแบบ

คำสำคัญ: การวิจัยเชิงปฏิบัติการ บริการการแพทย์ฉุกเฉิน การศึกษาความเป็นไปได้ ผู้สูงอายุ

*ติดต่อที่: **บุญญาภัทร ชาติพัฒนานันท์*** *ผู้ช่วยศาสตราจารย์ กลุ่มสาขาวิชาการพยาบาลผู้ใหญ่และผู้สูงอายุ สำนักวิชาพยาบาลศาสตร์ มหาวิทยาลัยแม่ฟ้าหลวง E-mail: boonyapat.sha@mfu.ac.th*
วงจันทร์ เพชรพิเชฐเชียร *ผู้ช่วยศาสตราจารย์ วิทยาลัยพยาบาลขั้นสูงแห่งประเทศไทย สภาการพยาบาล E-mail: pwongcha@hotmail.com*
โสพิศ เวียงโอสถ *พยาบาลวิชาชีพ กลุ่มงานเวชศาสตร์ฉุกเฉิน โรงพยาบาลเชียงรายประชานุเคราะห์ E-mail: so.mam109@gmail.com*
เกรียงศักดิ์ ปินตาธรรม *แพทย์ประจำกลุ่มงานเวชศาสตร์ฉุกเฉิน โรงพยาบาลเชียงรายประชานุเคราะห์ E-mail: birdkriangsak@gmail.com*
บุบผา วิริยรัตนกุล *อาจารย์ กลุ่มสาขาวิชาการพยาบาลชุมชน สำนักวิชาพยาบาลศาสตร์ มหาวิทยาลัยแม่ฟ้าหลวง E-mail: buppar.vir@mfu.ac.th*